



CDSC (NI)

***C. difficile* surveillance**

Quarter Ending June 2009

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

Key Points

- ❖ CDAD numbers and rates for hospital inpatients, over 65 years of age, in Northern Ireland have continued to decline during April – June 2009 (Figure 6).
- ❖ CDAD reports from ‘community’ patients, over 65 years of age, for the April – June quarter have decreased by 35% (25 episodes) compared with the previous quarter (Figure 1; Appendix A).
- ❖ CDAD reports in inpatients aged 65 years and over fell by 12% between 2007/08 and 2008/09 (Appendix F).
- ❖ CDAD numbers for hospital inpatients and ‘community’ patients, aged 2 years and over have continued to decline during April – June 2009.
- ❖ This quarter, one Trust was unable to validate their data within agreed timescales. Therefore, data relating to this Trust and NI is provisional.

C. difficile reporting

- ❖ Reports of *C. difficile* are obtained directly from each diagnostic laboratory through the routine laboratory surveillance programme.
- ❖ Line listings of cases are returned 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 CDAD surveillance now covers all individuals over 2 years of age. To reflect this, the quarterly report summarises data for individuals aged 65 years and over, those aged 2 years and over and CDAD episodes reported in individuals aged 2-64 years.
- ❖ The total number of *C. difficile* episodes in inpatients aged 65 years and over is presented for each Trust, by financial year, in Appendix F.
- ❖ This report contains an update on the new Northern Ireland ribotyping service which commenced 1st April 2009.

April – June 2009

All CDAD episodes for patients aged 65 years and over (inpatient and community)

- ❖ During the quarter, 193 episodes of CDAD were reported in persons aged 65 years and over compared to 269 episodes in the previous quarter (28% decrease, 76 reports; Figure 1).
- ❖ This quarters CDAD figures are lower than those reported during the same period in previous years, and are the lowest recorded for this quarter since reporting began in 2005 (Figure 1).
- ❖ Of these 193 episodes, 147 were known to have been a hospital inpatient in one of the listed hospitals (Appendix A Table 1) at the time their sample was taken.
- ❖ The remaining 46 isolates reported were from ‘community’ samples which may include: GPs, nursing homes and other non acute settings. This figure represents a

decrease in the proportion of CDAD reports from the 'community'; 26.4% (71/269 episodes) in the January – March quarter, compared with 23.8% (46/193) this quarter.

Inpatient episodes for patients aged 65 years and over

- ❖ There has been a decrease of 51 cases (25.8%) in the number of inpatient CDAD cases reported in this quarter (147) compared to the previous quarter (198). This is the sixth consecutive quarter in which there has been a reduction in inpatient CDAD episodes (Figure 2a).
- ❖ Comparing the April – June period in 2009 (147 episodes) to the same quarters in 2008 (248 episodes) and 2007 (211 episodes), there has been a decrease in the number of cases reported (41% and 30% decrease respectively; Figure 2b).
- ❖ For a breakdown of CDAD rates by Trust/hospitals see Figures 4 and 5.

Community episodes for patients aged 65 years and over

- ❖ Community figures have decreased by 25 episodes (35%) this quarter when compared to the previous quarter (46 reported this quarter compared to 71 reports in January – March 2009, Figure 1 and Appendix A).
- ❖ The number of 'community' isolates in this quarter (46 cases) is lower than the number reported in April – June 2008 (86 cases; 47% decrease; Figure 1). Currently, community isolates are identified by the location of the patient at the time the specimen was taken. Therefore, this number may include patients who have had a recent healthcare interaction.

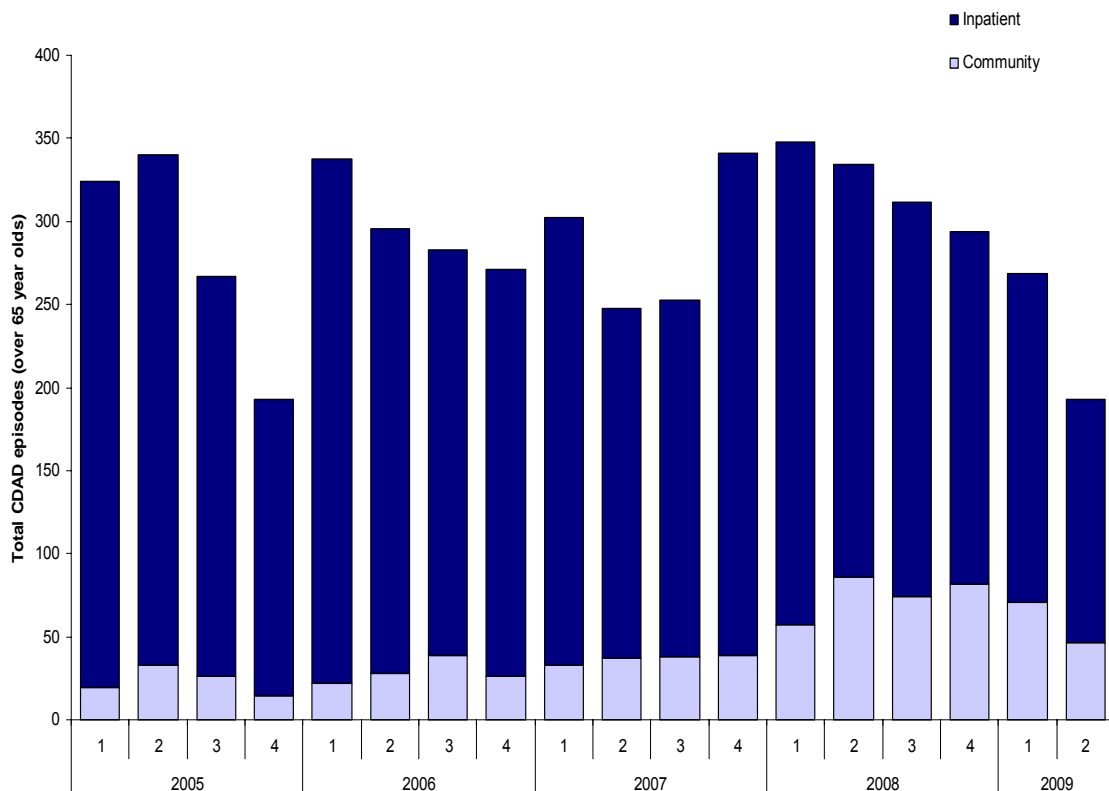


Figure 1: Total CDAD reports, inpatient and community, in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.

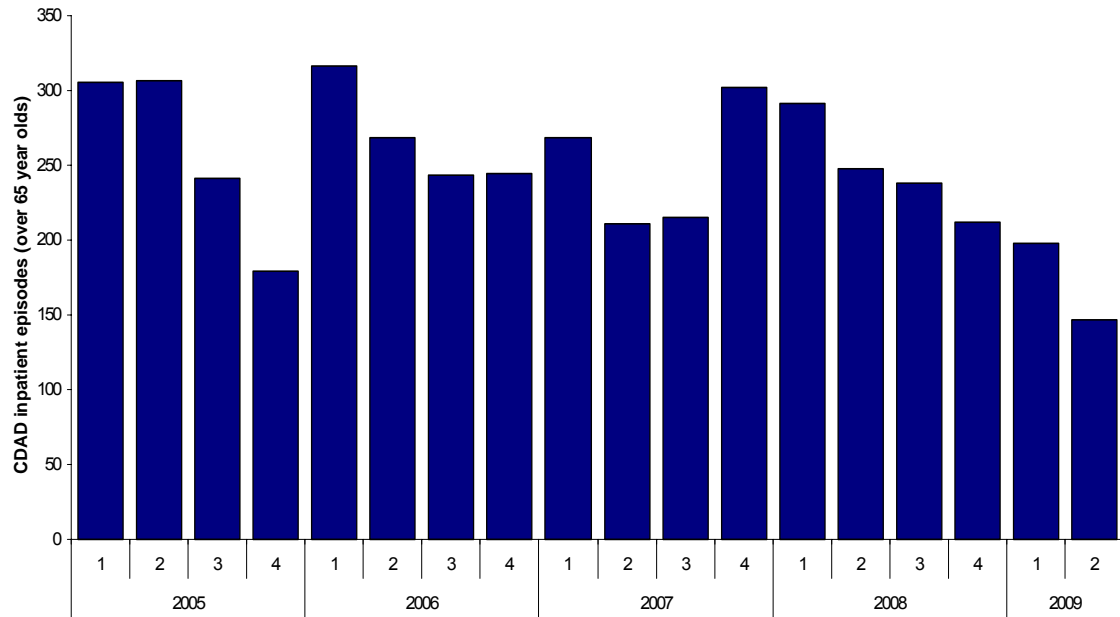


Figure 2a: Total CDAD 'Inpatient' reports, Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.

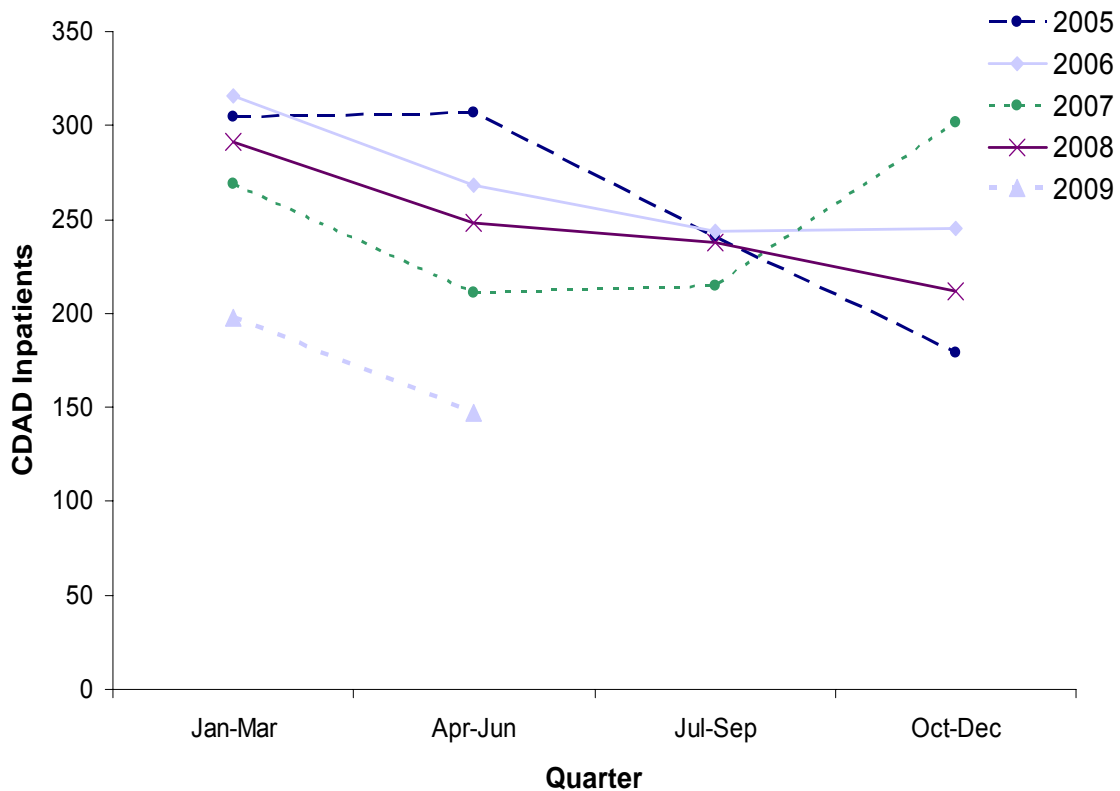


Figure 2b: Total CDAD 'Inpatient' reports, Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.

All CDAD episodes for patients aged 2 years and over (inpatient and community)

- ❖ During this quarter, 254 episodes of *C. difficile* associated disease were reported in persons aged 2 years and over. This represents a 27.6% decrease from the previous quarter (351 episodes). Of the 254 episodes, 76% were in those aged 65 years and over (includes inpatient and community).
- ❖ 198 patients were known to have been a hospital inpatient in one of the listed hospitals in Appendix A, Table 2 at the time their sample was taken (Figure 6). Of these 198, 74% were patients aged 65 years and over.
- ❖ The remaining 56 isolates reported in patients aged 2 years and over were from 'community' samples which may include: GPs, nursing homes and other such non acute settings. Of these 56, 82% occurred in patients aged 65 years and over. Currently, community isolates are identified by the location of the patient at the time the specimen was taken. Therefore, this number may include patients who have had a recent healthcare interaction.
- ❖ For a breakdown of episodes in individuals aged 2-64 years see Appendix A Table 3.

Rates of *C. difficile* in hospital inpatients

- ❖ 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 4). 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) obtained from DHSSPS on a quarterly basis.
- ❖ KH03a bed day data was not available for Lurgan General Hospital or Mullinure; therefore, the figures used are based on an estimate generated using Quarter 2 bed day data for these hospitals from 2005 – 2008. The bed day information will be updated when it becomes available.
- ❖ This quarter, the Western Trust reported the closure of the Sperrin Ward (Tyrone&Fermanagh). Patients in these facilities have been transferred to another ward; this will be reflected in future reports.

Clarification of episode definitions

- ❖ Due to ongoing queries regarding the assignment of CDAD episodes to particular Trusts, supplementary information reflecting situations that may arise and resulting actions applied is outlined in Appendix E.

Statistical Process Control charts

- ❖ 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 has crossed the lower action limit of the chart. This indicates a significant reduction in the number of *C. difficile* patient episodes not explained by natural variation (Figure 3).

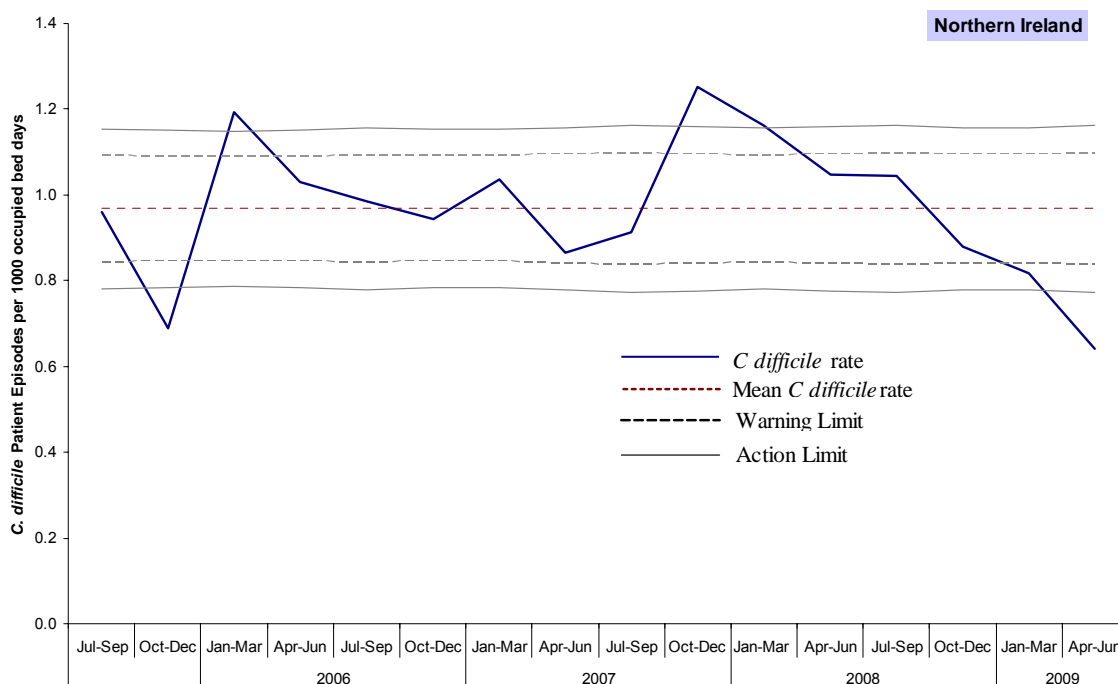


Figure 3: Statistical Process Control chart for quarterly *C. difficile* rates in inpatients aged 65 years and over, in Northern Ireland (For Trust level see Appendix B).

Ribotype surveillance

- ❖ As of 1st April 2009, a *C. difficile* ribotyping service has been established in Northern Ireland. This has been facilitated by the integration of the Belfast Trust laboratory service into the *Clostridium difficile* Ribotyping Network for England.
- ❖ Previously in 2008, all Trusts were requested to send 20 CDAD positive isolates per quarter, which were cultured and ribotyped in Leeds (Prof M. Wilcox). Building on this scheme, all *C. difficile* isolates within Northern Ireland will now be ribotyped.
- ❖ Trusts are requested to send CDAD positive isolates to the Belfast City Hospital laboratory. The samples are recorded and sent to the Royal Victoria Hospital lab where they are cultured and ribotyped. This new service will facilitate enhanced surveillance of ribotypes circulating in NI.
- ❖ Provisional ribotype data for Northern Ireland during the April – June quarter is presented in Table 1. This data will be validated and a full report to include analysis of age and geography of patients with *C. difficile* will be included in the next quarterly HCAI report. The format/commentary of this section will be refined with microbiology colleagues and will feature in subsequent bulletins.

- ❖ The most prevalent ribotype in Northern Ireland is ribotype 078 (17.4%), followed by ribotype 001 (13.4%). The proportion of 027 ribotypes remains low (3%) when compared to circulating ribotypes in England.

Table 1. A summary of *C. difficile* ribotypes, and the percentage contribution to the overall total, reported in Northern Ireland during routine surveillance, April – June 2009. **Figures are provisional.**

Ribotype	April – June 2009	
	Number	%
001	34	13.4
002	10	4.0
015	6	2.4
027	7	2.8
078	44	17.4
106	17	6.7
Other	55	21.7
Not matched*	45	17.8
Not grown**	35	13.8
Total	253***	-

*‘not matched’ are types which do not match any of the profiles on record from previously typed NI isolates. These may be re-visited in the future when a larger panel of types becomes available.

** For this quarter, ‘not grown’ represents isolates which have no ribotype information supplied, with at least 6 weeks since the date of the specimen.

*** The 253 episodes may not match the 254 *C. difficile* isolates reported in individuals aged 2 years and over,

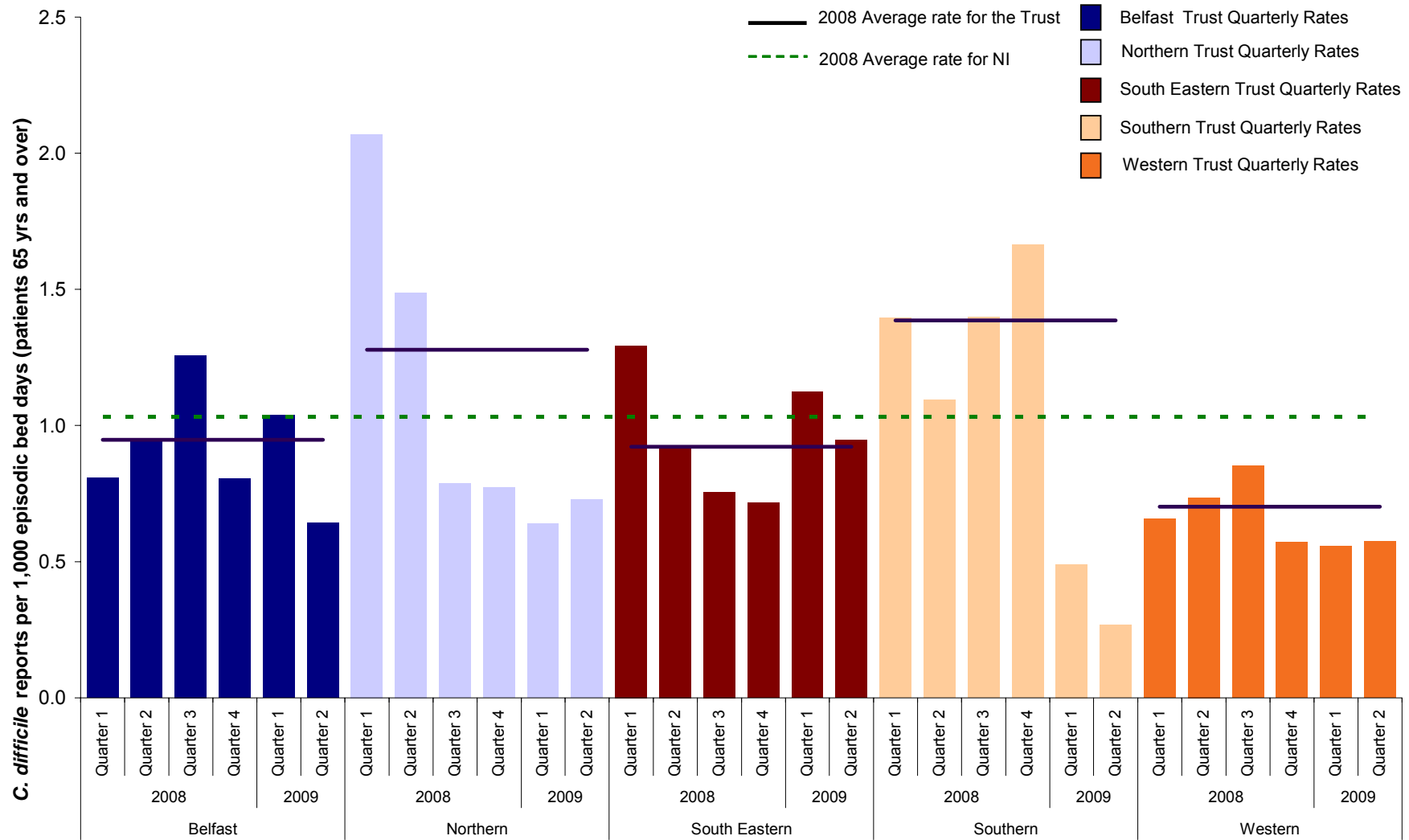


Figure 4: Quarterly rates of *Clostridium difficile* by Trust 1 January 2008 – 30 June 2009, compared with annual NI and Trust rates for 2008; inpatients ≥ 65 years.

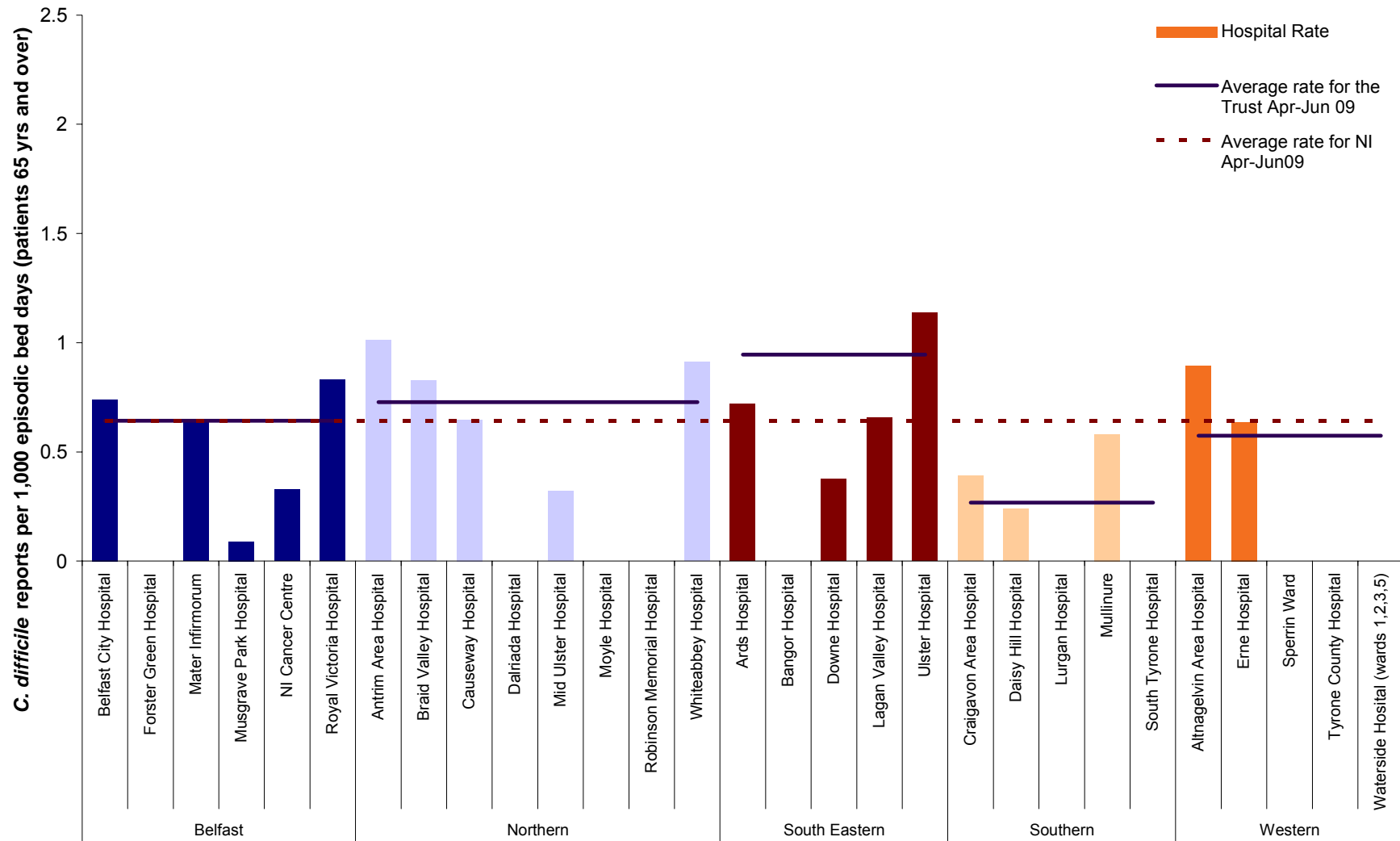


Figure 5: Rates of *Clostridium difficile* by individual Hospitals, 2009 Quarter 2 (inpatients ≥ 65 years), including the quarterly Trust rates and an average rate for NI, gaps represent zero episodes (see appendix A Table 1).

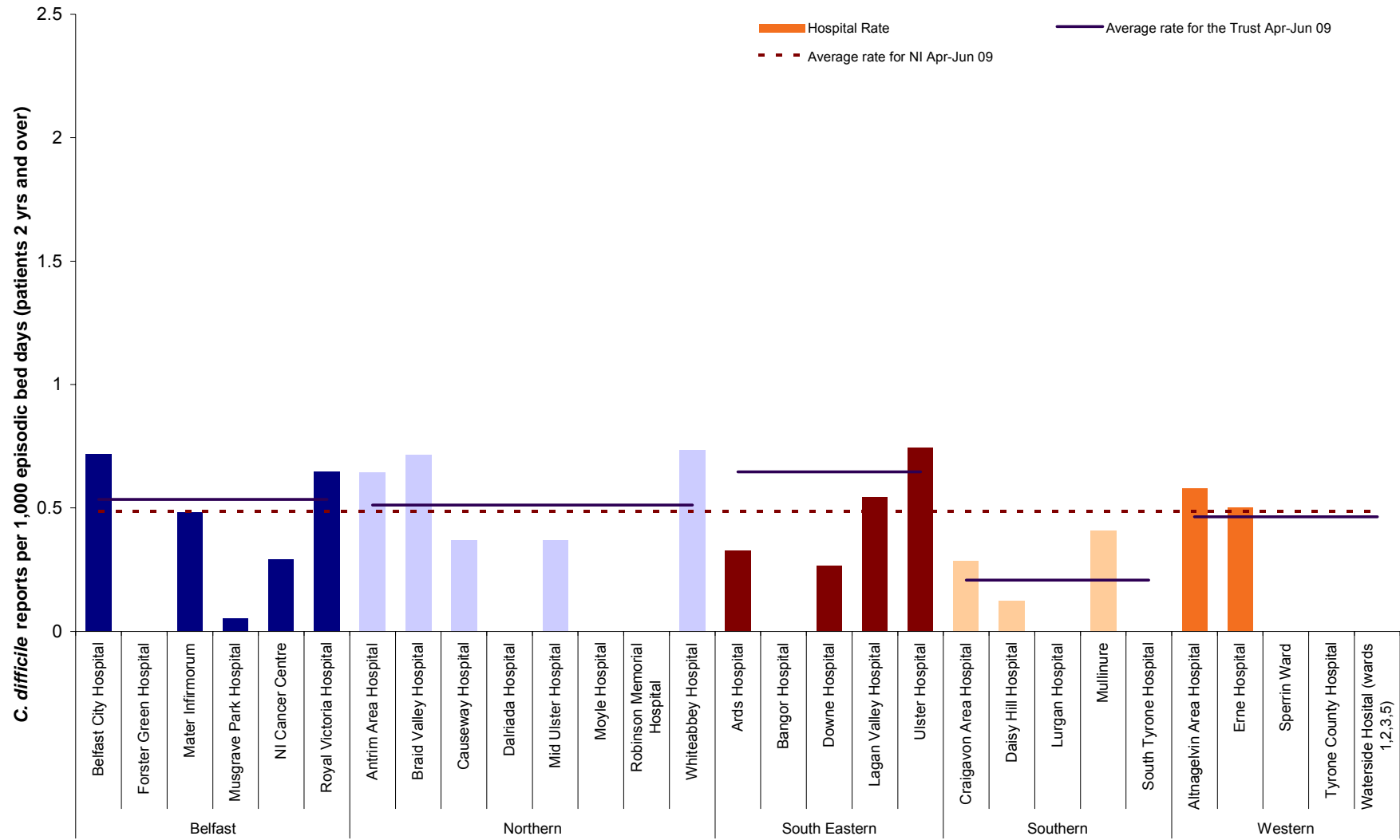


Figure 6: Rates of *Clostridium difficile* by individual Hospitals, 2009 Quarter 2 (inpatients 2 years and over), including the quarterly Trust rates and an average rate for NI, gaps represent zero episodes (see appendix A Table 2).

Appendix A

Table 1: Quarterly number of *Clostridium difficile* patient episodes, patients 65 years and over, and rates by Hospital, January – June 2009. Figures in parentheses represent data for October – December 2008.

Hospital	Jan-Mar 2009		Apr-Jun 2009	
	Episodes	Rate	Episodes	Rate
Belfast City Hospital	30	1.17	17	0.741
Forster Green Hospital	0	0.000	0	0.000
Mater Infirmorum	17	1.261	8	0.648
Musgrave Park Hospital	7	0.626	1	0.090
NICCO (formerly at Belvoir Park)	2	0.638	1	0.329
Royal Victoria Hospital	29	1.030	22	0.829
Belfast Health & Social Care Trust	85 (66)	1.038	49	0.643
Antrim Area Hospital	12	0.710	16	1.014
Braid Valley Hospital	2	0.714	2	0.827
Causeway Hospital	11	1.028	6	0.647
Dalriada Hospital	0	0.000	0	0.000
Mid Ulster Hospital	2	0.296	2	0.321
Moyle Hospital	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000
Whiteabbey Hospital	4	0.536	6	0.912
Northern Health & Social Care Trust	31 (38)	0.640	32	0.728
Ards Hospital	0	0.000	1	0.719
Bangor Hospital	0	0.000	0	0.000
Downe Hospital	1	0.260	1	0.375
Lagan Valley Hospital	4	0.608	4	0.657
Ulster Hospital	39	1.504	29	1.136
South Eastern Health & Social Care Trust	44 (29)	1.123	35	0.946
Craigavon Area Hospital	13	0.811	6	0.389
Daisy Hill Hospital	1	0.106	2	0.239
Lurgan Hospital	3	0.483	0	0.000
Mullinure	1	0.540	1	0.582
South Tyrone Hospital	0	0.000	0	0.000
Southern Health & Social Care Trust	18 (59)	0.490	9	0.268
Altnagelvin Area Hospital	13	0.752	16	0.894
Erne Hospital	5	0.659	6	0.638
Sperrin Ward (T&F)	0	0.000	0	0.000
Tyrone County Hospital	2	0.456	0	0.000
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000	0	0.000
Western Health & Social Care Trust	20 (21)	0.557	22	0.574
NI TOTAL	198 (213)	0.818	147	0.642
NI Community TOTAL	71 (82)	-	46	-

Appendix A

Table 2: Quarterly number of *Clostridium difficile* patient episodes, patients 2 years and over, and rates by Hospital, January – June 2009. Figures in parentheses represent data for October – December 2008.

Hospital	Jan - Mar 2009		Apr - Jun 2009	
	Episodes	Rate	Episodes	Rate
Belfast City Hospital	41	0.940	30	0.719
Forster Green Hospital	0	0.000	0	0.000
Mater Infirmorum	19	0.783	11	0.483
Musgrave Park Hospital	8	0.407	1	0.052
NICCO (formerly at Belvoir Park)	5	0.755	2	0.292
Royal Victoria Hospital	42	0.785	34	0.649
Belfast Health & Social Care Trust	115 (94)	0.765	78	0.534
Antrim Area Hospital	18	0.604	20	0.645
Braid Valley Hospital	2	0.000	2	0.715
Causeway Hospital	16	0.818	7	0.369
Dalriada Hospital	0	0.000	0	0.000
Mid Ulster Hospital	2	0.232	3	0.369
Moyle Hospital	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000
Whiteabbey Hospital	5	0.526	6	0.735
Northern Health & Social Care Trust	43 (45)	0.544	38	0.512
Ards Hospital	0	0.000	1	0.328
Bangor Hospital	0	0.000	0	0.000
Downe Hospital	1	0.209	1	0.267
Lagan Valley Hospital	7	0.768	5	0.545
Ulster Hospital	47	1.040	33	0.743
South Eastern Health & Social Care Trust	55 (31)	0.853	40	0.645
Craigavon Area Hospital	21	0.577	10	0.286
Daisy Hill Hospital	2	0.113	2	0.125
Lurgan Hospital	3	0.412	0	0.000
Mullinure	1	0.394	1	0.407
South Tyrone Hospital	0	0.000	0	0.000
Southern Health & Social Care Trust	27 (73)	0.404	13	0.207
Altnagelvin Area Hospital	16	0.425	22	0.580
Erne Hospital	5	0.359	7	0.504
Sperrin Ward (T&F)	0	0.000	0	0.000
Tyrone County Hospital	2	0.350	0	0.000
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000	0	0.000
Western Health & Social Care Trust	23 (28)	0.359	29	0.464
NI TOTAL	263 (271)	0.619	198	0.486
NI community TOTAL	88 (96)	-	56	-

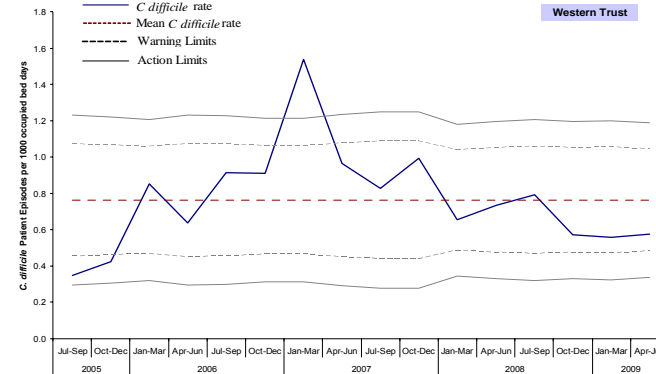
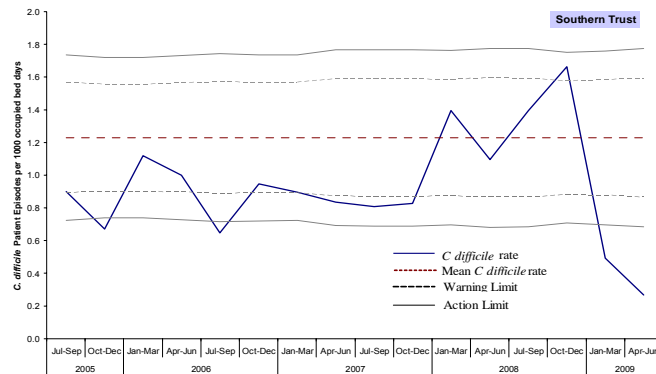
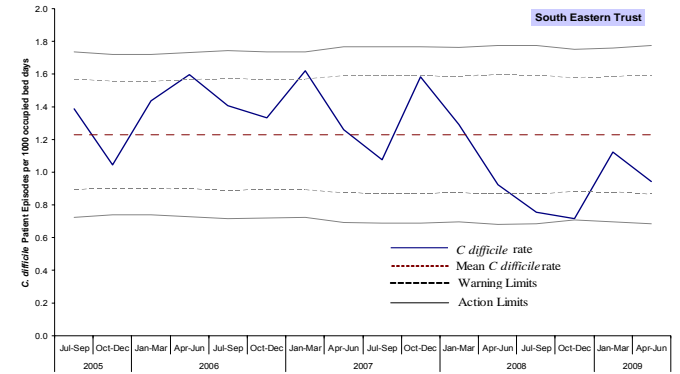
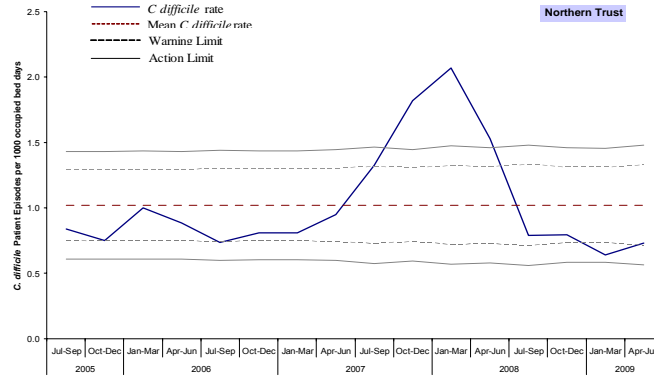
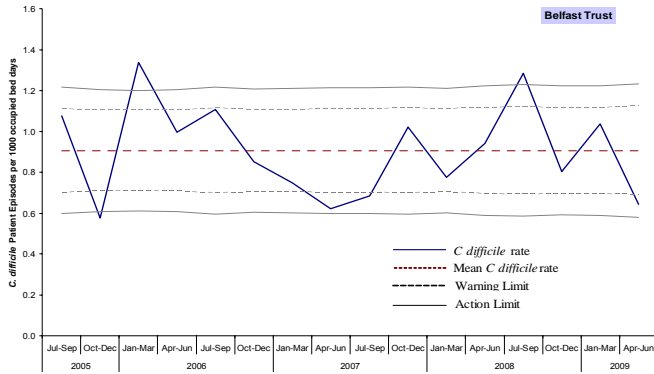
Appendix A

Table 3: Quarterly number of *Clostridium difficile* patient episodes, patients 2 to 64 years, by Hospital, January – June 2009. Figures in parentheses represent data for October – December 2008.

Hospital	Jan - Mar 09	Apr - Jun 09
	Episodes	Episodes
Belfast City Hospital	11	13
Forster Green Hospital	0	0
Mater Infirmorum	2	3
Musgrave Park Hospital	1	0
NICCO (formerly at Belvoir Park)	3	1
Royal Victoria Hospital	13	12
Belfast Health & Social Care Trust	30	29
Antrim Area Hospital	6	4
Braid Valley Hospital	0	0
Causeway Hospital	5	1
Dalriada Hospital	0	0
Mid Ulster Hospital	0	1
Moyle Hospital	0	0
Robinson Memorial Hospital	0	0
Whiteabbey Hospital	1	0
Northern Health & Social Care Trust	12	6
Ards Hospital	0	0
Bangor Hospital	0	0
Downe Hospital	0	0
Lagan Valley Hospital	3	1
Ulster Hospital	8	4
South Eastern Health & Social Care Trust	11	5
Craigavon Area Hospital	8	4
Daisy Hill Hospital	1	0
Lurgan Hospital	0	0
Mullinure	0	0
South Tyrone Hospital	0	0
Southern Health & Social Care Trust	9	4
Altnagelvin Area Hospital	3	6
Erne Hospital	0	1
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	3	7
NI TOTAL	65	51
NI community TOTAL	17	10

Appendix B

Trends in inpatients, aged 65 years and over, *C difficile* rates by trust and quarter (2005-2009)



Appendix C

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

Appendix E

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 be retested for *C. difficile*. If the new admission is within 28 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 F

Table 1 *C. difficile* patient episodes in inpatients aged 65 years and over by financial year and Trust, in Northern Ireland.

Trust	Financial Year			
	2005/06	2006/07	2007/08	2008/09
Belfast	352	336	280	327
Northern	184	172	297	172
South Eastern	243	256	199	135
Southern	168	130	134	164
Western	96	132	109	98
Northern Ireland	1043	1026	1019	896