

C. difficile surveillance

Quarterly report

January - March 2012 (Q1 2012)

Key points

- CDI reports for hospital inpatients aged 65 years and over decreased by 5% (from 79 to 75 episodes) during quarter one 2012 compared to quarter four 2011. CDI rates decreased by 10% during quarter one 2012.
- CDI reports for community patients aged 65 years and over increased by 26% (from 34 to 43 episodes) compared to quarter four 2011.
- Total CDI reports, for hospital inpatients and community patients combined, aged two years and over, decreased by 2% this quarter (from 143 to 140 episodes).
- CDI reports for hospital inpatients aged 65 years and over fell by 17% between the 2010/11 and 2011/12 financial years.

Surveillance of *C. difficile* infection (CDI)

***C. difficile* reporting**

- Reports of *C. difficile* are obtained directly from each diagnostic laboratory through the routine laboratory surveillance programme and cross-referenced with the Northern Ireland healthcare associated infections (HCAI) web-based surveillance system.
- Line listings of *C. difficile* cases are returned to the diagnostic laboratories, who confirm the totals and the breakdown of patients by source (hospital inpatient/community) according to the information provided on laboratory request forms.
- The data in this report therefore represent CDI episodes that have been validated by the diagnostic laboratories. It is possible that these numbers may change and any updates will be reflected in the next quarterly surveillance report.
- The total number of *C. difficile* episodes for hospital inpatients aged 65 years and over is included for each Health and Social Care Trust (HSCT), by financial year, in Table 6.

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

- During quarter one 2012, 118 episodes of CDI were reported in persons aged 65 years and over compared to 113 in the previous quarter (4% increase, 5 reports; Figure 1).
- This quarter's CDI figures are lower than those reported during the same period in previous years (Figure 1).
- Of these 118 episodes reported in quarter one 2012, 75 (64%) were known to have been a hospital inpatient in one of the listed hospitals (Table 3) at the time their sample was taken.
- The remaining 43 isolates were from community samples, which may include those from GPs, nursing homes and other non-acute settings. 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. This figure represents an increase in the proportion of CDI reports from the community – 36% (43/118) reported this quarter compared to 30% (34/113) in quarter four 2011.

Inpatient episodes for patients aged 65 years and over

- This quarter has seen inpatient CDI cases decrease by 5%, from 79 in quarter four 2011 to 75 this quarter (Figure 2a).
- This quarter's CDI inpatient figures are lower than those reported during the same period in previous years and are the lowest recorded since reporting began in 2005 (Figure 2b).
- For a breakdown of CDI rates by HSCT/individual hospital see Figures 4 and 5.

Community episodes for patients aged 65 years and over

- Community episodes of CDI this quarter (43 reports) have increased by 26% compared to quarter four 2011 (34 reports) (Figure 1 and Table 4).
- The number of community episodes this quarter (43 reports) is lower than the number reported for the same quarter in 2011 (62 reports), in 2009 (71 reports) and in 2008 (57 reports; Figure 1). This number may include patients who have had a recent healthcare interaction.

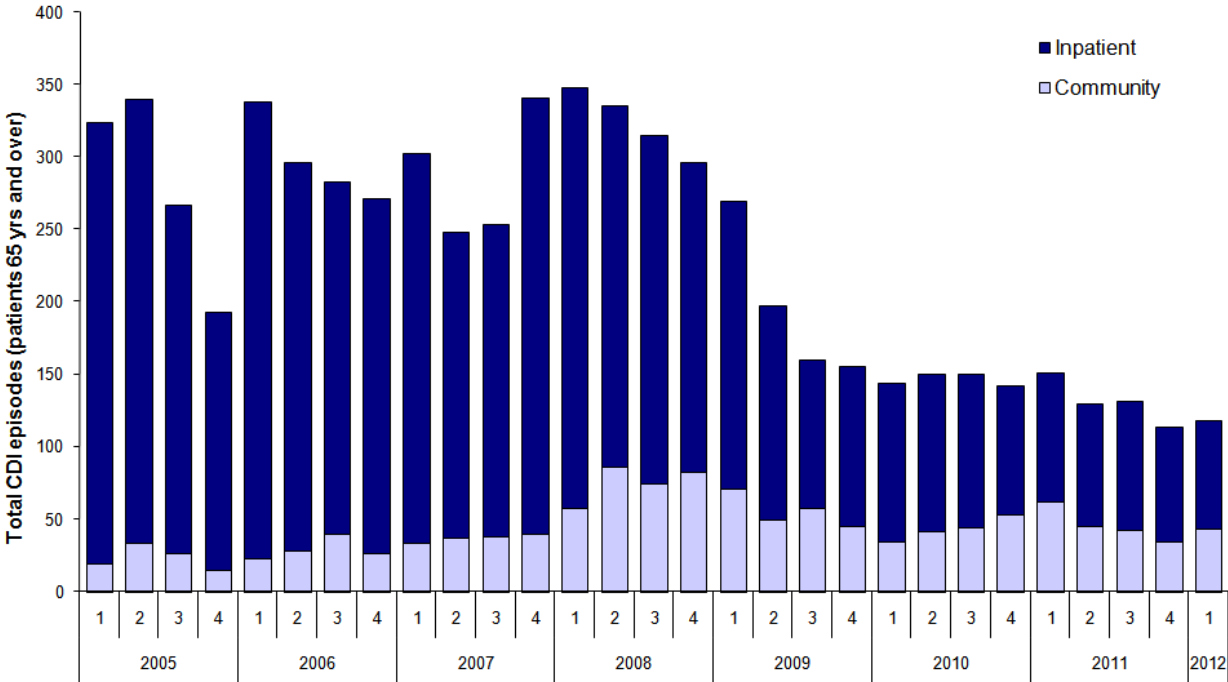


Figure 1: Total CDI reports, inpatient and community, in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2012

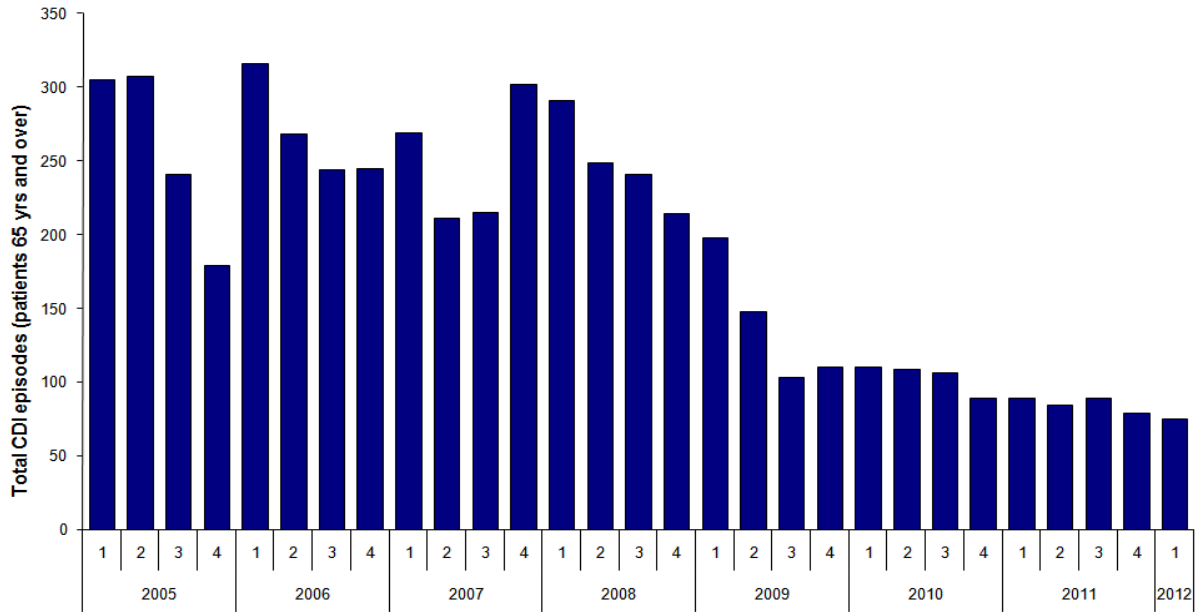


Figure 2a: Total CDI inpatient reports in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2012

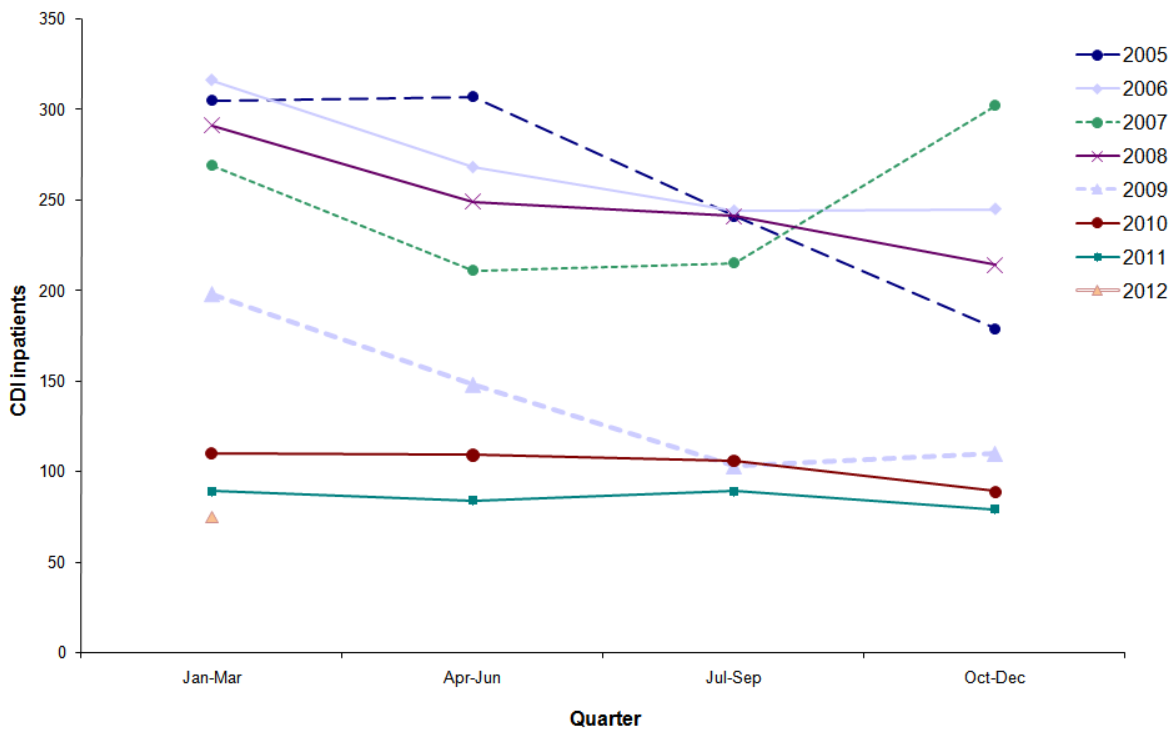


Figure 2b: Total CDI inpatient reports in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2012

All CDI episodes for patients aged two years and over (inpatient and community)

- During quarter one 2012, 140 episodes of *C. difficile* infection were reported in persons aged two years and over (Table 5). This represents a 2% decrease on the previous quarter (143 episodes). Of the 140 episodes reported, 84% were reported among patients aged 65 years and over (includes inpatient and community).
- In all, 91 patients were known to have been a hospital inpatient in one of the listed hospitals in Table 5 at the time their sample was taken (Figure 6). Of these 91, 82% were patients aged 65 years and over.
- The remaining 49 isolates reported in patients aged two years and over were from community samples, which may include those from GPs, nursing homes and other such non-acute settings. Of these 49, 88% 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.

Rates of *C. difficile* in hospital inpatients

- All HSCTs provide appropriate denominator data (bed occupancy for patients ≥ 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 two years and over (Figure 6), the most appropriate denominator is all-age bed occupancy, determined using the KH03a return (number of occupied beds) obtained from the DHSSPS on a quarterly basis.
- KH03a bed day data was not available for the Royal Maternity Hospital; therefore, the figures used are based on an estimate generated using quarter one bed day data for this hospital from previous years. This bed day information will be updated when it becomes available.

Clarification of episode definitions

- Due to ongoing queries regarding the assignment of CDI episodes to particular HSCTs, supplementary information on situations that may arise, and the resulting actions applied, is provided in appendix E.

Statistical process control (SPC) charts

- 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 D. Trends in CDI rates since July 2005 are shown for each HSCT in appendix B.
- In Northern Ireland this quarter, the rate of *C. difficile* patient episodes has remained below the lower action limit of the SPC chart. This indicates that a significant reduction in the number of *C. difficile* patient episodes has occurred which may not be explained by natural variation (Figure 3).

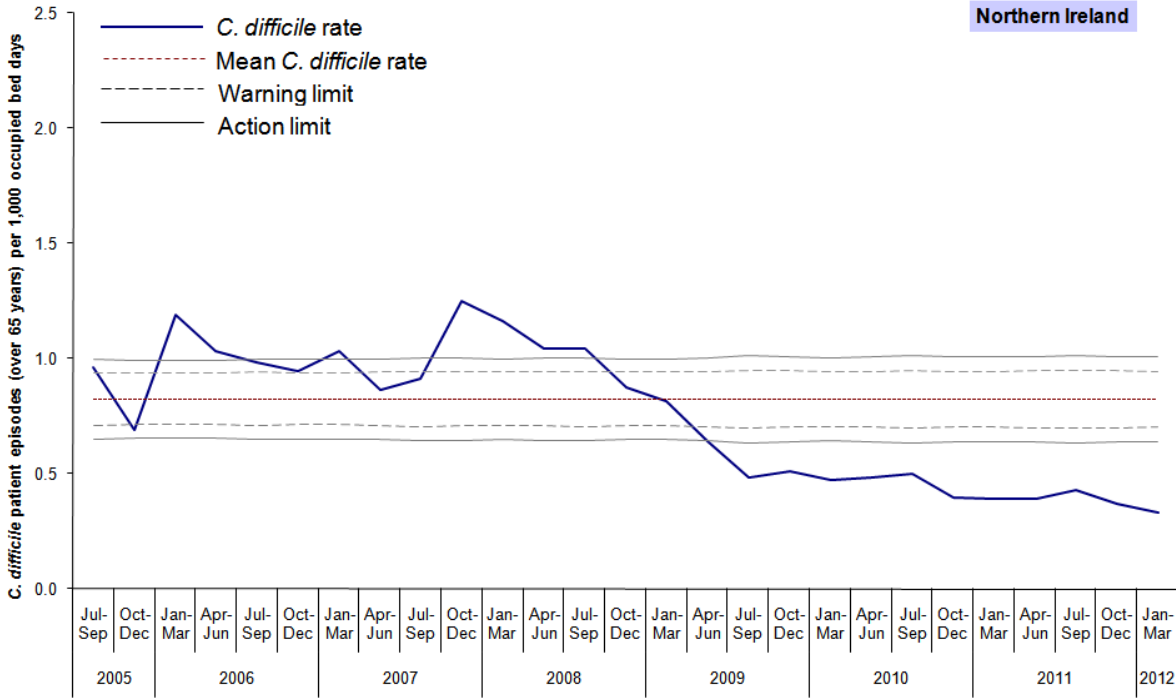


Figure 3: Statistical process control chart for quarterly *C. difficile* rates among inpatients in Northern Ireland aged 65 years and over (for HSCT level, see appendix B)

NI Ribotype Surveillance Programme

- On 1 April 2009, a *C. difficile* ribotyping service was established in Northern Ireland. The NI Ribotyping Service saw the integration of the Belfast HSCT laboratory service into the *Clostridium difficile* Ribotyping Network for England (CDRN).
- HSCTs are now requested to send all CDI positive isolates to the Royal Victoria laboratory, where they are recorded, cultured and ribotyped. The samples sent for ribotyping are matched against validated CDI episodes from CoSurv on a quarterly basis.
- Tables 1 and 2 present validated ribotype data for Northern Ireland stratified by patient location at time of sampling for quarter two 2011, quarter three 2011 and quarter four 2011. Provisional ribotype data for this quarter (quarter one 2012) are also presented.
- This quarter, the most prevalent ribotypes for CDI inpatients are 078 (23.1%), 002 (12.1%) and 020 (6.6%) (Table 1) and in the community are 078 (26.5%), 002 (12.2%), 001 (8.2%) and 014 (8.2%) (Table 2). There have been no cases of 027 identified since July-September 2011 in an inpatient setting.
- Descriptive data for January - March 2012, summarising the age, gender, HSCT and source description of the four most prevalent ribotypes from all sources, are presented in Table 3.

Table 1: A summary of *C. difficile* ribotypes in Hospital Inpatients aged 2 years and over, and the percentage of each against the overall total, in Northern Ireland during routine surveillance, April 2011 - March 2012

Ribotype	Apr - Jun 2011		Jul - Sep 2011		Oct - Dec 2011		Jan - Mar 2012*	
	Number	%	Number	%	Number	%	Number	%
001	2	1.7	6	5.0	2	1.9	0	0.0
002	10	8.3	9	7.6	8	7.5	11	12.1
005	4	3.3	8	6.7	4	3.8	3	3.3
014	7	5.8	7	5.9	12	11.3	4	4.4
015	8	6.6	6	5.0	5	4.7	3	3.3
020	7	5.8	7	5.9	5	4.7	6	6.6
023	2	1.7	10	8.4	7	6.6	3	3.3
027	1	0.8	4	3.4	0	0.0	0	0.0
078	27	22.3	15	12.6	11	10.4	21	23.1
106	1	0.8	2	1.7	2	1.9	0	0.0
193	7	5.8	1	0.8	3	2.8	2	2.2
Other	13	10.7	14	11.8	15	14.2	19	20.9
Not groupable**	12	9.9	16	13.4	11	10.4	8	8.8
Not on ribotype list	4	3.3	6	5.0	8	7.5	2	2.2
Not grown***	16	13.2	8	6.7	13	12.3	9	9.9
Total	121		119		106		91	

Table 2: A summary of *C. difficile* ribotypes in Community Patients aged 2 years and over, and the percentage of each against the overall total, in Northern Ireland during routine surveillance, April 2011 - March 2012

Ribotype	Apr - Jun 2011		Jul - Sep 2011		Oct - Dec 2011		Jan - Mar 2012*	
	Number	%	Number	%	Number	%	Number	%
001	3	5.3	2	4.3	1	2.7	4	8.2
002	3	5.3	3	6.5	0	0.0	6	12.2
005	2	3.5	4	8.7	2	5.4	2	4.1
014	1	1.8	1	2.2	2	5.4	4	8.2
015	6	10.5	4	8.7	3	8.1	2	4.1
020	3	5.3	5	10.9	5	13.5	1	2.0
023	4	7.0	1	2.2	3	8.1	2	4.1
027	4	7.0	0	0.0	0	0.0	0	0.0
078	8	14.0	12	26.1	9	24.3	13	26.5
106	2	3.5	0	0.0	0	0.0	1	2.0
193	4	7.0	1	2.2	2	5.4	1	2.0
Other	6	10.5	6	13.0	4	10.8	3	6.1
Not groupable**	6	10.5	4	8.7	4	10.8	5	10.2
Not on ribotype list	2	3.5	1	2.2	1	2.7	1	2.0
Not grown***	3	5.3	2	4.3	1	2.7	4	8.2
Total	57		46		37		49	

* Figures are provisional

** 'Not groupable' ribotypes do not match existing profiles

*** 'Not grown' indicates isolates that have no ribotype information supplied, with at least six weeks since the date of the specimen

Table 3: Descriptive data for *C. difficile* ribotypes 078, 002, 014 and 020 in Northern Ireland, January - March 2012

	078 (n=34)		002 (n=17)		014 (n=8)		020 (n=7)	
Age	min, max		27, 96		69, 97		51, 89	
	median		81		80		81	
Sex	n	%	n	%	n	%	n	%
Female	23	67.6	11	64.7	5	62.5	4	57.1
Male	11	32.4	6	35.3	3	37.5	3	42.9
Trust	Belfast		13, 38.2		6, 35.3		0, 0.0	
	Northern		11, 32.4		5, 29.4		4, 50.0	
	Southern		1, 2.9		1, 5.9		1, 12.5	
	South Eastern		8, 23.5		4, 23.5		2, 25.0	
	Western		1, 2.9		1, 5.9		1, 12.5	
Source	Inpatient		21, 61.8		11, 64.7		4, 50.0	
	Community*		13, 38.2		6, 35.3		4, 50.0	

* Community specimens include those taken from accident and emergency, outpatients, GPs and psychiatric facilities

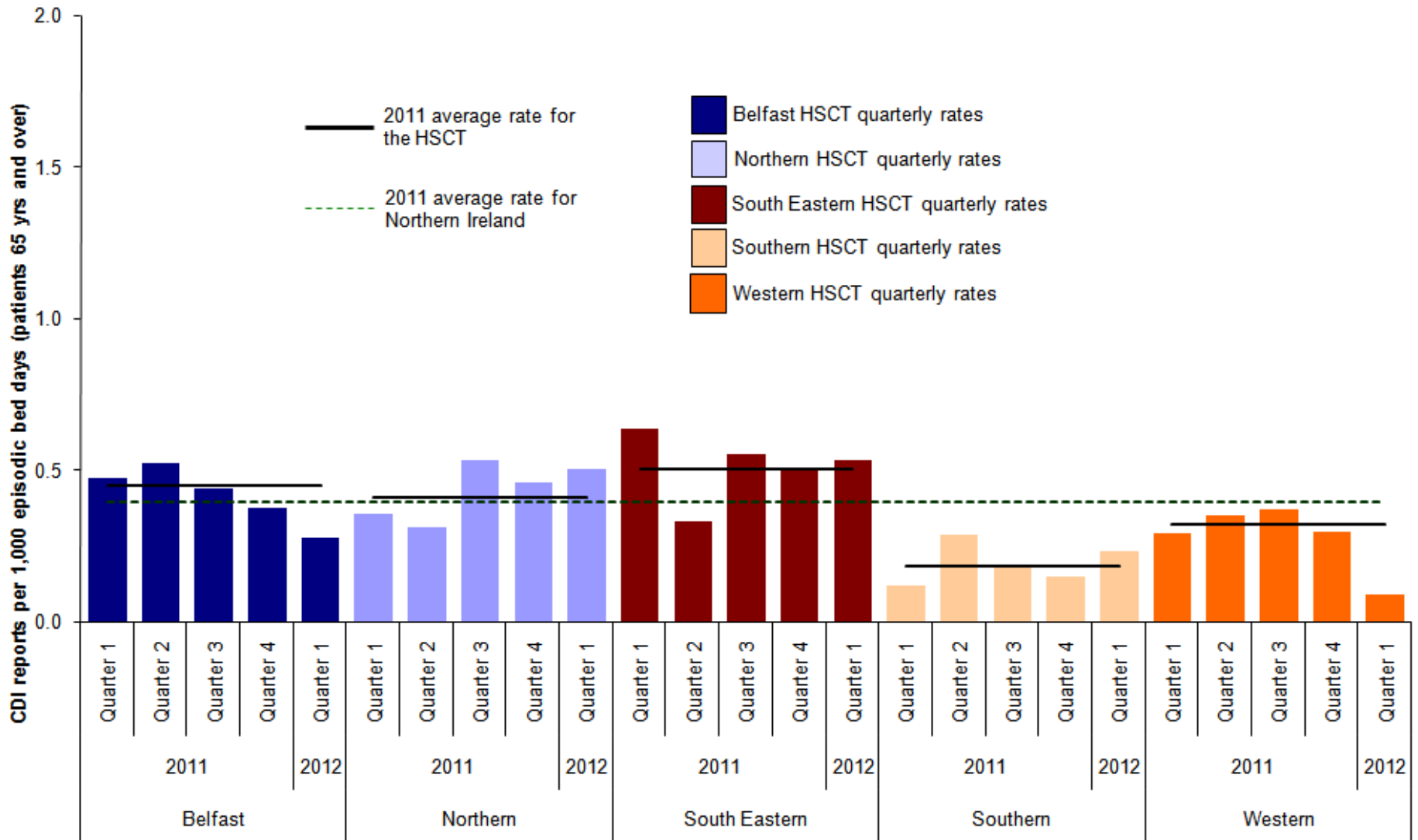


Figure 4: Quarterly rates of *C. difficile* among inpatients aged 65 years and over, by HSCT, 1 January 2011 – 31 March 2012, compared with annual Northern Ireland and HSCT rates for 2011

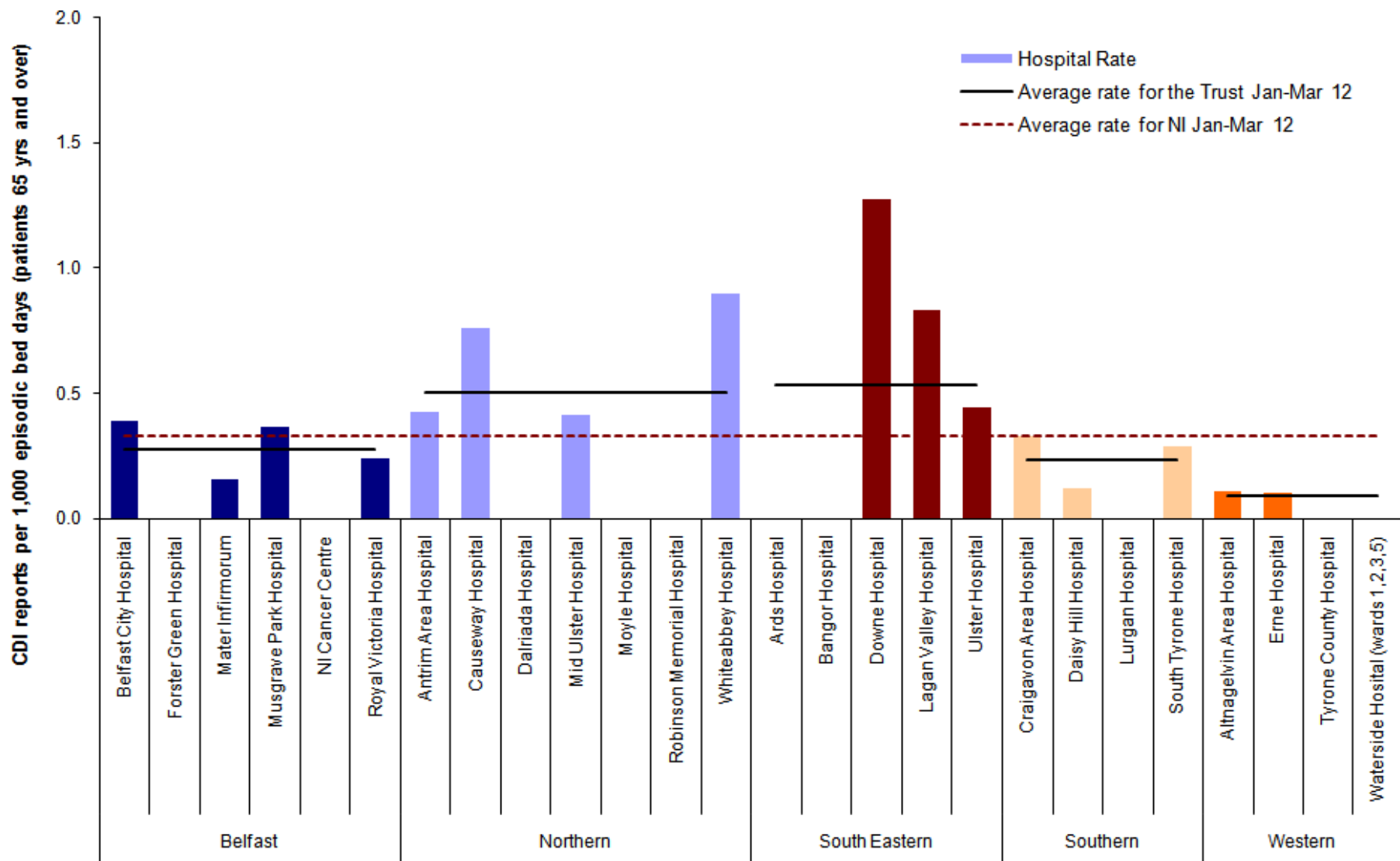


Figure 5: Rates of *C. difficile* in quarter one 2012 among inpatients aged 65 years and over, by hospital, including the quarterly HSCT rates and an average rate for Northern Ireland (see appendix A, Table 3)

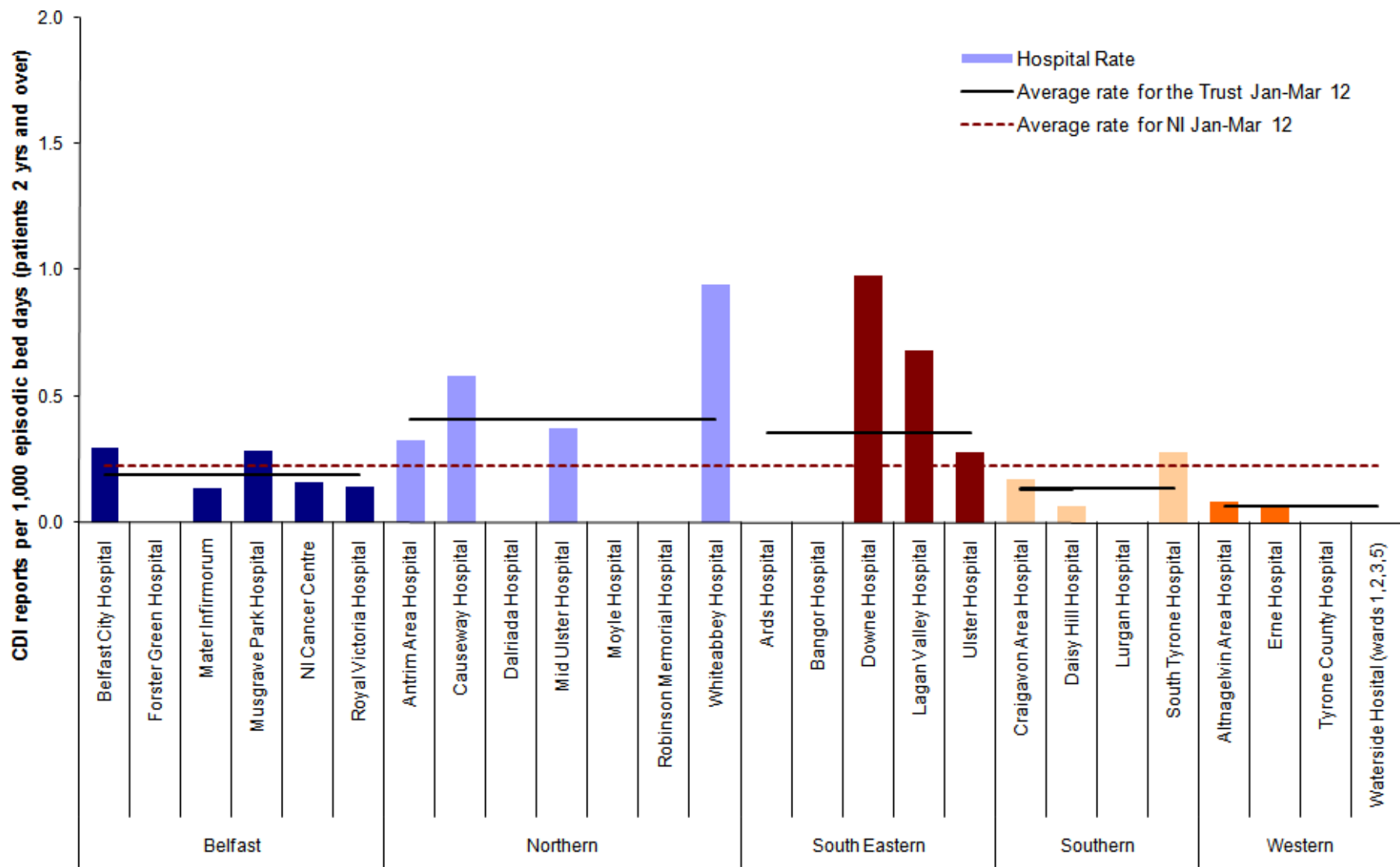


Figure 6: Rates of *C. difficile* in quarter one 2012 among inpatients aged two years and over, by hospital, including the quarterly HSCT rates and an average rate for Northern Ireland (see appendix A, Table 4)

Appendix A

Table 4: Quarterly number and rate of *C. difficile* episodes in patients aged 65 years and over, by hospital, April 2011 - March 2012

Hospital	Apr-Jun 2011		Jul-Sep 2011		Oct-Dec 2011		Jan-Mar 2012	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	15	0.708	13	0.621	4	0.195	8	0.390
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	5	0.409	2	0.176	6	0.527	2	0.158
Musgrave Park Hospital	5	0.504	1	0.102	0	0.000	4	0.368
NICCO (formerly at Belvoir Park)	3	1.053	1	0.367	1	0.342	0	0.000
Royal Victoria Hospital	10	0.387	14	0.546	16	0.614	7	0.243
Belfast Health & Social Care Trust	38	0.526	31	0.438	27	0.377	21	0.277
Antrim Area Hospital	7	0.387	11	0.579	12	0.584	9	0.427
Causeway Hospital	1	0.110	6	0.646	7	0.699	8	0.760
Dalriada Hospital	1	0.540	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	2	0.391	1	0.446	0	0.000	1	0.412
Moyle Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	1	0.650	0	0.000	0	0.000
Whiteabbey Hospital	2	0.485	2	0.529	0	0.000	4	0.901
Northern Health & Social Care	13	0.311	21	0.534	19	0.459	22	0.504
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	2	0.662	0	0.000	4	1.275
Lagan Valley Hospital	2	0.338	1	0.191	1	0.178	5	0.835
Ulster Hospital	10	0.417	17	0.686	18	0.692	12	0.446
South Eastern Health & Social	12	0.333	20	0.555	19	0.502	21	0.535
Craigavon Area Hospital	6	0.383	6	0.375	3	0.177	6	0.330
Daisy Hill Hospital	1	0.129	0	0.000	1	0.119	1	0.121
Lurgan Hospital	1	0.239	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	1	0.290	0	0.000	1	0.292	1	0.290
Southern Health & Social Care	9	0.290	6	0.190	5	0.152	8	0.234
Altnagelvin Area Hospital	9	0.499	8	0.472	6	0.343	2	0.108
Erne Hospital	3	0.338	3	0.349	3	0.330	1	0.103
Tyrone County Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000	0	0.000	0	0.000	0	0.000
Western Health & Social Care	12	0.350	11	0.372	9	0.295	3	0.092
NI TOTAL	84	0.390	89	0.429	79	0.369	75	0.333
NI Community TOTAL	45	-	42	-	34	-	43	-

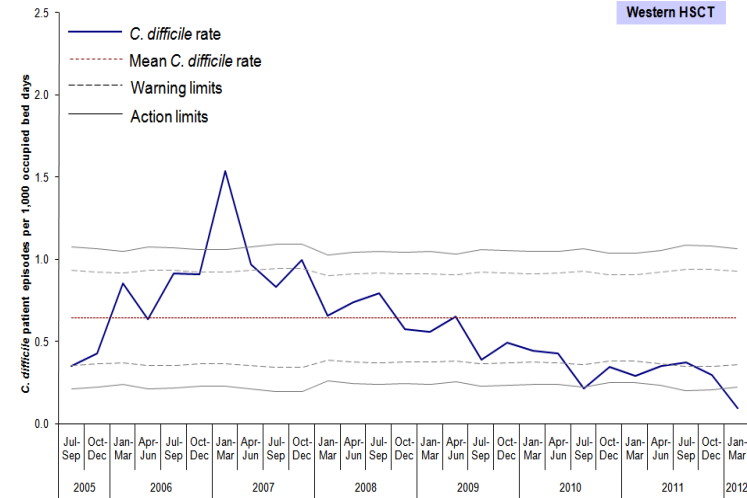
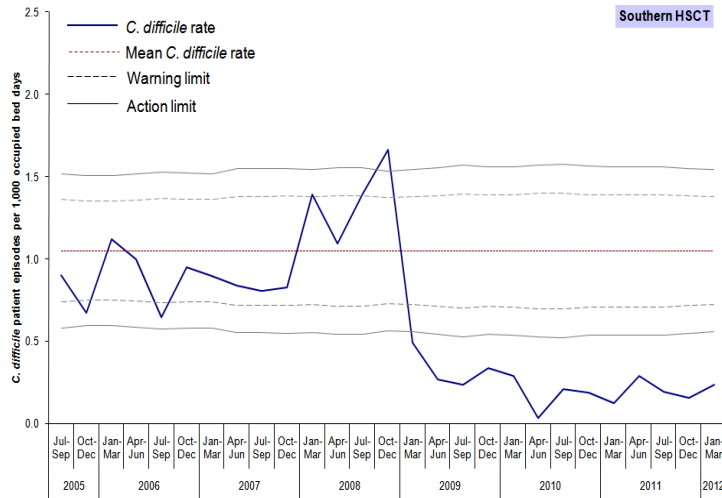
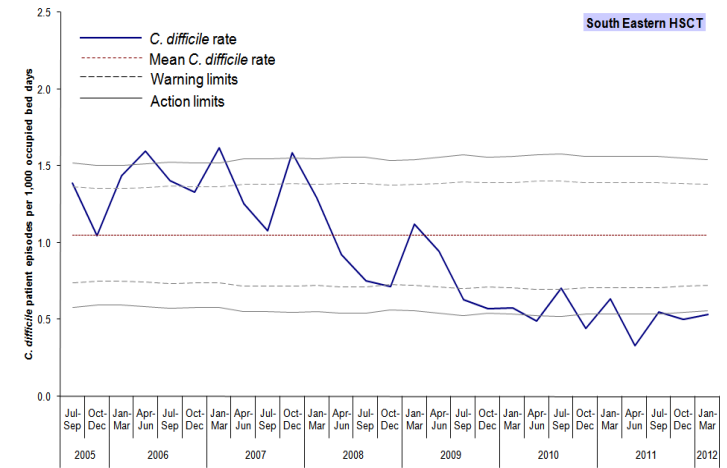
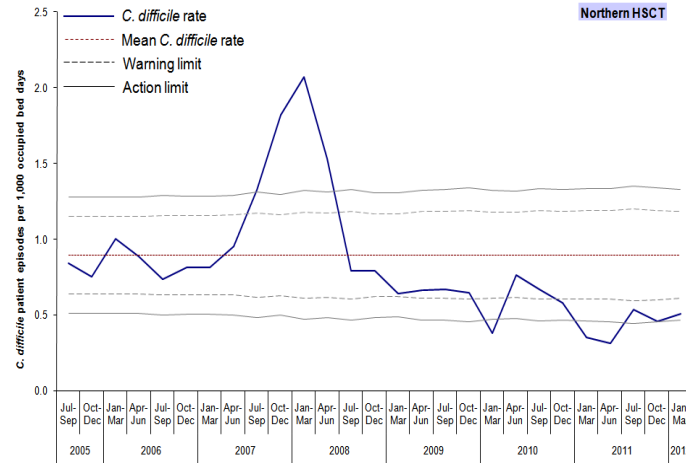
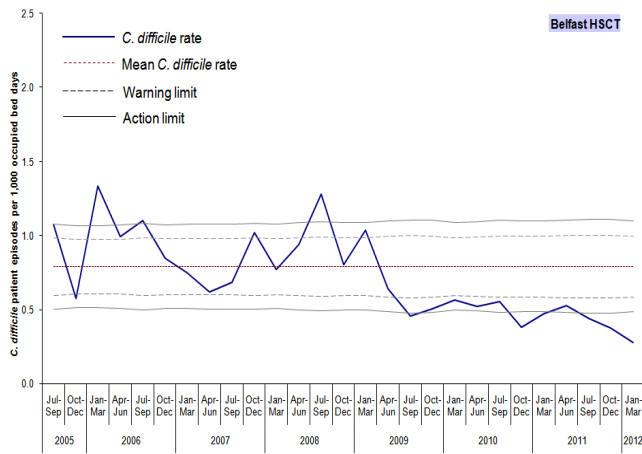
Appendix A

Table 5: Quarterly number and rate of *C. difficile* episodes in patients aged two years and over, by hospital, April 2011 - March 2012

Hospital	Apr-Jun 2011		Jul-Sep 2011		Oct-Dec 2011		Jan-Mar 2012	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	18	0.497	15	0.433	6	0.173	10	0.294
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	8	0.358	3	0.141	6	0.275	3	0.135
Musgrave Park Hospital	6	0.350	1	0.060	0	0.000	5	0.287
NICCO (formerly at Belvoir Park)	4	0.670	5	0.839	1	0.162	1	0.161
Royal Victoria Hospital	18	0.277	21	0.327	28	0.423	10	0.142
Belfast Health & Social Care Trust	54	0.364	45	0.311	41	0.279	29	0.191
Antrim Area Hospital	9	0.267	13	0.375	15	0.405	12	0.325
Causeway Hospital	6	0.325	7	0.373	7	0.375	11	0.582
Dalriada Hospital	1	0.488	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	2	0.457	1	0.377	0	0.000	1	0.371
Moyle Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	1	0.523	0	0.000	0	0.000
Whiteabbey Hospital	2	0.496	2	0.512	0	0.000	4	0.941
Northern Health & Social Care Trust	20	0.303	24	0.366	22	0.323	28	0.407
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	0.253	3	0.736	0	0.000	4	0.977
Lagan Valley Hospital	2	0.274	1	0.153	1	0.145	5	0.681
Ulster Hospital	14	0.335	23	0.548	24	0.547	13	0.278
South Eastern Health & Social Care	17	0.302	27	0.483	25	0.430	22	0.356
Craigavon Area Hospital	7	0.220	8	0.255	4	0.121	6	0.172
Daisy Hill Hospital	1	0.069	1	0.070	1	0.066	1	0.064
Lurgan Hospital	1	0.230	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	1	0.275	0	0.000	1	0.272	1	0.276
Southern Health & Social Care Trust	10	0.184	9	0.167	6	0.107	8	0.136
Altnagelvin Area Hospital	15	0.402	10	0.286	9	0.256	3	0.081
Erne Hospital	5	0.334	4	0.276	3	0.204	1	0.064
Tyrone County Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000	0	0.000	0	0.000	0	0.000
Western Health & Social Care Trust	20	0.323	14	0.239	12	0.204	4	0.064
NI TOTAL	121	0.313	119	0.314	106	0.273	91	0.226
NI community TOTAL	57	-	46	-	37	-	49	-

Appendix B

Trends in *C. difficile* rates in inpatients aged 65 years and over, by HSCT and quarter, 2005–2012



Appendix C

Notes and definitions

As of 1 April 2008, **the number of CDI patient episodes** is defined as the total number of patients aged two years and over from whom a diarrhoeal specimen tested positive for *C. difficile* toxins A and 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 CDI, 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 CDI in patients aged two years and over, KH03a data are 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 HSCT individually on a quarterly basis. All rates have been calculated for both individual HSCTs and Northern Ireland as a whole.

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

- The denominator supplied by each HSCT is the number of 'episodic bed days' for patients aged 65 years and over. Patient age is the age of the patient at the end of the 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 HSCT level, that is, on a hospital basis, is less accurate than for an entire HSCT. 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 HSCTs, 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 an 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 that all laboratories used identical testing methods and interpretation of 2005 data should be undertaken with caution. Surveillance originally focused on individuals aged 65 years and over, but this has been reviewed as of 1 April 2008 to include all patients aged two 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 HSCT will be largely similar over time. They present the occurrence of *C. difficile* 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 July 2005. 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:

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

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 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.

Appendix E

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, PHA 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 *C. difficile*. If the new admission is within 28 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 F

Table 6: *C. difficile* episodes among inpatients in Northern Ireland aged 65 years and over, by financial year and HSCT

HSCT	Financial Year						
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Belfast	352	336	280	327	163	147	117
Northern	184	172	297	172	102	103	75
South Eastern	243	256	199	135	98	80	72
Southern	168	130	134	164	37	17	28
Western	96	132	109	104	71	46	35
Northern Ireland	1043	1026	1019	902	471	393	327