



**CDSC (NI)**

## ***C. difficile* surveillance**

**Quarter Ending June 2008**

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

## Key Points

- ❖ **CDAD rates for hospital inpatients in Northern Ireland have continued to decrease during April – June 2008 (Figure 7).**
- ❖ **CDAD reports from ‘community’ patients for the April – June quarter have increased 44% 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 1<sup>st</sup> 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).

## April – June 2008: Quarter 2

### Figures for patients aged 65 years and over

#### All CDAD episodes (inpatient and community)

- ❖ During the quarter, 338 episodes of *C. difficile* associated disease were reported in persons aged 65 years and over compared to 349 episodes the previous quarter (3.2% decrease; Figure 1).
- ❖ The 2008 April - June total CDAD figures are higher than those reported in the same time period in 2007 and 2006 (36.3% and 14.2% respectively; Figure 1).
- ❖ Of the 338 episodes, 250 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 88 isolates reported were from ‘community’ samples which may include: GPs, nursing homes and other such non acute settings. The proportion of CDAD reports that are from the ‘community’ have increased from 17.5% (61/349 episodes) in the first quarter of 2008 to 26.0% (88/338 episodes) in the second quarter.

#### Inpatient episodes

- ❖ There has been a decrease of 38 cases (13.2%) in the number of inpatient cases reported in this quarter (250) when compared to the previous quarter (288). This is the second consecutive quarter in 2008 where there has been a reduction in inpatient

episodes, with a decrease of 47 cases between this quarter and October/December, 2007 (297 cases, 15.8% reduction).

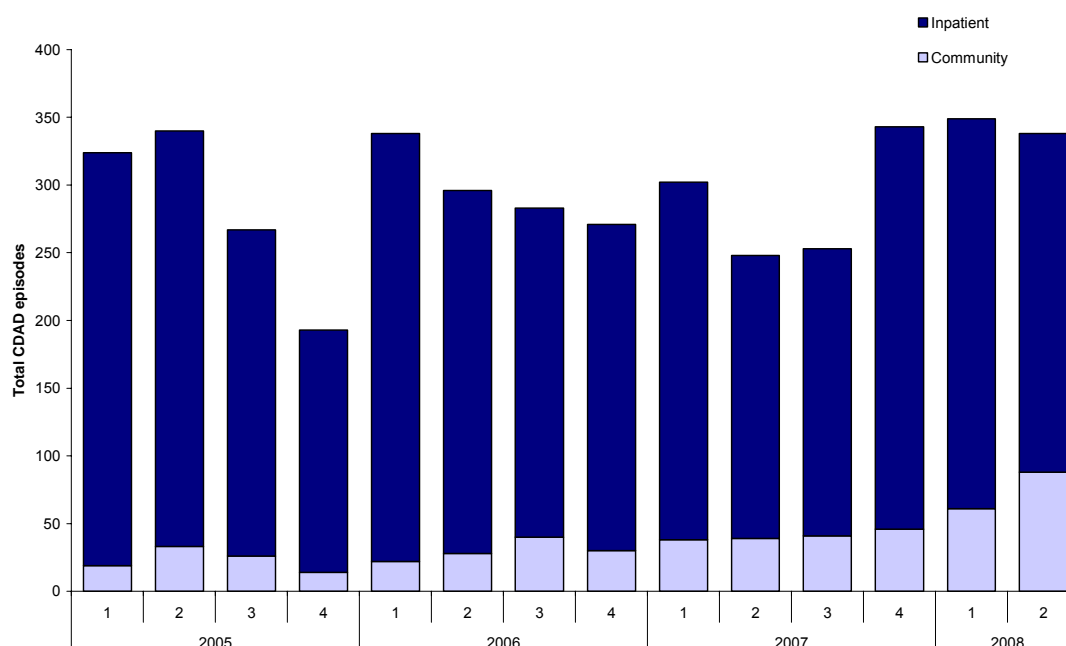
- ❖ Comparing the April – June 2008 period (250 episodes) to the same quarter in 2007 (209 episodes) there has been an increase of 41 cases reported (19.6% increase; Figure 2). However, figures for this quarter are still less than those reported for Quarter 2 in 2005 and 2006 (307 and 268 respectively; Figure 2). For a breakdown by Trust/hospitals see Figures 4 and 5.

### Community episodes

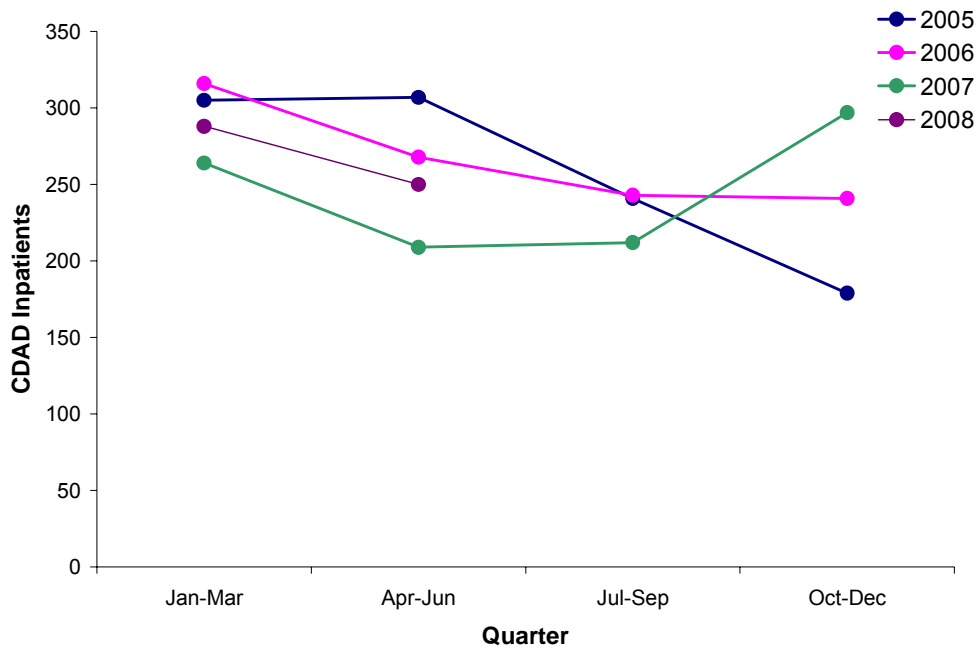
- ❖ Community figures have risen by 27 episodes (44.3%) this quarter (61 reports in quarter 1 to 88 reports in quarter 2; Figure 1 and Appendix A).
- ❖ When April – June 2008 (88 cases) is compared to the same quarter in 2007 (39 cases) it is clear that there is a significant rise in the number of episodes (125.6% 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 has fallen below the warning limit of the chart (Figure 7).
- ❖ This quarter the rate of *C. difficile* patient episodes in the Northern Trust has fallen below the action limit, but still remains about the warning limit of the chart (Appendix B).



**Figure 1:** Total CDAD reports, inpatient and community, in Northern Ireland, by quarter (patients  $\geq 65$  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: Quarter 2

#### All CDAD episodes (inpatient and community)

- ❖ During the quarter, 439 episodes of *C. difficile* associated disease were reported in persons aged 2 years and over. Of the 439 episodes 77.0% were in patients (inpatient and community) aged 65 years and over.
- ❖ 329 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 329, 76.0% occurred in patients aged 65 years and over.
- ❖ The remaining 110 isolates reported were from ‘community’ samples which may include: GPs, nursing homes and other such non acute settings. Of the 110, 80% 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 1 Table 3.
- ❖ Quarter 2, 2008, represents the first quarter where episodes in patients aged 2 years and over have been validated, therefore only this quarter is presented in the figures/tables.

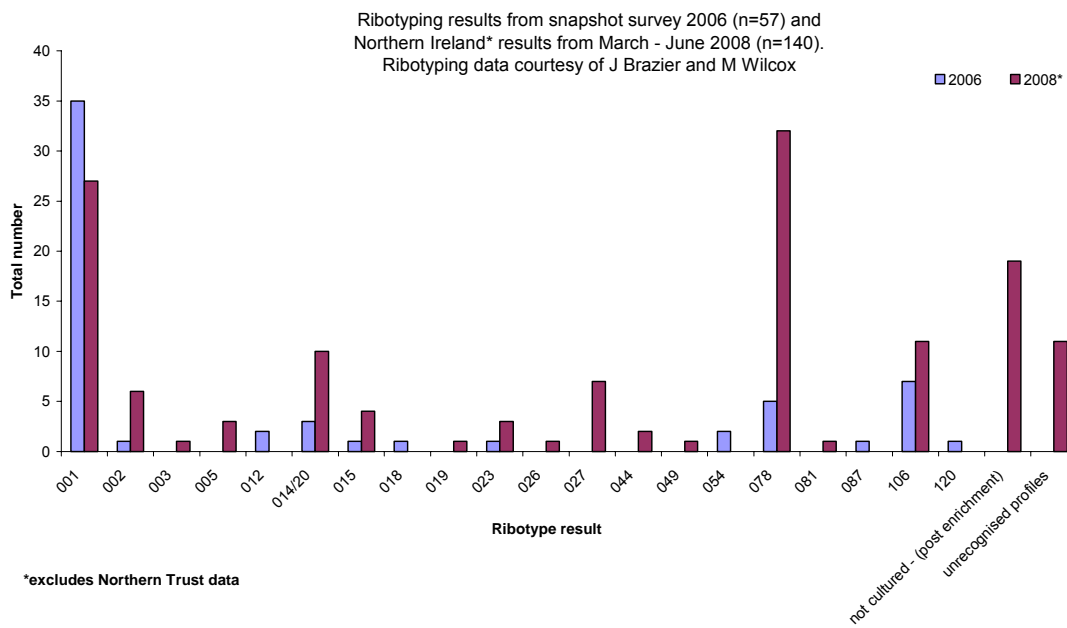
#### Rates of hospital inpatient *C. difficile* reports

- ❖ 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.

### Ribotype 027 surveillance

- ❖ As a consequence of the Northern Trust outbreak and the emergence of *C. difficile* ribotype 027, an enhanced CDAD ribotype surveillance programme has recently been established to monitor the regional pattern of ribotypes circulating in Northern Ireland.
- ❖ The Northern Trust continue to have all their samples ribotyped, CDSC(NI) receives these results independently via CoSurv.
- ❖ Provisional results from the routine surveillance programme and an earlier ribotyping snapshot survey undertaken by the Anaerobic Reference Laboratory, Cardiff (2006) are presented in Figure 3. Updated ribotype data, including the Northern Trust, will be published at a later date.
- ❖ A breakdown of the results collected during March – June, 2008, is presented in Table 1 which includes the percentage contribution to the total for each ribotype.

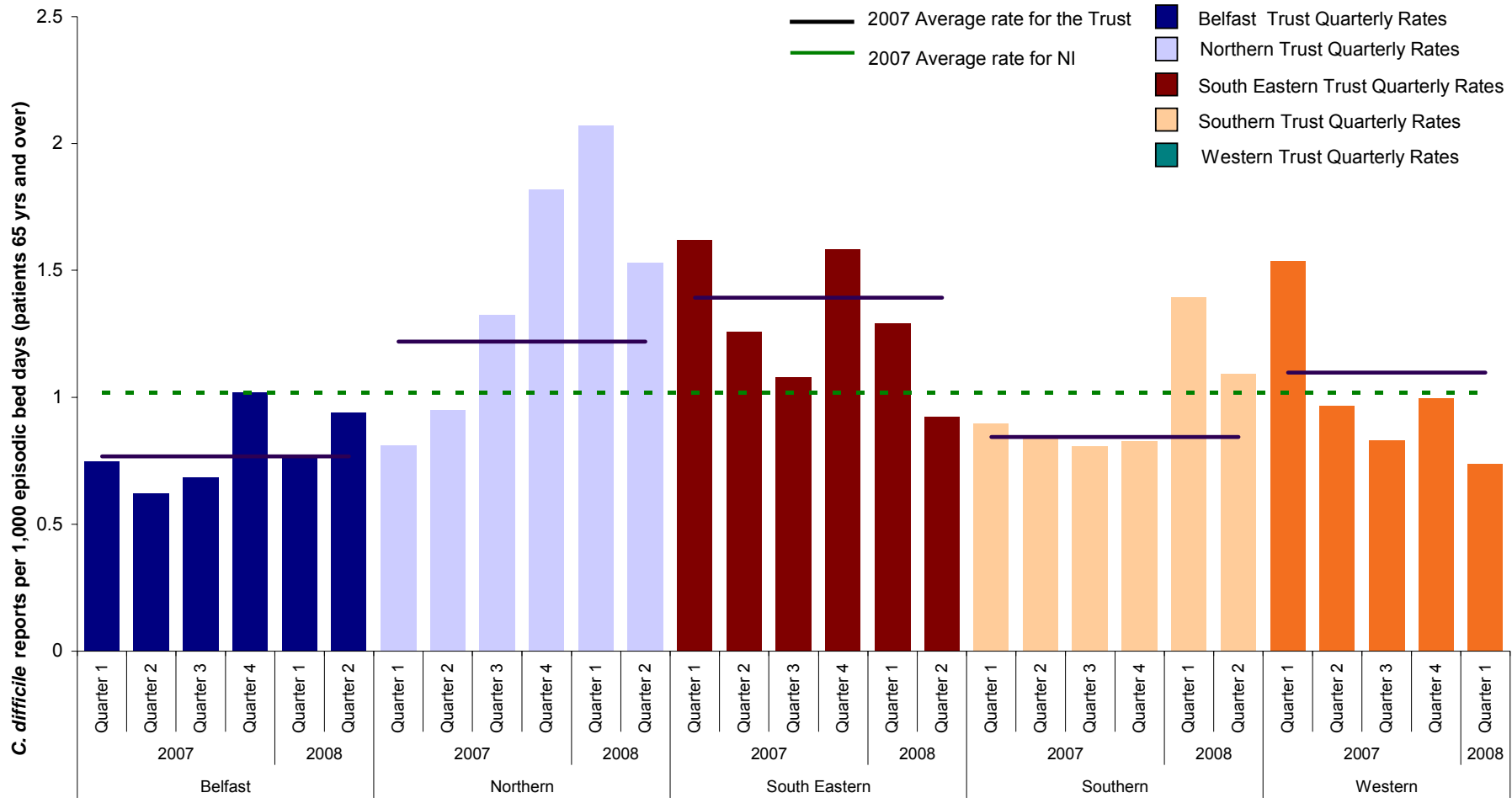


**Figure 3:** Total number of individual ribotypes\* reported in Northern Ireland during the snapshot survey, 2006, and routine surveillance, March – June 2008 (excludes Northern Trust data).

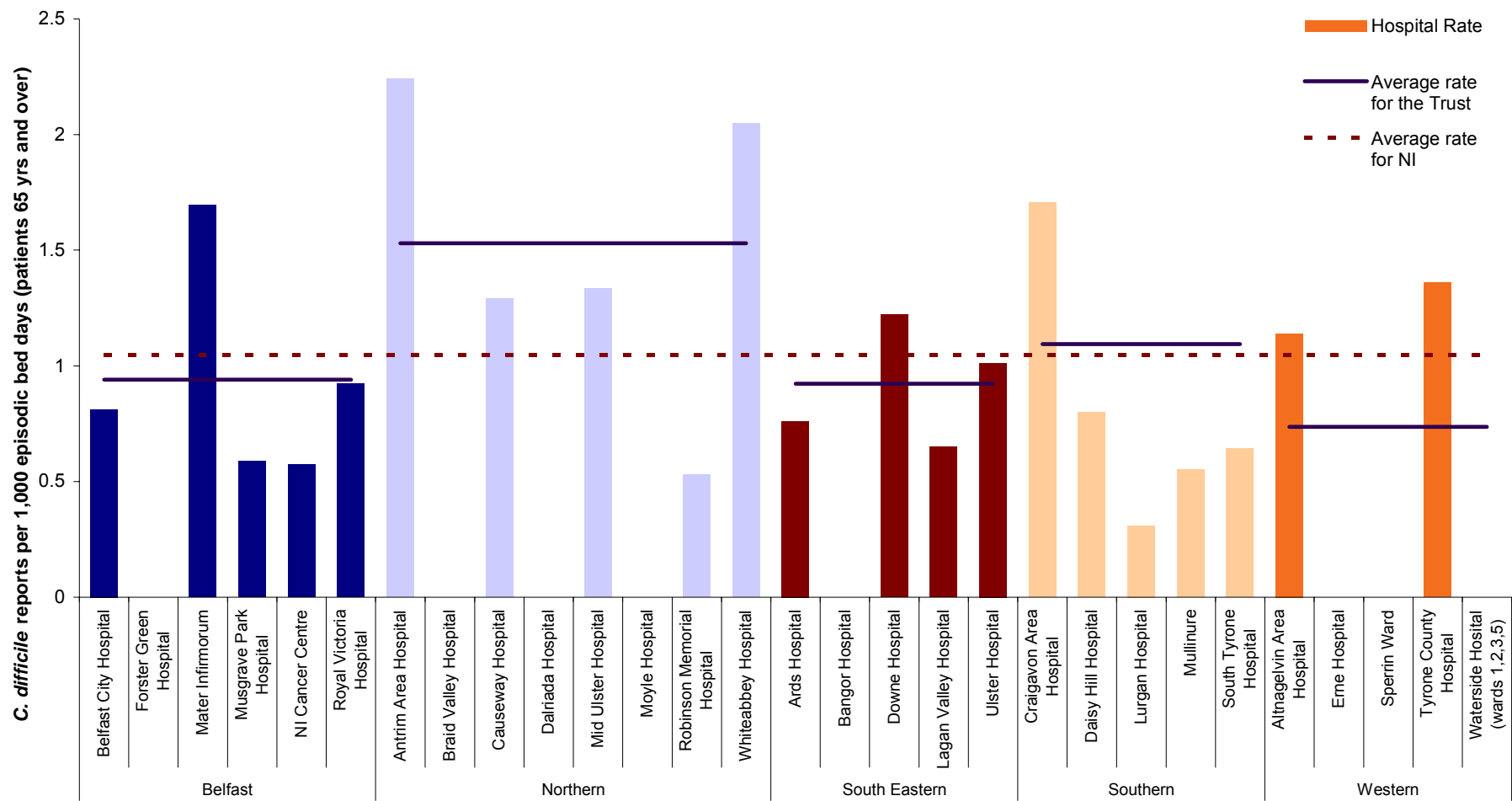
\*Figures are provisional

**Table 1:** Total number of individual ribotypes, and percentage contribution to the total, reported in Northern Ireland\* during routine surveillance, March – June 2008 (\*excludes Northern Trust data). **Figures are provisional.**

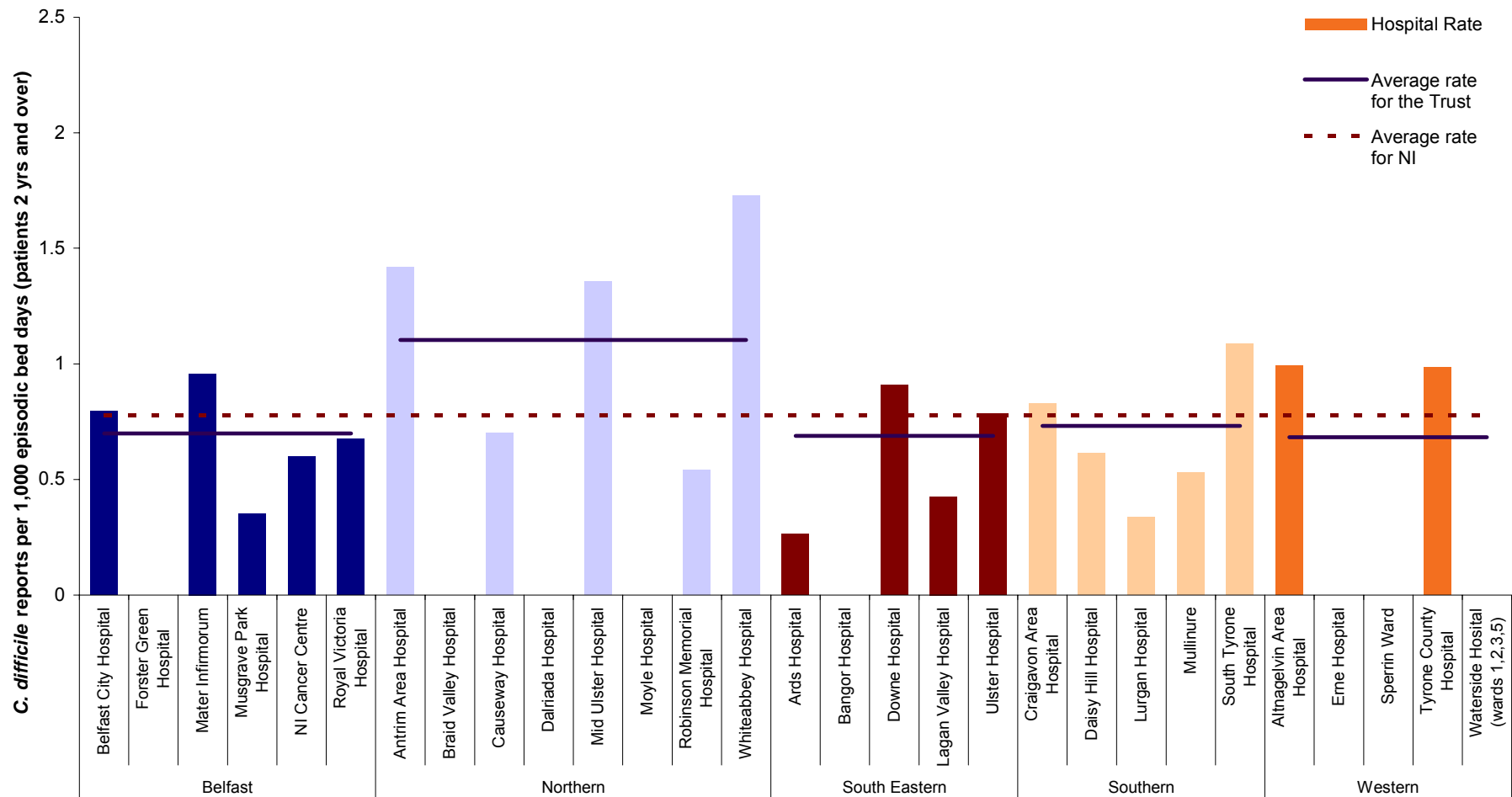
Ribotype	2008*	% total
001	27	19.29
002	6	4.29
003	1	0.71
005	3	2.14
014/20	10	7.14
015	4	2.86
019	1	0.71
023	3	2.14
026	1	0.71
027	7	5.00
044	2	1.43
049	1	0.71
078	32	22.86
081	1	0.71
106	11	7.86
not cultured - (post enrichment)	19	13.57
unrecognised profiles	11	7.86
<b>Grand Total</b>	<b>140</b>	<b>-</b>



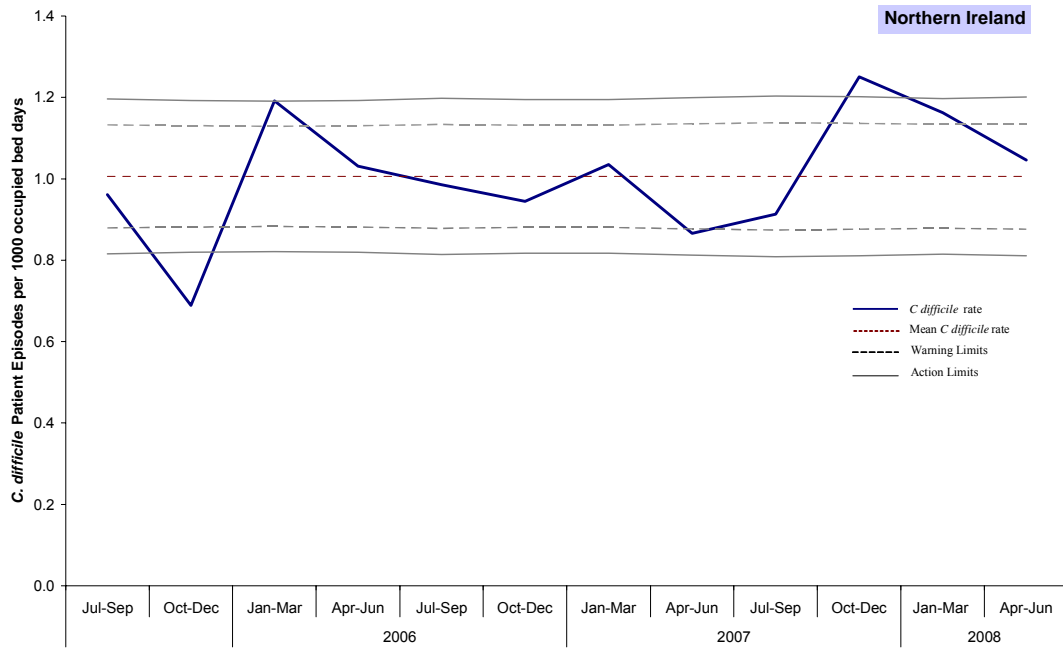
**Figure 4:** Quarterly rates of *Clostridium difficile* by Trust 1 January 2007 – 30 June 2008, compared with annual NI and Trust rates for 2007; inpatients  $\geq$  65 years.



**Figure 5:** Rates of *Clostridium difficile* by individual Hospitals and new Trusts, 2008 Quarter 2 (inpatients  $\geq$  65 years), including the quarterly Trust rate, gaps represent zero episodes (see appendix A Table 1).



**Figure 6:** Rates of *Clostridium difficile* by individual Hospitals and new Trusts, 2008 Quarter 2 (inpatients 2 years and over), including the quarterly Trust rate, 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 – June 2008

Hospital	Jan - Mar 2008		Apr - June 2008	
	Episodes	Rate	Episodes	Rate
Belfast City Hospital	18	0.577	24	0.812
Forster Green Hospital	0	0.000	0	0.000
Mater Infirmorum	17	1.339	21	1.614
Musgrave Park Hospital	2	0.184	6	0.588
NICCO (formerly at Belvoir Park)	5	1.656	2	0.573
Royal Victoria Hospital	26	0.879	24	0.923
<b>Belfast Health &amp; Social Care Trust</b>	<b>68</b>	<b>0.774</b>	<b>77</b>	<b>0.940</b>
Antrim Area Hospital	49	3.097	36	2.240
Braid Valley Hospital	0	0.000	0	0.000
Causeway Hospital	11	1.164	13	1.292
Dalriada Hospital	0	0.000	0	0.000
Mid Ulster Hospital	16	2.578	9	1.335
Moyle Hospital	0	0.000	0	0.000
Robinson Memorial Hospital	1	0.566	1	0.531
Whiteabbey Hospital	16	2.426	13	2.050
<b>Northern Health &amp; Social Care Trust</b>	<b>93</b>	<b>2.070</b>	<b>72</b>	<b>1.530</b>
Ards Hospital	1	0.677	1	0.760
Bangor Hospital	0	0.000	0	0.000
Downe Hospital	5	1.377	4	1.222
Lagan Valley Hospital	5	0.690	4	0.650
Ulster Hospital	39	1.568	25	1.012
<b>South Eastern Health &amp; Social Care Trust</b>	<b>50</b>	<b>1.293</b>	<b>34</b>	<b>0.923</b>
Craigavon Area Hospital	31	1.951	28	1.706
Daisy Hill Hospital	7	0.752	7	0.799
Lurgan Hospital	9	1.332	2	0.309
Mullinure	2	1.122	1	0.551
South Tyrone Hospital	2	0.708	2	0.644
<b>Southern Health &amp; Social Care Trust</b>	<b>51</b>	<b>1.395</b>	<b>40</b>	<b>1.094</b>
Altnagelvin Area Hospital	14	0.745	20	1.140
Erne Hospital	3	0.449	0	0.000
Sperrin Ward (T&F)	0	0.000	0	0.000
Tyrone County Hospital	7	1.025	7	1.360
Waterside Hospital (Wards 1-3, 5)	2	0.322	0	0.000
<b>Western Health &amp; Social Care Trust</b>	<b>26</b>	<b>0.656</b>	<b>27</b>	<b>0.736</b>
<b>NI Inpatient TOTAL</b>	<b>288</b>	<b>1.163</b>	<b>250</b>	<b>1.046</b>
<b>NI Community TOTAL</b>	<b>61</b>	<b>-</b>	<b>88</b>	<b>-</b>

## Appendix A

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

Hospital	Apr - June 2008	
	Episodes	Rate
Belfast City Hospital	36	0.796
Forster Green Hospital	0	0.000
Mater Infirmorum	23	0.959
Musgrave Park Hospital	7	0.350
NICCO (formerly at Belvoir Park)	4	0.599
Royal Victoria Hospital	37	0.677
<b>Belfast Health &amp; Social Care Trust</b>	<b>107</b>	<b>0.698</b>
Antrim Area Hospital	47	1.420
Braid Valley Hospital	0	0.000
Causeway Hospital	14	0.700
Dalriada Hospital	0	0.000
Mid Ulster Hospital	12	1.358
Moyle Hospital	0	0.000
Robinson Memorial Hospital	1	0.540
Whiteabbey Hospital	14	1.729
<b>Northern Health &amp; Social Care Trust</b>	<b>88</b>	<b>1.104</b>
Ards Hospital	1	0.264
Bangor Hospital	0	0.000
Downe Hospital	4	0.909
Lagan Valley Hospital	4	0.426
Ulster Hospital	34	0.784
<b>South Eastern Health &amp; Social Care Trust</b>	<b>43</b>	<b>0.688</b>
Craigavon Area Hospital	31	0.829
Daisy Hill Hospital	10	0.615
Lurgan Hospital	2	0.338
Mullinure	1	0.529
South Tyrone Hospital	3	1.086
<b>Southern Health &amp; Social Care Trust</b>	<b>47</b>	<b>0.732</b>
Altnagelvin Area Hospital	37	0.992
Erne Hospital	0	0.000
Sperrin Ward (T&F)	0	0.000
Tyrone County Hospital	7	0.984
Waterside Hospital (Wards 1-3, 5)	0	0.000
<b>Western Health &amp; Social Care Trust</b>	<b>44</b>	<b>0.683</b>
<b>NI Inpatient TOTAL</b>	<b>329</b>	<b>0.776</b>
<b>NI community TOTAL</b>	<b>110</b>	<b>-</b>

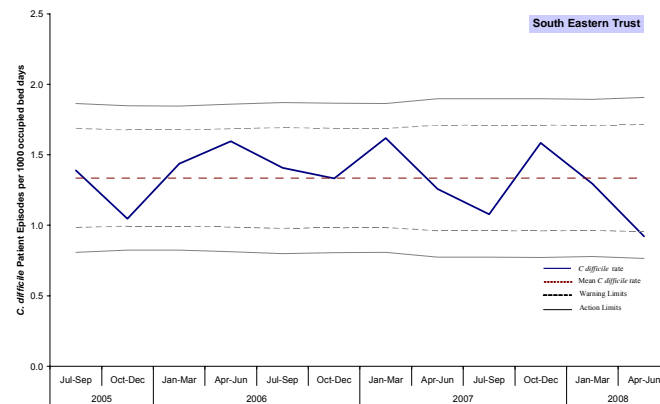
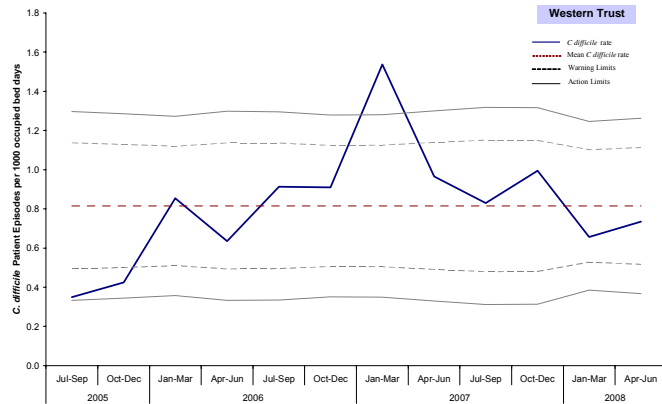
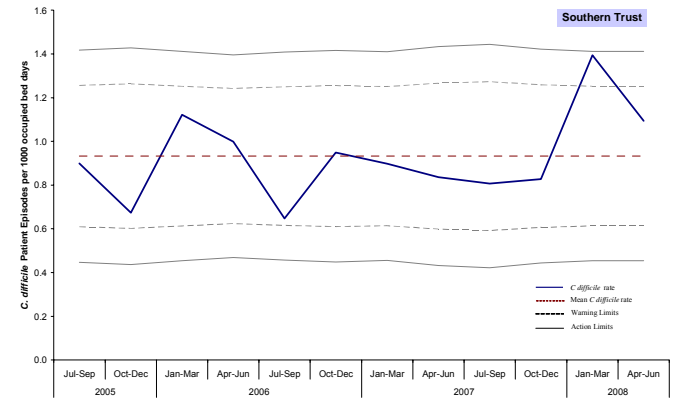
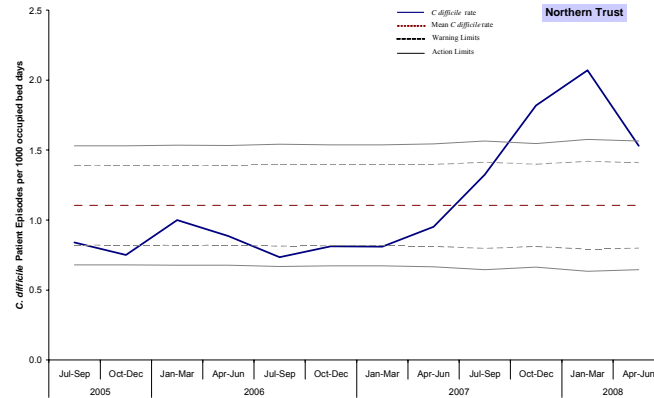
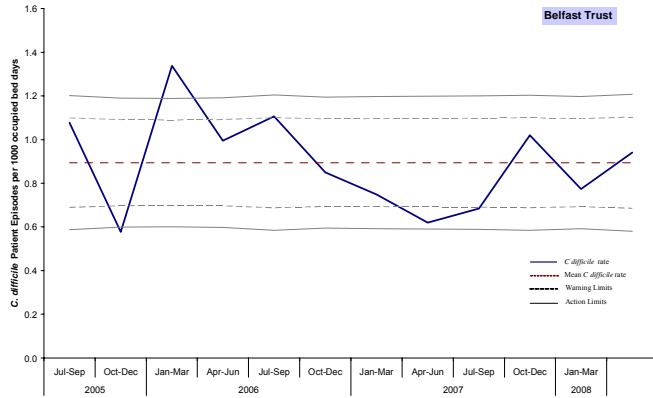
## Appendix A

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

Hospital	Apr - June 2008
	Episodes
Belfast City Hospital	12
Forster Green Hospital	0
Mater Infirmorum	2
Musgrave Park Hospital	1
NICCO (formerly at Belvoir Park)	2
Royal Victoria Hospital	13
<b>Belfast Health &amp; Social Care Trust</b>	<b>30</b>
Antrim Area Hospital	11
Braid Valley Hospital	0
Causeway Hospital	1
Dalriada Hospital	0
Mid Ulster Hospital	3
Moyle Hospital	0
Robinson Memorial Hospital	0
Whiteabbey Hospital	1
<b>Northern Health &amp; Social Care Trust</b>	<b>16</b>
Ards Hospital	0
Bangor Hospital	0
Downe Hospital	0
Lagan Valley Hospital	0
Ulster Hospital	9
<b>South Eastern Health &amp; Social Care Trust</b>	<b>9</b>
Craigavon Area Hospital	3
Daisy Hill Hospital	3
Lurgan Hospital	0
Mullinure	0
South Tyrone Hospital	1
<b>Southern Health &amp; Social Care Trust</b>	<b>7</b>
Altnagelvin Area Hospital	17
Erne Hospital	0
Sperrin Ward (T&F)	0
Tyrone County Hospital	0
Waterside Hospital (Wards 1-3, 5)	0
<b>Western Health &amp; Social Care Trust</b>	<b>17</b>
<b>NI Inpatient TOTAL</b>	<b>79</b>
<b>NI community TOTAL</b>	<b>22</b>

# Appendix B

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



### Notes:

As of the 1<sup>st</sup> 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 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