

***Clostridium difficile* Surveillance**  
**Northern Ireland**

**Quarter Ending December 2009**

## Surveillance of *C. difficile* infection (CDI)

- ❖ **CDI reports for hospital in-patients aged 65 years and over increased by 8% (increase of 8 episodes) during Quarter 4 compared to Quarter 3 of 2009 (Figure 2a). CDI Rates increased by 5% during Quarter 4.**
- ❖ **CDI reports for community patients aged 65 years and over decreased by 19% (decrease of 11 episodes) during Quarter 4 compared to Quarter 3 2009 (Figure 1; Appendix A).**
- ❖ **Total CDI reports, for both hospital inpatients and community patients aged 2 years and over, continued to decline during Quarter 4 2009 (Table 2; Appendix A).**
- ❖ **CDI reports for hospital in-patients aged 65 years and over fell by 12% between the 2007/08 and 2008/09 financial years (Appendix F)**

### **C. difficile reporting**

- ❖ Reports of *C. difficile* are obtained directly from each diagnostic laboratory through the routine laboratory surveillance programme.
- ❖ Line listings of *C. difficile* 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.
- ❖ The data in this report therefore represents CDI episodes that have been validated by the diagnostic laboratories. It is possible that these numbers may change when cross referenced with the HCAI web-based surveillance system. Any updates will be reflected in the next quarterly surveillance report.
- ❖ The total number of *C. difficile* episodes for hospital in-patients aged 65 years and over is presented for each Health & Social Care Trust, by financial year, in Appendix F.

### **October – December 2009**

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

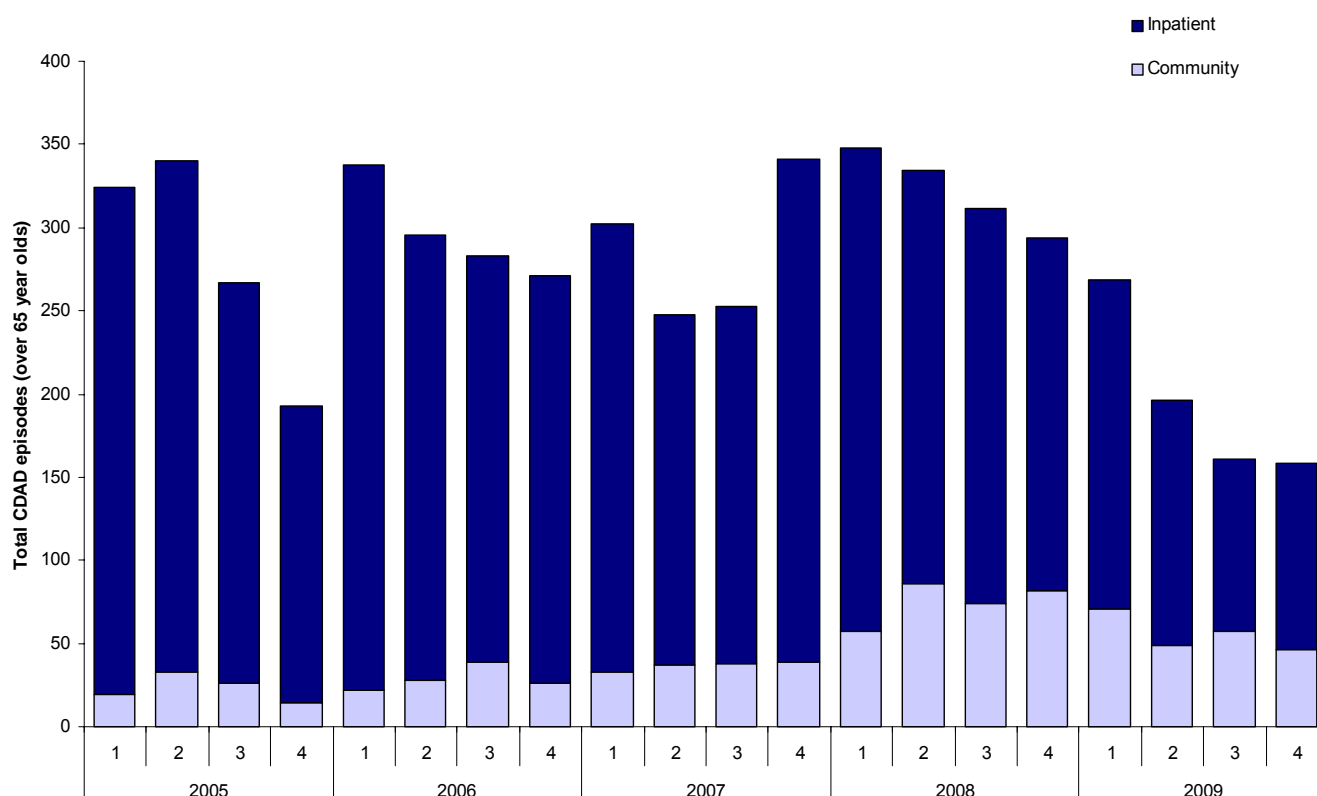
- ❖ During Quarter 4 2009, 158 episodes of CDI were reported in persons aged 65 years and over compared to 161 episodes in the previous quarter (2% decrease, 3 reports; Figure 1).
- ❖ This quarter's CDI figures are lower than those reported during the same period in previous years, and are the lowest recorded for this Quarter 4 since reporting began in 2005 (Figure 1).
- ❖ Of these 158 episodes, 112 were known to have been a hospital in-patient 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 CDI reports from the 'community' of 35% (57/161 episodes) in Quarter 3 compared with 29% (46/158) this quarter.

### Inpatient episodes for patients aged 65 years and over

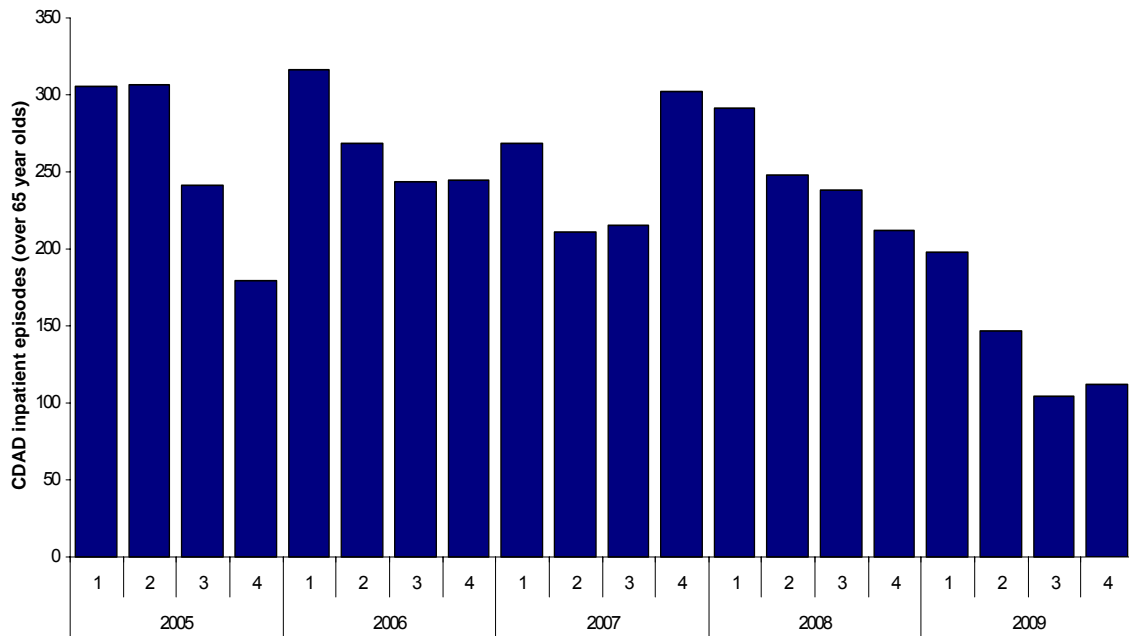
- ❖ There has been an increase of 8 cases (8%) in the number of in-patient CDI cases reported in this quarter (112) compared to the previous quarter (104) (Figure 2a).
- ❖ Comparing the Quarter 4 2009 (112 episodes) to the same quarter in 2008 (212 episodes) and 2007 (341 episodes), a decrease in the number of CDI in-patient cases is noted between each year (47% and 67% decrease respectively; Figure 2b).
- ❖ For a breakdown of CDI rates by Trust/hospitals see Figures 4 and 5.

### Community episodes for patients aged 65 years and over

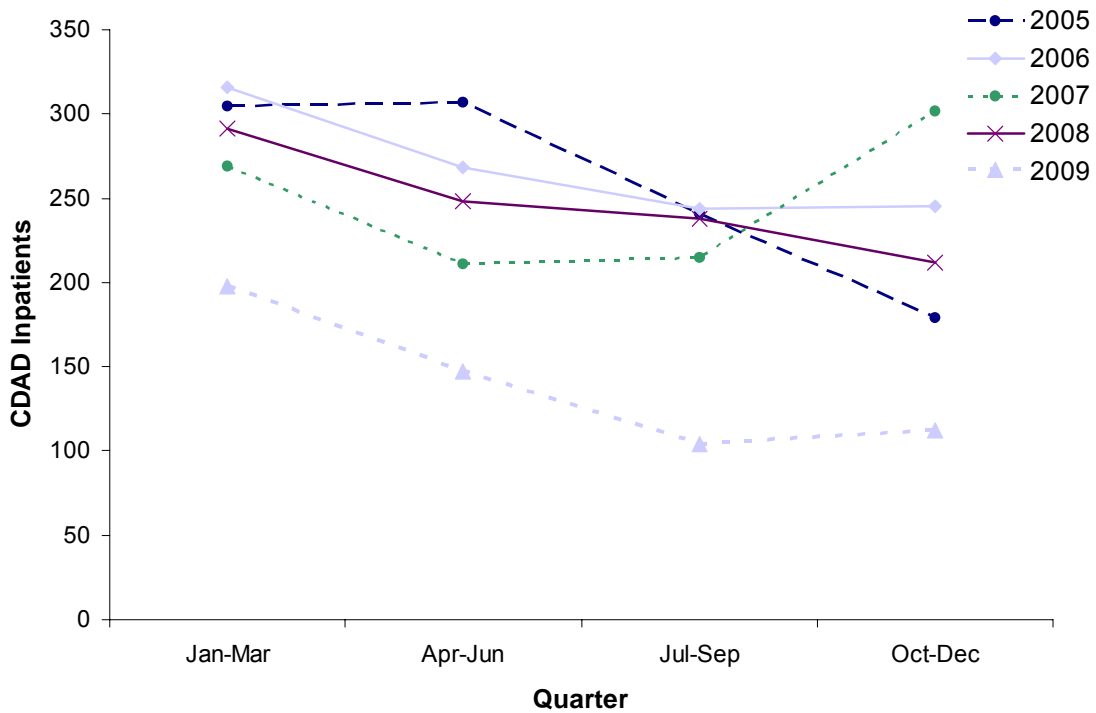
- ❖ Community episodes of CDI have decreased by 11 (19%) this quarter when compared to Quarter 3 2009 - 46 episodes reported this quarter compared to 57 reports in Quarter 3 (Figure 1 and Appendix A).
- ❖ The number of 'community' episodes in this quarter (46 cases) is lower than the number reported in the same quarter in 2008 (a reduction of 36 cases; 44% 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 CDI reports, inpatient and community, in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.



**Figure 2a:** Total CDI 'Inpatient' reports, Northern Ireland, by quarter (patients  $\geq$  65 years), between 2005 and 2009.



**Figure 2b:** Total CDI 'Inpatient' reports, Northern Ireland, by quarter (patients  $\geq$  65 years), between 2005 and 2009.

### **All CDI episodes for patients aged 2 years and over (inpatient and community)**

- ❖ During this quarter, 194 episodes of *C. difficile* associated disease were reported in persons aged 2 years and over. This represents a 5% decrease from the previous quarter (204 episodes). Of the 194 episodes, 81% were in those aged 65 years and over (includes inpatient and community).
- ❖ 142 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 142, 79% were patients aged 65 years and over.
- ❖ The remaining 52 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 52, 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.
- ❖ For a breakdown of episodes in individuals aged 2-64 years see Appendix A Table 3.

### **Rates of *C. difficile* in hospital inpatients**

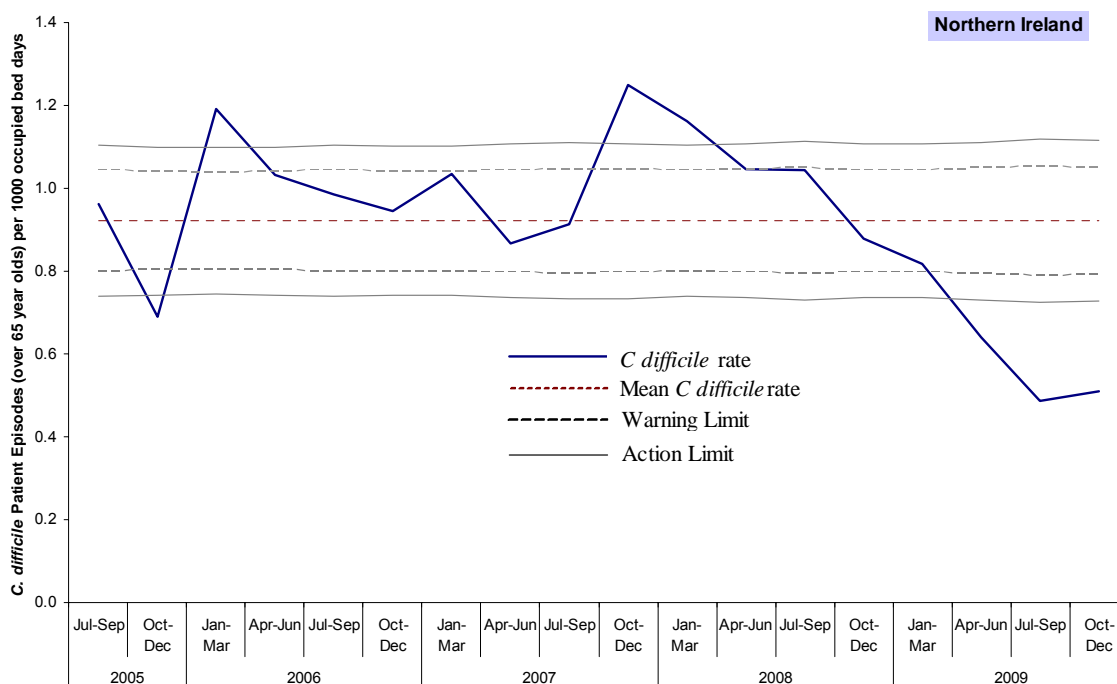
- ❖ All Trusts provide appropriate denominator data (bed occupancy for patients  $\geq$  65 years) on a regular basis, making the calculation of *C. difficile* rates possible for their constituent hospitals (Figure 4). Notes on this denominator are included in Appendix C.
- ❖ To determine the rate of *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 the Craigavon Hospital; therefore, the figures used are based on an estimate generated using Quarter 4 bed day data for this hospital from 2005 – 2008. The 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 Trusts, supplementary information reflecting situations that may arise and resulting actions applied is outlined in Appendix E.

## Statistical Process Control charts

- ❖ 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 remained below the lower action limit of the SPC chart. This indicates a significant reduction in the number of *C. difficile* patient episodes not explained by natural variation (Figure 3). This decrease is driven by reductions across all Trusts (Appendix B).
- ❖ Trends in CDI rates since July 2005 are shown for each HSC Trust in appendix B



**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

- ❖ Prior to April 2009, all Trusts in Northern Ireland were requested to send 20 positive CDI isolates per quarter to Leeds (Prof M. Wilcox) for culture and ribotyping.
- ❖ On 1<sup>st</sup> April 2009, a *C. difficile* ribotyping service was established in Northern Ireland. Establishment of the NI Ribotyping Service has been facilitated by integration of the Belfast Trust laboratory service into the *Clostridium difficile* Ribotyping Network for England (CDRN).
- ❖ Trusts 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.
- ❖ Table 1 presents validated ribotype data for Northern Ireland for Quarters 2 and 3 2009 (April – September 2009). Provisional ribotype data for Quarter 4 2009 quarter is also presented.

- ❖ Data in Table 1 is presented by ribotype and not by patient episode. Please note that one patient may have more than one ribotype.
- ❖ The most prevalent ribotype in Northern Ireland this quarter is ribotype 078 (15.4%), followed by ribotype 014 (11.5%). The proportion of 027 ribotypes remains low (1.8%) when compared to circulating ribotypes in England, with little change from the previous quarter (2%).
- ❖ Validated descriptive data, for July – September 2009, summarising the age, gender, Trust and source description of ribotypes 001, 078, 027 is presented in Table 2.

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

Ribotype	April - June 2009		July - September 2009		October - December 2009*	
	Number	%	Number	%	Number	%
001	29	11.11	18	8.82	18	7.93
002	10	3.83	12	5.88	16	7.05
014	-	-	19	9.31	26	11.45
015	5	1.92	13	6.37	15	6.61
027	6	2.30	4	1.96	4	1.76
078	44	16.86	26	12.75	35	15.42
106	18	6.90	9	4.41	9	3.96
Other	48	18.39	21	10.29	29	12.78
Not groupable**	44	16.86	37	18.14	35	15.42
Not on ribotype list	23	8.81	21	10.29	n/a	n/a
Not grown***	34	13.03	24	11.76	40	17.62
<b>Total</b>	<b>261</b>	<b>-</b>	<b>204</b>	<b>-</b>	<b>227</b>	<b>-</b>

\*\* 'not groupable' do not match existing profiles

\*\*\* 'not grown' represents isolates which have no ribotype information supplied, with at least 6 weeks since the date of the specimen.

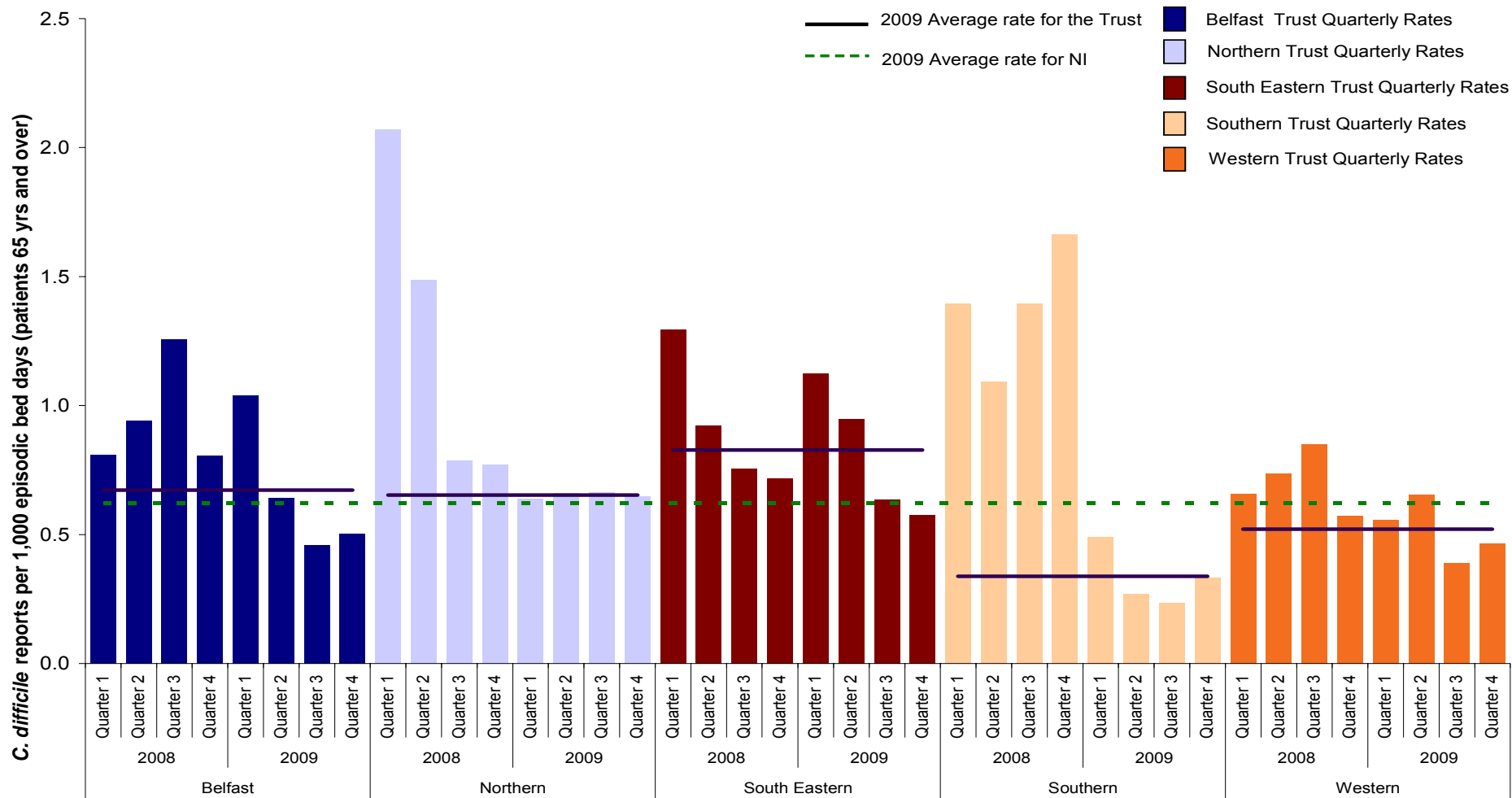
n/a = data have not been matched to validated records. This data will be available in the next report.

Following validation of Quarters 2 and 3 2009 data (April to September), a total of 21 validated episodes of CDI were found not to have been sent for ribotyping to the NI Ribotyping Service. Figures for Quarter 4 2009 (October to December) are not yet available.

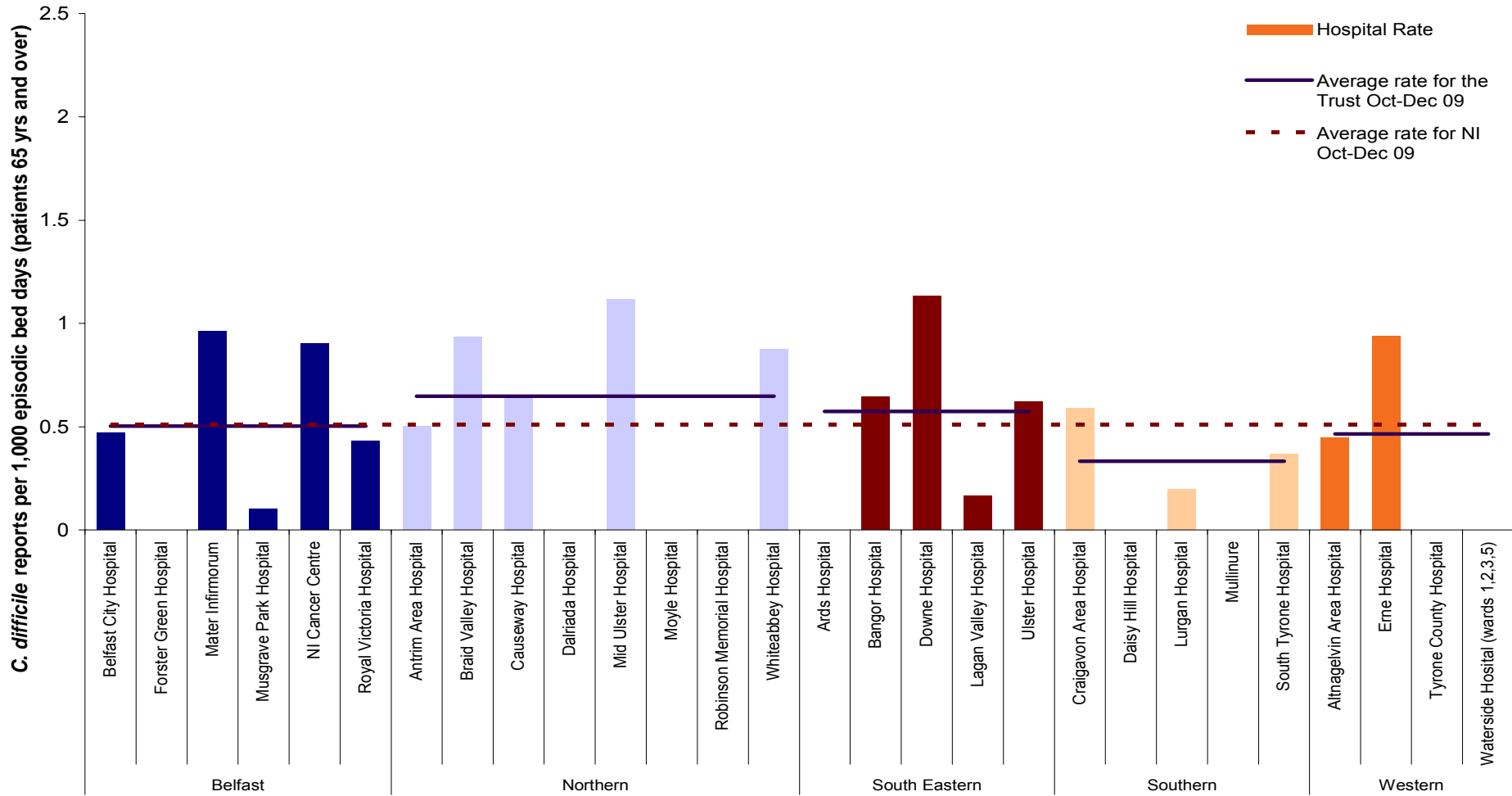
**Table 2** Validated descriptive data for *C. difficile* ribotypes 001, 078, 027 in Northern Ireland, July - September 2009.

	<b>001</b>		<b>078</b>		<b>027</b>	
<b>Age</b>						
min, max	24, 95		62, 100		75, 94	
median	69		83		83	
<b>Sex</b>	n	%	n	%	n	%
Female	11	61.1	19	73.1	4	100.0
Male	7	38.9	7	26.9	0	0.0
<b>Trust</b>	n	%	n	%	n	%
Belfast	9	50.0	5	19.2	0	0.0
Northern	2	11.1	11	42.3	3	75.0
Southern	0	0.0	1	3.8	1	25.0
South Eastern	4	22.2	3	11.5	0	0.0
Western	3	16.7	6	23.1	0	0.0
<b>Total</b>	18		26		4	
<b>Source</b>	n	%	n	%	n	%
Inpatient	14	77.8	14	51.9	3	75.0
Community*	4	22.2	13	48.1	1	25.0

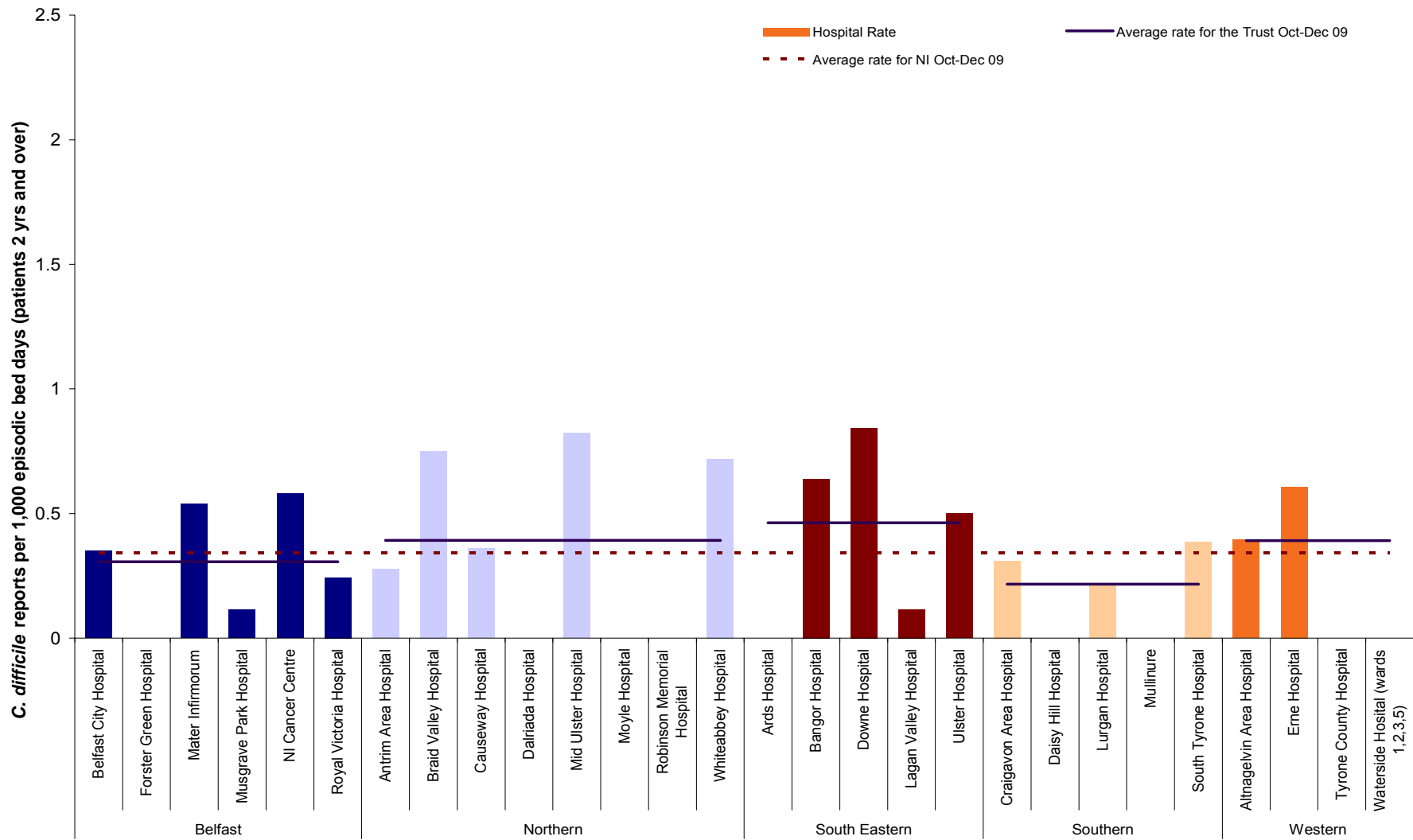
\*community specimens include A+E, outpatients, GP and specimens taken in psychiatric facilities.



**Figure 4:** Quarterly rates of *Clostridium difficile* by Trust 1 January 2008 – 31 December 2009, compared with annual NI and Trust rates for 2009; inpatients  $\geq 65$  years.



**Figure 5:** Rates of *Clostridium difficile* by individual Hospitals, Quarter 4 2009 (inpatients  $\geq 65$  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, Quarter 4 2009 (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 – December 2009. Figures in parentheses represent data for October – December 2008.

Hospital	Jan-Mar 2009		Apr-Jun 2009		Jul-Sep 2009		Oct-Dec 2009	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	30	1.17	17	0.741	8	0.359	11	0.472
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	17	1.261	8	0.648	8	0.700	11	0.963
Musgrave Park Hospital	7	0.626	1	0.090	2	0.210	1	0.103
NICCO (formerly at Belvoir Park)	2	0.638	1	0.329	2	0.667	3	0.904
Royal Victoria Hospital	29	1.030	22	0.829	13	0.509	11	0.430
<b>Belfast Health &amp; Social Care Trust</b>	<b>85 (66)</b>	<b>1.038</b>	<b>49</b>	<b>0.643</b>	<b>33</b>	<b>0.458</b>	<b>37</b>	<b>0.503</b>
Antrim Area Hospital	12	0.710	13	0.824	12	0.822	8	0.503
Braid Valley Hospital	2	0.714	2	0.827	1	0.466	2	0.935
Causeway Hospital	11	1.028	6	0.647	4	0.416	6	0.655
Dalriada Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	2	0.296	2	0.321	6	0.919	6	1.116
Moyle Hospital	0	0.000	0	0.000	1	1.244	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000	1	0.505	0	0.000
Whiteabbey Hospital	4	0.536	6	0.912	4	0.609	5	0.878
<b>Northern Health &amp; Social Care Trust</b>	<b>31 (38)</b>	<b>0.640</b>	<b>29</b>	<b>0.660</b>	<b>29</b>	<b>0.665</b>	<b>27</b>	<b>0.647</b>
Ards Hospital	0	0.000	1	0.719	0	0.000	0	0.000
Bangor Hospital	0	0.000	0	0.000	0	0.000	1	0.645
Downe Hospital	1	0.260	1	0.375	1	0.318	4	1.132
Lagan Valley Hospital	4	0.608	4	0.657	1	0.199	1	0.165
Ulster Hospital	39	1.504	29	1.136	20	0.838	15	0.621
<b>South Eastern Health &amp; Social Care Trust</b>	<b>44 (29)</b>	<b>1.123</b>	<b>35</b>	<b>0.946</b>	<b>22</b>	<b>0.635</b>	<b>21</b>	<b>0.574</b>
Craigavon Area Hospital	13	0.811	6	0.389	3	0.199	9	0.591
Daisy Hill Hospital	1	0.106	2	0.239	4	0.533	0	0.000
Lurgan Hospital	3	0.483	0	0.000	0	0.000	1	0.199
Mullinure	1	0.540	1	0.582	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000	1	0.368
<b>Southern Health &amp; Social Care Trust</b>	<b>18 (59)</b>	<b>0.490</b>	<b>9</b>	<b>0.268</b>	<b>7</b>	<b>0.236</b>	<b>11</b>	<b>0.333</b>
Altnagelvin Area Hospital	13	0.752	19	1.062	10	0.589	8	0.447
Erne Hospital	5	0.659	6	0.638	3	0.354	8	0.941
Tyrone County Hospital	2	0.456	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
<b>Western Health &amp; Social Care Trust</b>	<b>20 (21)</b>	<b>0.557</b>	<b>25</b>	<b>0.653</b>	<b>13</b>	<b>0.389</b>	<b>16</b>	<b>0.464</b>
<b>NI TOTAL</b>	<b>198 (213)</b>	<b>0.818</b>	<b>147</b>	<b>0.642</b>	<b>104</b>	<b>0.487</b>	<b>112</b>	<b>0.510</b>
<b>NI Community TOTAL</b>	<b>71 (82)</b>	<b>-</b>	<b>49</b>	<b>-</b>	<b>57</b>	<b>-</b>	<b>46</b>	<b>-</b>

## Appendix A

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

Hospital	Jan - Mar 2009		Apr - Jun 2009		Jul - Sep 2009		Oct - Dec 2009	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	41	0.940	30	0.719	12	0.304	14	0.350
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	19	0.783	11	0.483	12	0.542	12	0.539
Musgrave Park Hospital	8	0.407	1	0.052	3	0.172	2	0.113
NICCO (formerly at Belvoir Park)	5	0.755	2	0.292	3	0.425	4	0.580
Royal Victoria Hospital	42	0.785	34	0.649	21	0.313	17	0.243
<b>Belfast Health &amp; Social Care Trust</b>	<b>115 (94)</b>	<b>0.765</b>	<b>78</b>	<b>0.534</b>	<b>51</b>	<b>0.327</b>	<b>49</b>	<b>0.307</b>
Antrim Area Hospital	18	0.604	17	0.548	15	0.492	9	0.278
Braid Valley Hospital	2	0.000	2	0.715	1	0.405	2	0.750
Causeway Hospital	16	0.818	7	0.369	6	0.334	7	0.361
Dalriada Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	2	0.232	3	0.369	6	0.740	6	0.824
Moyle Hospital	0	0.000	0	0.000	1	1.075	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000	1	0.566	0	0.000
Whiteabbey Hospital	5	0.526	6	0.735	4	0.551	5	0.719
<b>Northern Health &amp; Social Care Trust</b>	<b>43 (45)</b>	<b>0.544</b>	<b>35</b>	<b>0.471</b>	<b>34</b>	<b>0.477</b>	<b>29</b>	<b>0.393</b>
Ards Hospital	0	0.000	1	0.328	0	0.000	0	0.000
Bangor Hospital	0	0.000	0	0.000	0	0.000	1	0.639
Downe Hospital	1	0.209	1	0.267	1	0.235	4	0.842
Lagan Valley Hospital	7	0.768	5	0.545	1	0.125	1	0.116
Ulster Hospital	47	1.040	33	0.743	27	0.644	21	0.500
<b>South Eastern Health &amp; Social Care Trust</b>	<b>55 (31)</b>	<b>0.853</b>	<b>40</b>	<b>0.645</b>	<b>29</b>	<b>0.507</b>	<b>27</b>	<b>0.463</b>
Craigavon Area Hospital	21	0.577	10	0.286	4	0.114	11	0.310
Daisy Hill Hospital	2	0.113	2	0.125	5	0.302	0	0.000
Lurgan Hospital	3	0.412	0	0.000	0	0.000	1	0.213
Mullinure	1	0.394	1	0.407	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000	1	0.387
<b>Southern Health &amp; Social Care Trust*</b>	<b>27 (73)</b>	<b>0.404</b>	<b>13</b>	<b>0.207</b>	<b>9</b>	<b>0.141</b>	<b>13</b>	<b>0.216</b>
Altnagelvin Area Hospital	16	0.425	27	0.712	17	0.467	15	0.396
Erne Hospital	5	0.359	7	0.504	3	0.206	9	0.608
Tyrone County Hospital	2	0.350	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
<b>Western Health &amp; Social Care Trust</b>	<b>23 (28)</b>	<b>0.359</b>	<b>34</b>	<b>0.544</b>	<b>20</b>	<b>0.338</b>	<b>24</b>	<b>0.391</b>
<b>NI TOTAL</b>	<b>263 (271)</b>	<b>0.623</b>	<b>200</b>	<b>0.491</b>	<b>143</b>	<b>0.351</b>	<b>142</b>	<b>0.344</b>
<b>NI community TOTAL</b>	<b>88 (96)</b>	<b>-</b>	<b>58</b>	<b>-</b>	<b>61</b>	<b>-</b>	<b>52</b>	<b>-</b>

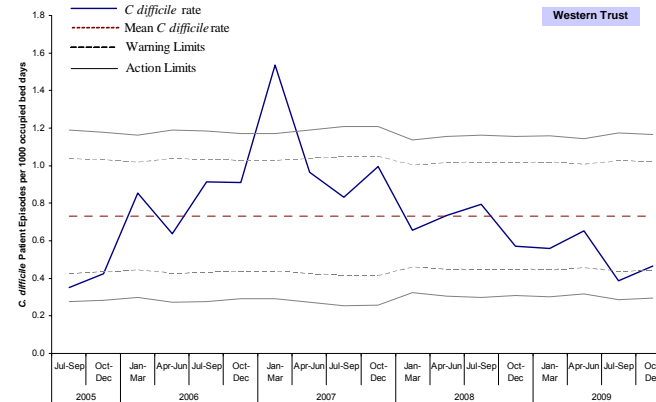
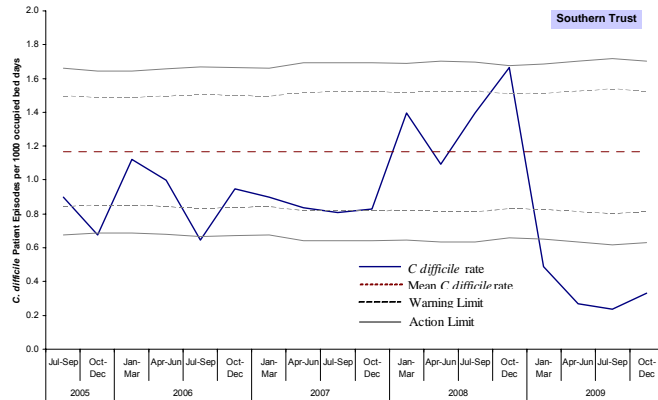
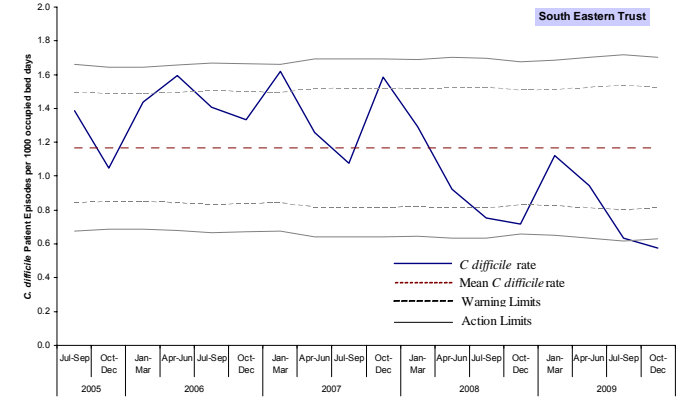
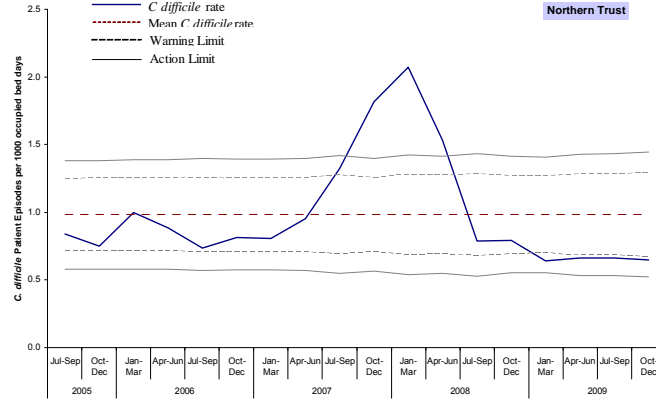
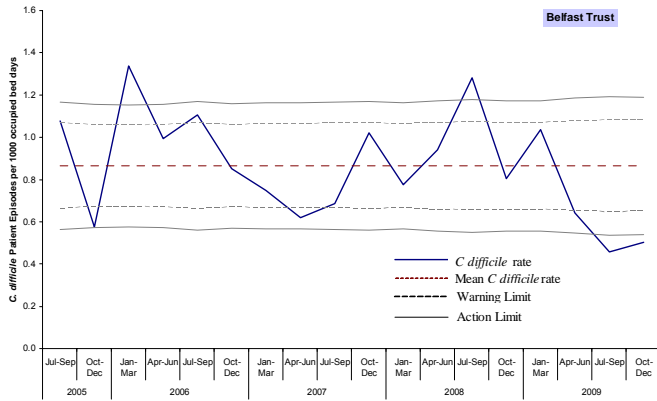
## Appendix A

**Table 3:** Quarterly number of *Clostridium difficile* patient episodes, patients 2 to 64 years, by Hospital, January – December 2009.

Hospital	Jan - Mar 09	Apr - Jun 09	Jul - Sep 09	Oct - Dec 09
	Episodes	Episodes	Episodes	Episodes
Belfast City Hospital	11	13	4	3
Forster Green Hospital	0	0	0	0
Mater Infirmorum	2	3	4	1
Musgrave Park Hospital	1	0	1	1
NICCO (formerly at Belvoir Park)	3	1	1	1
Royal Victoria Hospital	13	12	8	6
<b>Belfast Health &amp; Social Care Trust</b>	<b>30</b>	<b>29</b>	<b>18</b>	<b>12</b>
Antrim Area Hospital	6	4	3	1
Braid Valley Hospital	0	0	0	0
Causeway Hospital	5	1	2	1
Dalriada Hospital	0	0	0	0
Mid Ulster Hospital	0	1	0	0
Moyle Hospital	0	0	0	0
Robinson Memorial Hospital	0	0	0	0
Whiteabbey Hospital	1	0	0	0
<b>Northern Health &amp; Social Care Trust</b>	<b>12</b>	<b>6</b>	<b>5</b>	<b>2</b>
Ards Hospital	0	0	0	0
Bangor Hospital	0	0	0	0
Downe Hospital	0	0	0	0
Lagan Valley Hospital	3	1	0	0
Ulster Hospital	8	4	7	6
<b>South Eastern Health &amp; Social Care Trust</b>	<b>11</b>	<b>5</b>	<b>7</b>	<b>6</b>
Craigavon Area Hospital	8	4	1	2
Daisy Hill Hospital	1	0	1	0
Lurgan Hospital	0	0	0	0
Mullinure	0	0	0	0
South Tyrone Hospital	0	0	0	0
<b>Southern Health &amp; Social Care Trust</b>	<b>9</b>	<b>4</b>	<b>2</b>	<b>2</b>
Altnagelvin Area Hospital	3	8	7	7
Erne Hospital	0	1	0	1
Tyrone County Hospital	0	0	0	0
Waterside Hospital (Wards 1, 2, 3, 5)	0	0	0	0
<b>Western Health &amp; Social Care Trust</b>	<b>3</b>	<b>9</b>	<b>7</b>	<b>8</b>
<b>NI TOTAL</b>	<b>67</b>	<b>53</b>	<b>39</b>	<b>30</b>
<b>NI community TOTAL</b>	<b>17</b>	<b>9</b>	<b>4</b>	<b>6</b>

## 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 1<sup>st</sup> April 2008 the **number of CDI 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 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 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 1<sup>st</sup> 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.

<b>Trust</b>	<b>Financial Year</b>			
	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
<b>Northern Ireland</b>	1043	1026	1019	896