



**CDSC (NI)**

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

**Quarter Ending December 2007**

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

- **CDAD reports in Northern Ireland have risen significantly during October – December 2007 (Figure 5).**
- **CDAD reports from inpatients for the calendar year 2007 have decreased 8.1% compared with 2006**

### ***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. Currently, mandatory surveillance is restricted to those individuals over 65 years of age.

Targets have been set to reduce the number and rate of *C. difficile* patient episodes (>65 year olds) by 20% by March 2009 using the figures from the financial year 2006/07 as the baseline. These figures are presented in Appendix A Table 2 for reference.

### **October – December 2007: Quarter 4**

During the fourth quarter of 2007 a total of 343 episodes of *C. difficile* associated disease were reported in persons aged 65 years and over (Figure 1). Of these 343 episodes, 297 were known to have been a hospital inpatient in one of the listed hospitals in Table 1 at the time of the sample being taken. The remaining 46 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 8.9% in 2005 to 16.7% in 2007 (Figure 1).

The Northern Ireland total of CDAD episodes for this quarter has risen 35.6% compared with the previous quarter (Figure 2). Further, the 2007 Oct-Dec figures are higher than those reported in the same time period in 2005 and 2006 (77.7% and 26.6% respectively, Figure 2). Caution must be taken when interpreting the 2005 figures as laboratory detection methods were not standardised during this year.

Community figures have risen slightly in quarter 4 (46) when compared to quarter 3 (41; 12.2% increase). Overall, community figures have increased 36.7% in 2007 when compared to 2006, indeed, this quarter has seen a 53.3% increase in community cases when compared to 2006 Quarter 4. It should be noted that it is not possible to distinguish in the 'community' episodes those patients who may have recently been discharged from hospital.

There has been an increase in the number of inpatient cases reported in this quarter (85 cases, 40.1%) when compared to the previous quarter (Figure 2).

### **January – December 2007**

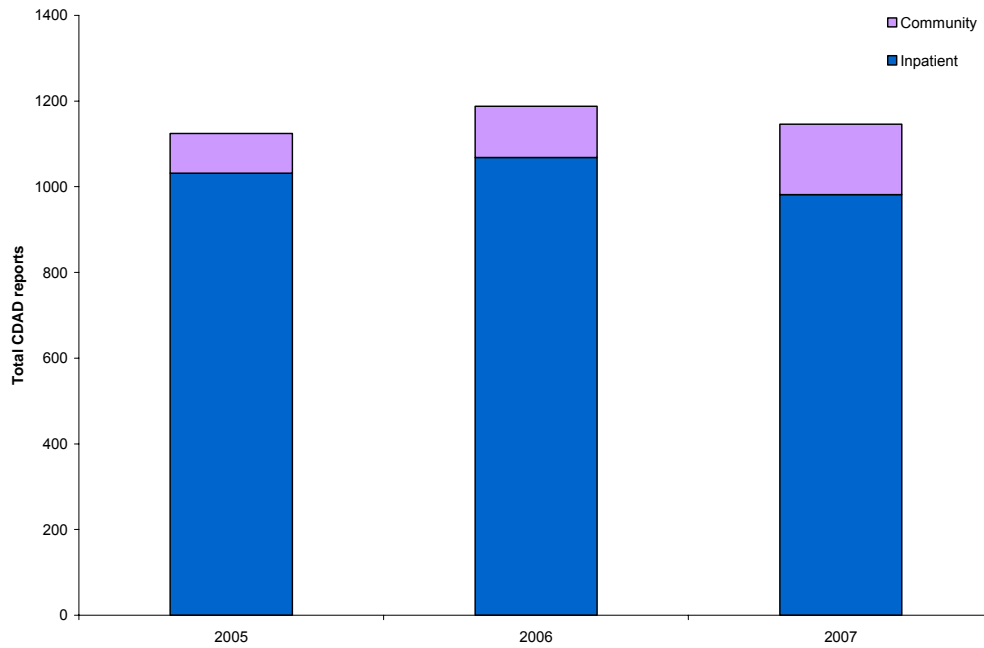
In 2007, the total number of CDAD reports from inpatients has decreased from January–December 2007 when compared to the same period in 2006 (8.1% reduction). (For a breakdown by Trust/hospitals see Figures 3 and 4).

### **Statistical Process Control charts**

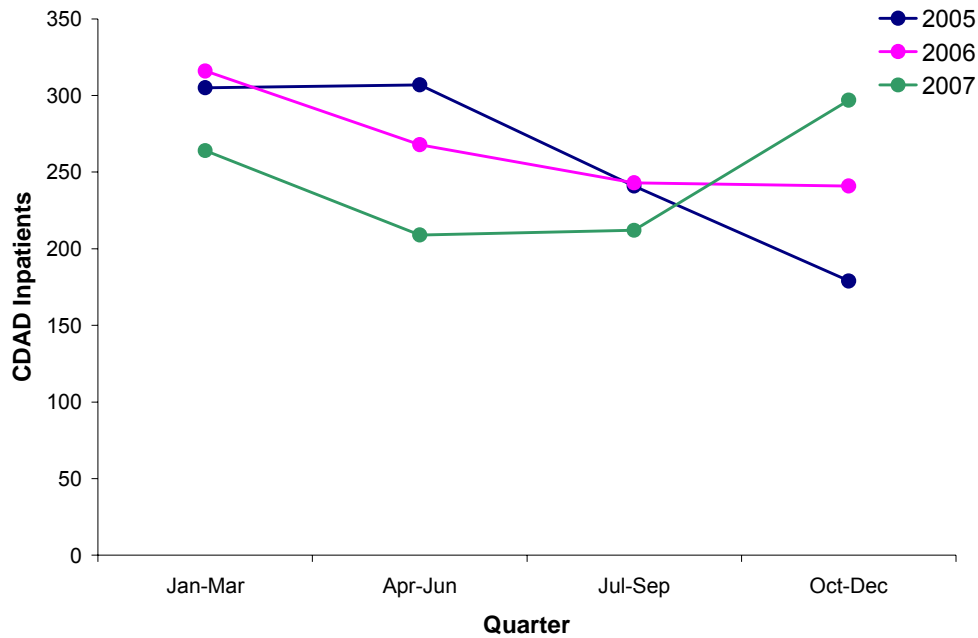
Control charts have now been introduced for *C. difficile* surveillance to emulate the current practice for *S. aureus* reporting. Trends in rates since July 2005 are shown for each Trust configuration in appendix B. SPC charts allow the distinction to be made between natural variation and "special cause 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 breached the action limits of the chart indicating that the rates are no longer fluctuating within normal limits (Figure 5). This increase has been driven by a particularly high number of cases in the Northern Trust who remain above their action limits for the second consecutive quarter (Appendix B). However, during this quarter marked increases were also recorded in the

Belfast, South Eastern and Western Trusts, but these did not breach the SPC warning limits (Figure 3).



**Figure 1:** Total CDAD reports in Northern Ireland, by source and year (patients  $\geq 65$  years)



**Figure 2:** Total CDAD 'Inpatient' reports in Northern Ireland, by quarter (patients  $\geq 65$  years)

### **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 4). Notes on this denominator are included in Appendix C.

Since July – September 2007 Mullinure, a care of the elderly facility, has been added to the Southern Trust dataset. To create an accurate baseline for the Southern Trust a look back exercise is currently underway. This will allow the calculation of the total number of *C difficile* episodes in Mullinure since 1 April 2006, thus, **data for the Southern Trust is provisional.**

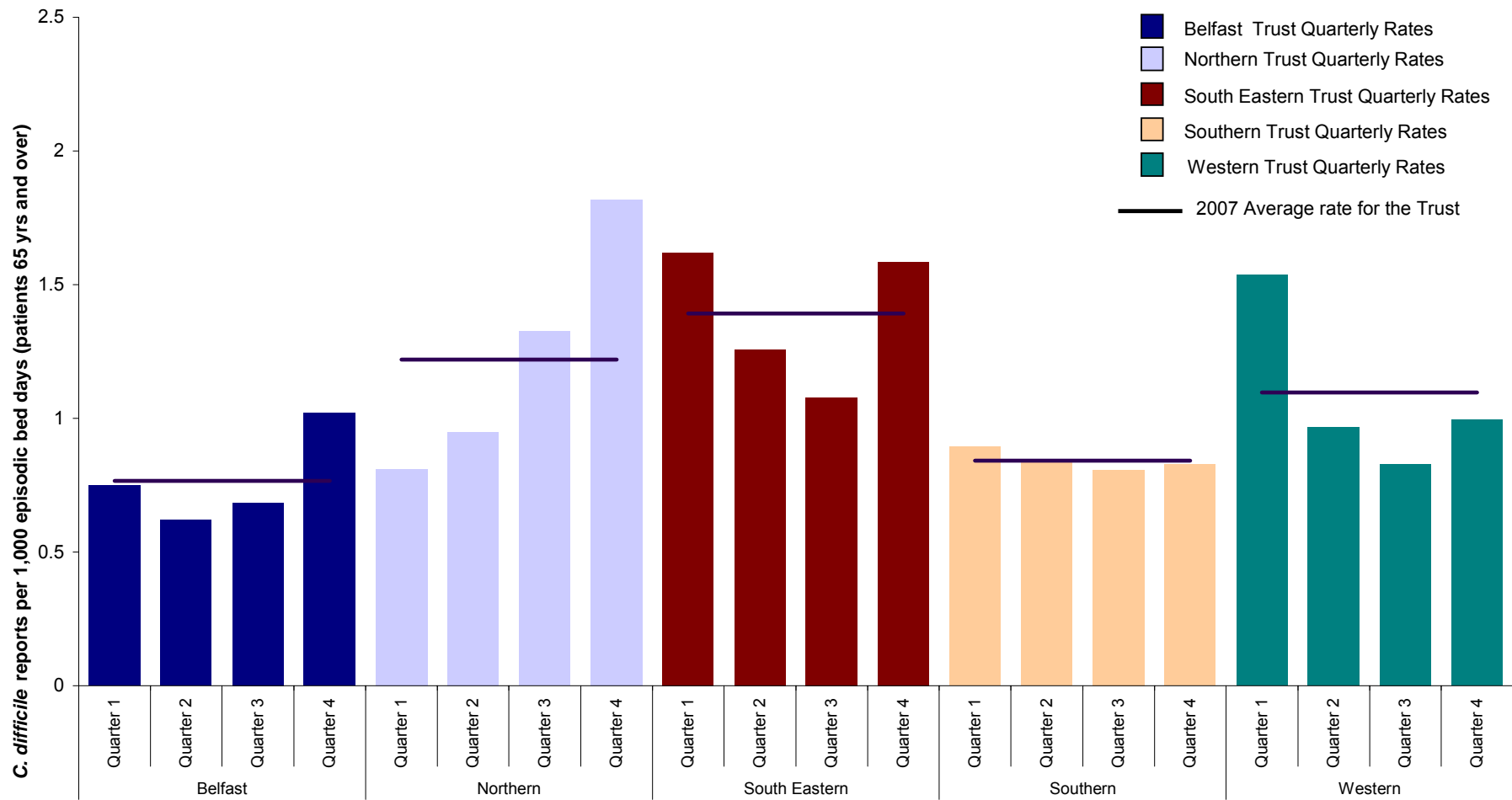
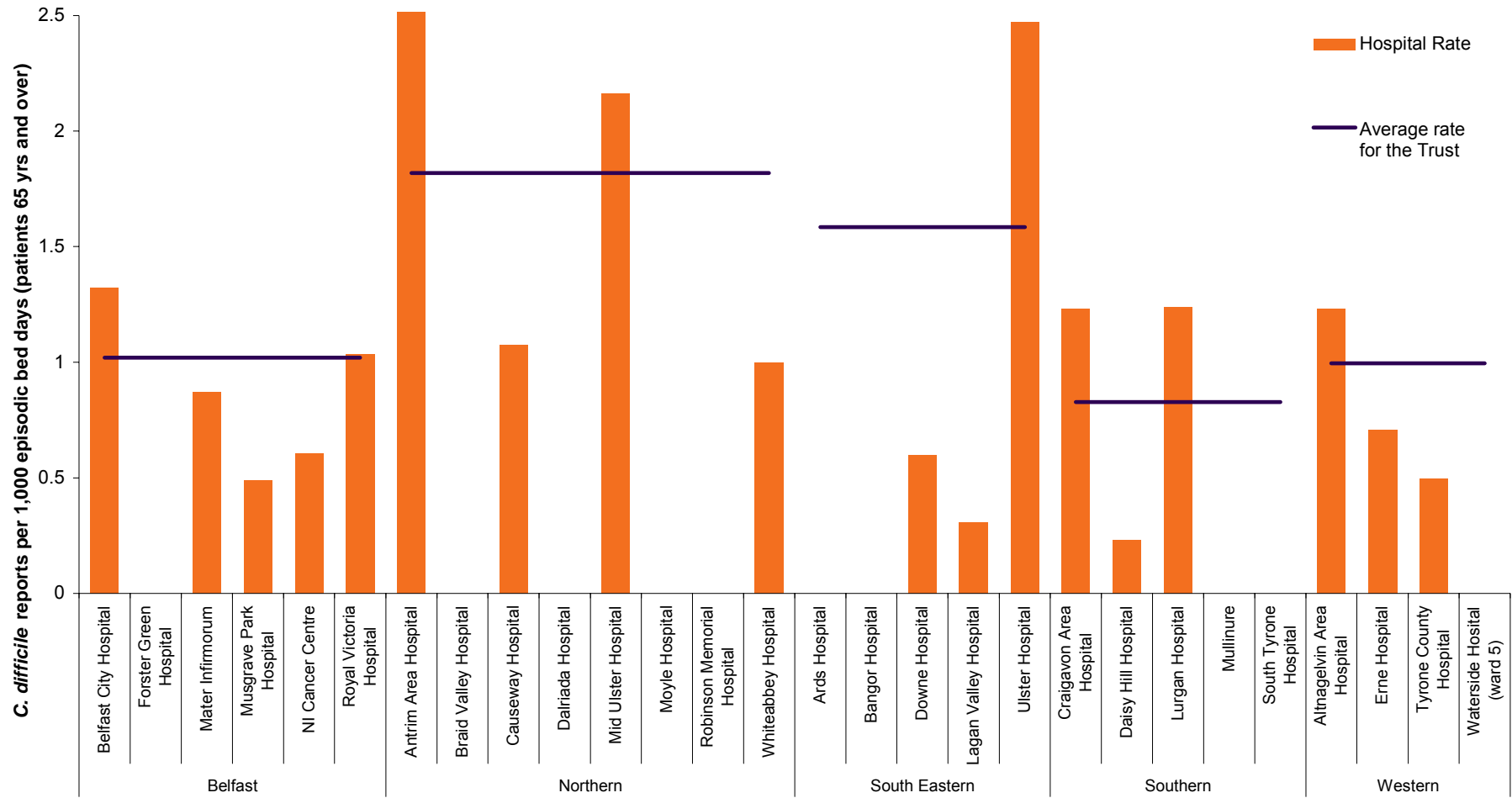
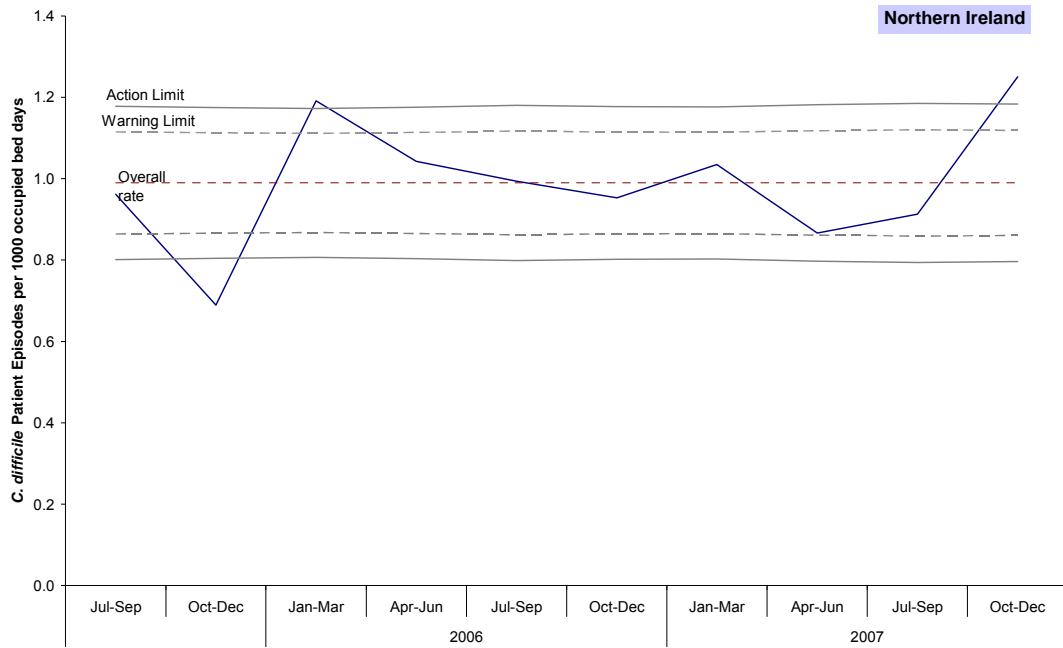


Figure 3: Quarterly rates of *Clostridium difficile* by Trust 1 January 2007 – 31 December 2007, annual Trust rates for 2007; inpatients  $\geq 65$  years.



**Figure 4:** Rates of *Clostridium difficile* by individual Hospitals and new Trusts, 2007 Quarter 4 (inpatients  $\geq$  65 years), including the quarterly Trust rate, gaps represent zero episodes (see appendix A Table 1).



**Figure 5:** Statistical Process Control chart for quarterly *C difficile* rates 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 - December 2007

Hospital	Jan-Mar 2007		Apr-Jun 2007		Jul-Sep 2007		Oct-Dec 2007	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	19	0.61	25	0.78	23	0.68	40	1.32
Forster Green Hospital	0	0	0	0	0	0	0	0.00
Mater Infirmorum	25	1.99	6	0.47	3	0.24	11	0.87
Musgrave Park Hospital	4	0.35	1	0.09	1	0.09	5	0.49
NICCO (formerly at Belvoir Park)	1	0.35	5	1.95	5	1.63	2	0.61
Royal Victoria Hospital	17	0.59	17	0.62	27	1.09	28	1.03
<b>Belfast Health &amp; Social Care Trust</b>	<b>66</b>	<b>0.75</b>	<b>54</b>	<b>0.62</b>	<b>59</b>	<b>0.68</b>	<b>86</b>	<b>1.02</b>
Antrim Area Hospital	26	1.54	26	1.67	39	2.84	58	3.55
Braid Valley Hospital	0	0	0	0	0	0	0	0.00
Causeway Hospital	11	1.23	11	1.19	5	0.58	11	1.07
Dalriada Hospital	0	0	2	1.37	0	0	0	0.00
Mid Ulster Hospital	4	0.52	4	0.51	3	0.58	16	2.16
Moyle Hospital	0	0	0	0	0	0	0	0.00
Robinson Memorial Hospital	0	0	1	0.58	0	0	0	0.00
Whiteabbey Hospital	2	0.21	5	0.55	15	2.6	8	1.00
<b>Northern Health &amp; Social Care Trust</b>	<b>43</b>	<b>0.81</b>	<b>49</b>	<b>0.95</b>	<b>62</b>	<b>1.56</b>	<b>93</b>	<b>1.82</b>
Ards Hospital	0	0	0	0	0	0	0	0.00
Bangor Hospital	0	0	0	0	0	0	0	0.00
Downe Hospital	7	1.45	8	1.99	2	0.43	2	0.60
Lagan Valley Hospital	5	0.68	2	0.32	3	0.44	3	0.31
Ulster Hospital	58	2.07	38	1.52	36	1.51	55	2.47
<b>South Eastern Health &amp; Social Care Trust</b>	<b>70</b>	<b>1.62</b>	<b>48</b>	<b>1.26</b>	<b>41</b>	<b>1.08</b>	<b>60</b>	<b>1.58</b>
Craigavon Area Hospital	26	1.67	19	1.38	16	1.2	18	1.23
Daisy Hill Hospital	2	0.24	2	0.25	2	0.27	2	0.23
Lurgan Hospital	3	0.39	6	0.86	6	0.87	9	1.24
Mullinure	2	0.89	1	0.48	1	0.57	0	0.00
South Tyrone Hospital	0	0	0	0	1	0.35	0	0.00
<b>Southern Health &amp; Social Care Trust*</b>	<b>33</b>	<b>0.9</b>	<b>28</b>	<b>0.83</b>	<b>26</b>	<b>0.81</b>	<b>29</b>	<b>0.83</b>
Altnagelvin Area Hospital	35	1.9	18	1.07	22	1.28	22	1.23
Erne Hospital	4	0.5	2	0.3	0	0	5	0.71
Tyrone County Hospital	13	2.23	10	1.51	2	0.46	2	0.50
Waterside Hospital (Ward 5)	0	0	0	0	0	0	0	0.00
<b>Western Health &amp; Social Care Trust</b>	<b>52</b>	<b>1.54</b>	<b>30</b>	<b>0.97</b>	<b>24</b>	<b>0.83</b>	<b>29</b>	<b>1.00</b>
<b>NI TOTAL</b>	<b>264</b>	<b>1.04</b>	<b>209</b>	<b>0.87</b>	<b>212</b>	<b>0.94</b>	<b>297</b>	<b>1.26</b>

\*January – December 2007 Southern Trust data now includes Mullinure

## Appendix A

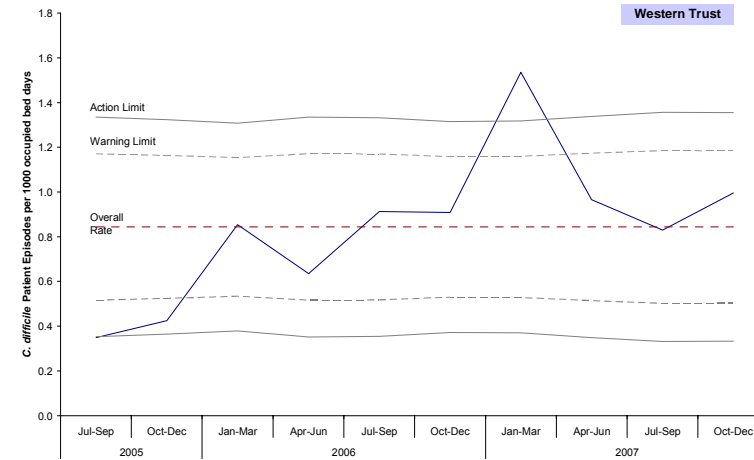
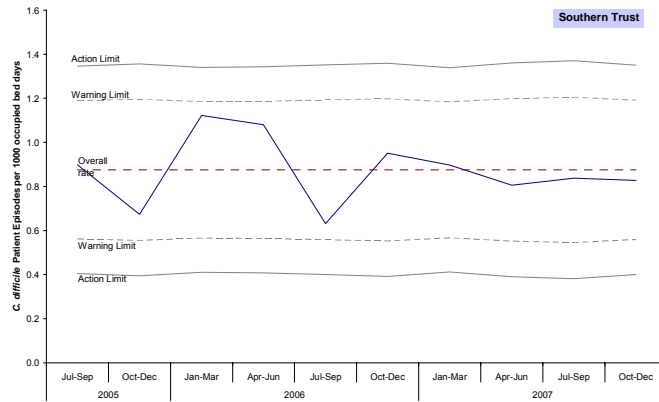
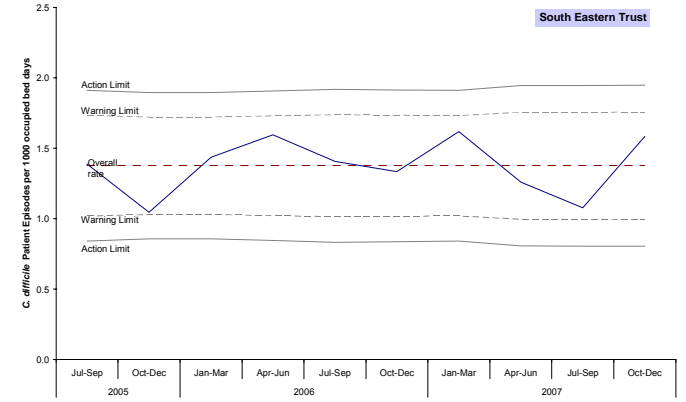
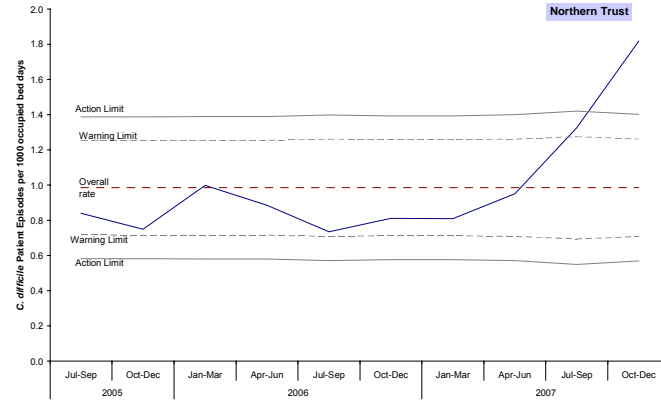
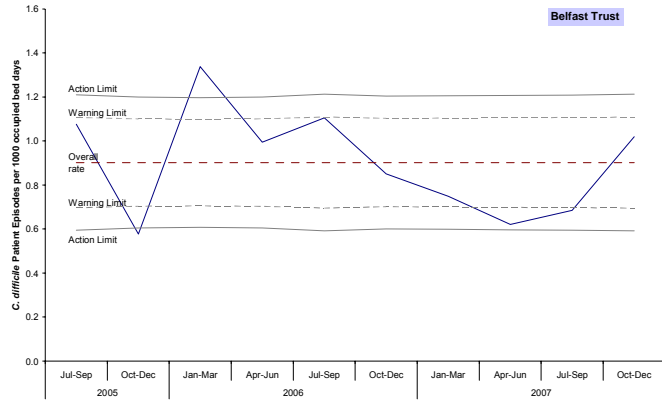
**Table 2:** Number of *Clostridium difficile* patient episodes, patients 65 years and over, and rates by Hospital for the baseline financial year 2006/07, with targets for the financial year 2008/09

Hospital	Baseline 2006/07		Target (March 2009)	
	Episodes	Rate	Episodes	Rate
Belfast City Hospital	113	0.881	90	0.70
Forster Green Hospital	0	0.000	0	0.00
Mater Infirmorum	95	1.925	76	1.54
Musgrave Park Hospital	22	0.531	18	0.42
NICCO (formerly at Belvoir Park)	4	0.404	3	0.32
Royal Victoria Hospital	92	0.776	74	0.62
<b>Belfast Health &amp; Social Care Trust</b>	<b>326</b>	<b>0.923</b>	<b>261</b>	<b>0.74</b>
Antrim Area Hospital	87	1.399	70	1.12
Braid Valley Hospital	1	0.063	1	0.05
Causeway Hospital	40	1.046	32	0.84
Dalriada Hospital	0	0.000	0	0.00
Mid Ulster Hospital	20	0.626	16	0.50
Moyle Hospital	0	0.000	0	0.00
Robinson Memorial Hospital	0	0.000	0	0.00
Whiteabbey Hospital	24	0.634	19	0.51
<b>Northern Health &amp; Social Care Trust</b>	<b>172</b>	<b>0.811</b>	<b>138</b>	<b>0.65</b>
Ards Hospital	0	0.000	0	0.00
Bangor Hospital	0	0.000	0	0.00
Downe Hospital	19	1.057	15	0.85
Lagan Valley Hospital	19	0.582	15	0.47
Ulster Hospital	218	1.993	174	1.59
<b>South Eastern Health &amp; Social Care Trust</b>	<b>256</b>	<b>1.490</b>	<b>205</b>	<b>1.19</b>
Craigavon Area Hospital	86	1.413	69	1.13
Daisy Hill Hospital	17	0.498	14	0.40
Lurgan Hospital	16	0.514	13	0.41
Mullinure	2	0.206	2	0.16
South Tyrone Hospital	5	0.384	4	0.31
<b>Southern Health &amp; Social Care Trust*</b>	<b>126</b>	<b>0.846</b>	<b>101</b>	<b>0.68</b>
Altnagelvin Area Hospital	94	1.325	75	1.06
Erne Hospital	20	0.647	16	0.52
Tyrone County Hospital	18	0.739	14	0.59
Waterside Hospital (Ward 5)	0	0.000	0	0.00
<b>Western Health &amp; Social Care Trust</b>	<b>132</b>	<b>1.006</b>	<b>106</b>	<b>0.81</b>
<b>NI TOTAL</b>	<b>1012</b>	<b>0.995</b>	<b>810</b>	<b>0.80</b>

\* 06/07 baseline Southern Trust data is provisional until Mullinure figures are confirmed

# Appendix B

## Trends in *C. difficile* rates by trust and quarter (2005-2007)



### Notes:

**The number of CDAD patient episodes** is defined as the total number of patients aged 65 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 (patients aged 65 years and over). The denominator used for this calculation is derived from patient episode statistics obtained from each Trust individually on a quarterly basis. 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.

## 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,  $N_i$  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 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