



CDSC (NI)

***C. difficile* surveillance**

Quarter Ending March 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 January – March 2009 (Figure 6).**
- ❖ **CDAD reports from ‘community’ patients, over 65 years of age, for the January – March quarter have decreased by 13% (11 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.**

C. difficile reporting

- ❖ Reports of *C. difficile* are obtained directly from each diagnostic laboratory through the normal 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 (Figure 6; Appendix A, Table 2), and CDAD episodes reported in individuals aged 2-64 years (Appendix A, Table 3).
- ❖ This report contains an update on the new Northern Ireland ribotyping service which commenced 1st April 2009.
- ❖ 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.

January – March 2009

Data for patients aged 65 years and over

All CDAD episodes (inpatient and community)

- ❖ During the quarter, 269 episodes of CDAD were reported in persons aged 65 years and over compared to 295 episodes in the previous quarter (8.8% decrease, 26 reports; Figure 1).
- ❖ This quarters CDAD figures are lower than those reported in the same period since reporting began in 2005 (Figure 1).
- ❖ Of the 269 episodes, 198 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 71 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’; 27.8% (82/295 episodes) in the October – December quarter, compared with 26.4% (71/269) this quarter.

Inpatient episodes

- ❖ There has been a decrease of 15 cases (7%) in the number of inpatient cases reported in this quarter (198) compared with the previous quarter (213). This is the fifth consecutive quarter where there has been a reduction in inpatient episodes

(Figure 2a), with a decrease of 93 cases between this quarter and January/March, 2008 (291 cases, 32.0% reduction).

- ❖ Comparing the January – March 2009 period (198 episodes) to the same quarter in 2008 (291 episodes) and 2007 (269 episodes), there has been a decrease in the number of cases reported (32.0% and 26.4% decrease respectively; Figure 2b). For a breakdown by Trust/hospitals see Figures 4 and 5.

Community episodes

- ❖ Community figures have decreased by 11 episodes (13%) this quarter (82 reports in October-December to 71 reports this quarter; Figure 1 and Appendix A).
- ❖ A higher number of ‘community’ isolates were reported in this quarter (71 cases) when compared to January – March in 2008 (58 cases; 22.4% 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

- ❖ 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 warning limit of the chart. If this continues for 2 consecutive quarters (3 quarters below the warning limit in total) this would indicate a significant reduction in the number of *C. difficile* patient episodes not explained by natural variation (Figure 6).

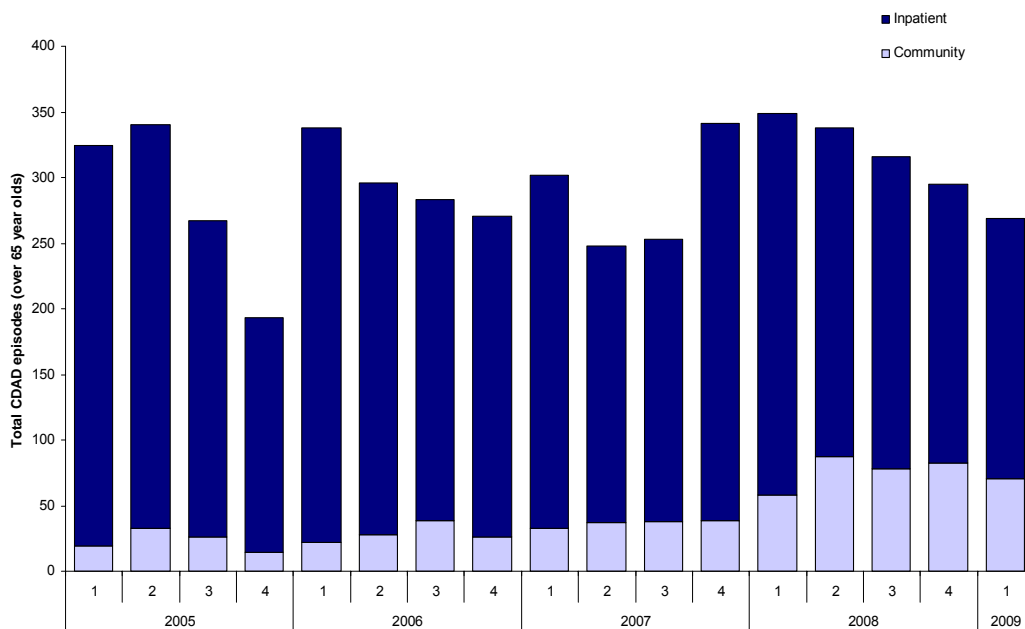


Figure 1: Total CDAD reports, inpatient and community, in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.

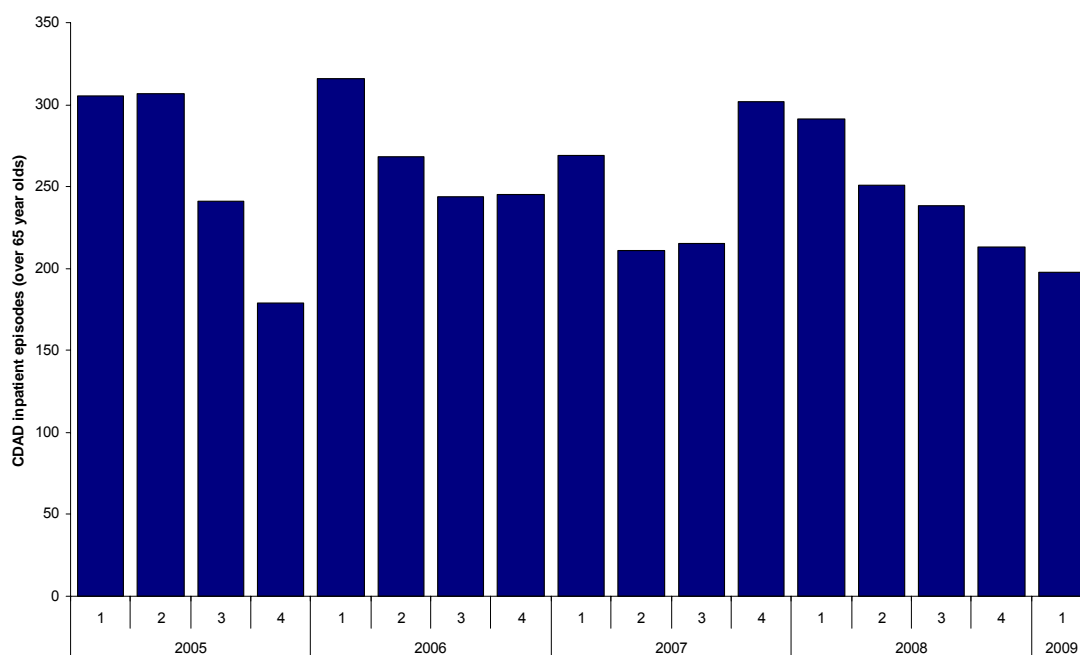


Figure 2a: Total CDAD 'Inpatient' reports, Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.

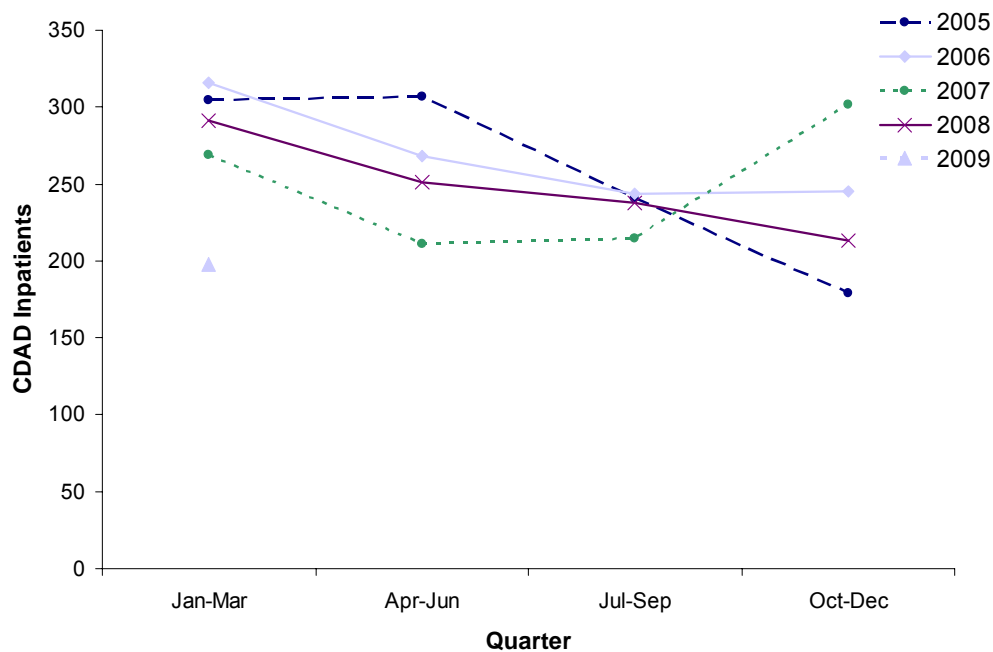


Figure 2b: Total CDAD 'Inpatient' reports, Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2009.

Data for patients aged 2 years and over

All CDAD episodes (inpatient and community)

- ❖ During the quarter, 351 episodes of *C. difficile* associated disease were reported in persons aged 2 years and over. This represents a 4.6% decrease from the previous quarter (368 episodes). Of the 351 episodes, 77% were in those (inpatient and community) aged 65 years and over.
- ❖ 263 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 5). Of the 263, 75% occurred in patients aged 65 years and over.
- ❖ The remaining 88 isolates reported were from 'community' samples which may include: GPs, nursing homes and other such non acute settings. Of the 88, 81% 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 A Table 3.

Rates of hospital inpatient *C. difficile* episodes

- ❖ 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.
- ❖ Bed day data was not available for Lurgan General Hospital, Mullinure or Daisy Hill; therefore, the figures used are based on an estimate generated using Quarter 4 bed day data for these hospitals from 2005 – 2008. The bed day information will be updated when it becomes available.

Ribotype surveillance

- ❖ As of 1st April 2009, a *C. difficile* ribotyping service has been established in Northern Ireland. In contrast to the previous routine ribotyping scheme, all *C. difficile* isolates within Northern Ireland will now be ribotyped. This will facilitate enhanced surveillance of ribotypes circulating in NI.
- ❖ Data was not available for inclusion in this report; however, subsequent reports will contain quarterly updates of the ribotypes isolated in NI.

Clarification of episode definitions

- ❖ Due to a number of queries about the assignment of episodes to Trusts, new information to reflect situations that may arise and the action to be taken has been applied in Appendix E.

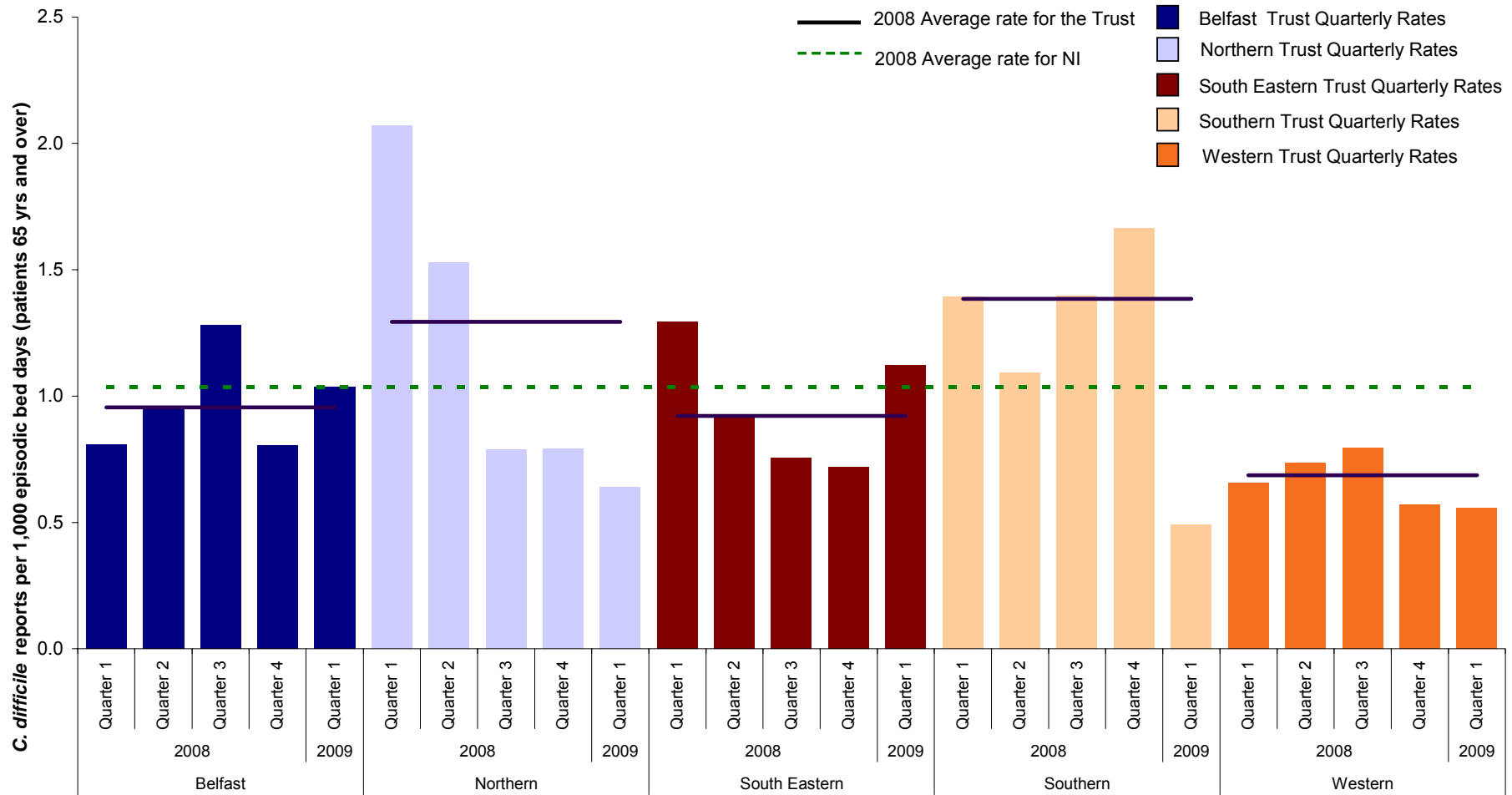


Figure 3: Quarterly rates of *Clostridium difficile* by Trust 1 January 2008 – 31 March 2009, compared with annual NI and Trust rates for 2008; inpatients ≥ 65 years.

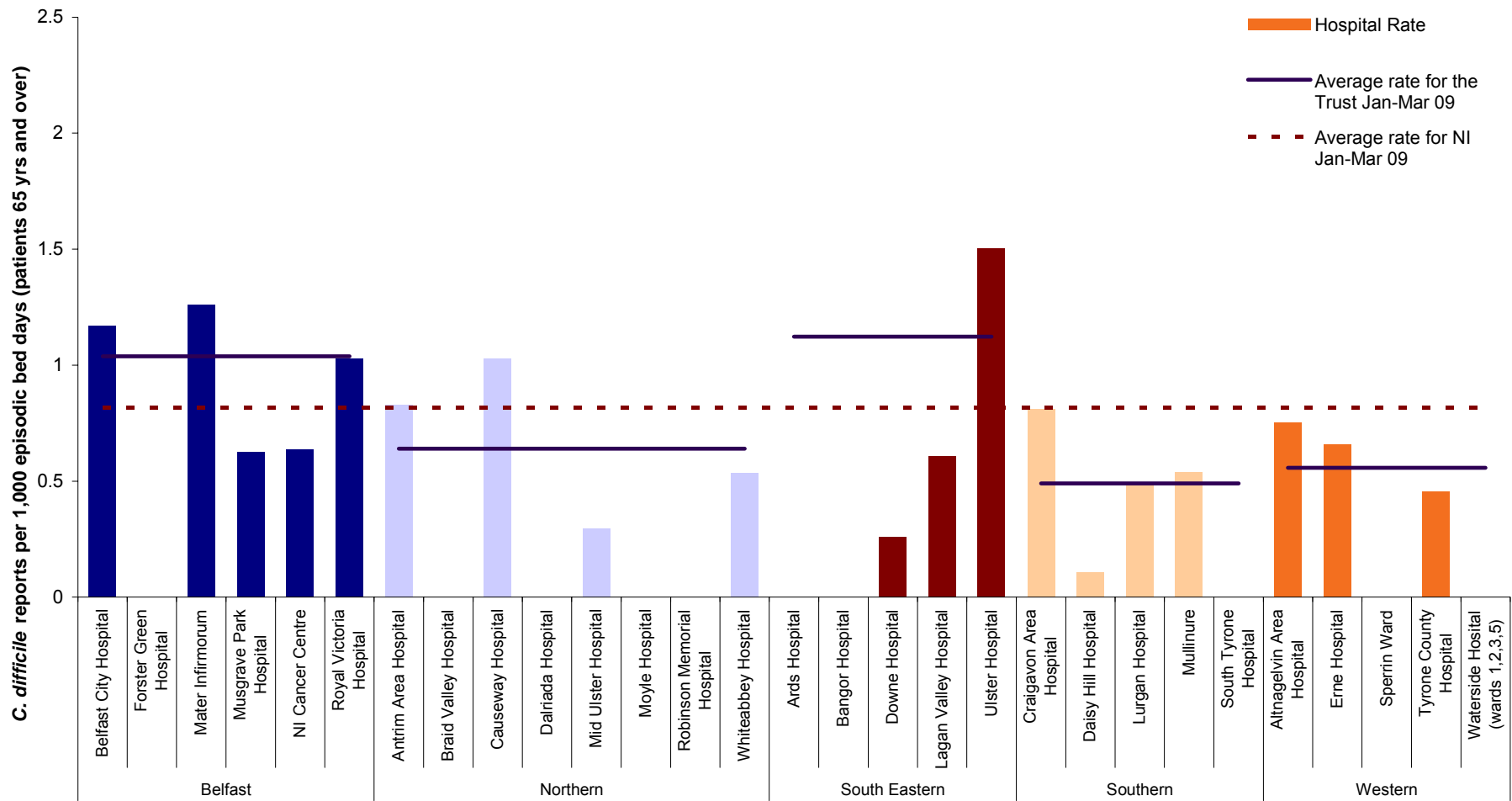


Figure 4: Rates of *Clostridium difficile* by individual Hospitals, 2009 Quarter 1 (inpatients \geq 65 years), including the quarterly Trust rates and an average rate for NI, gaps represent zero episodes (see appendix A Table 1).

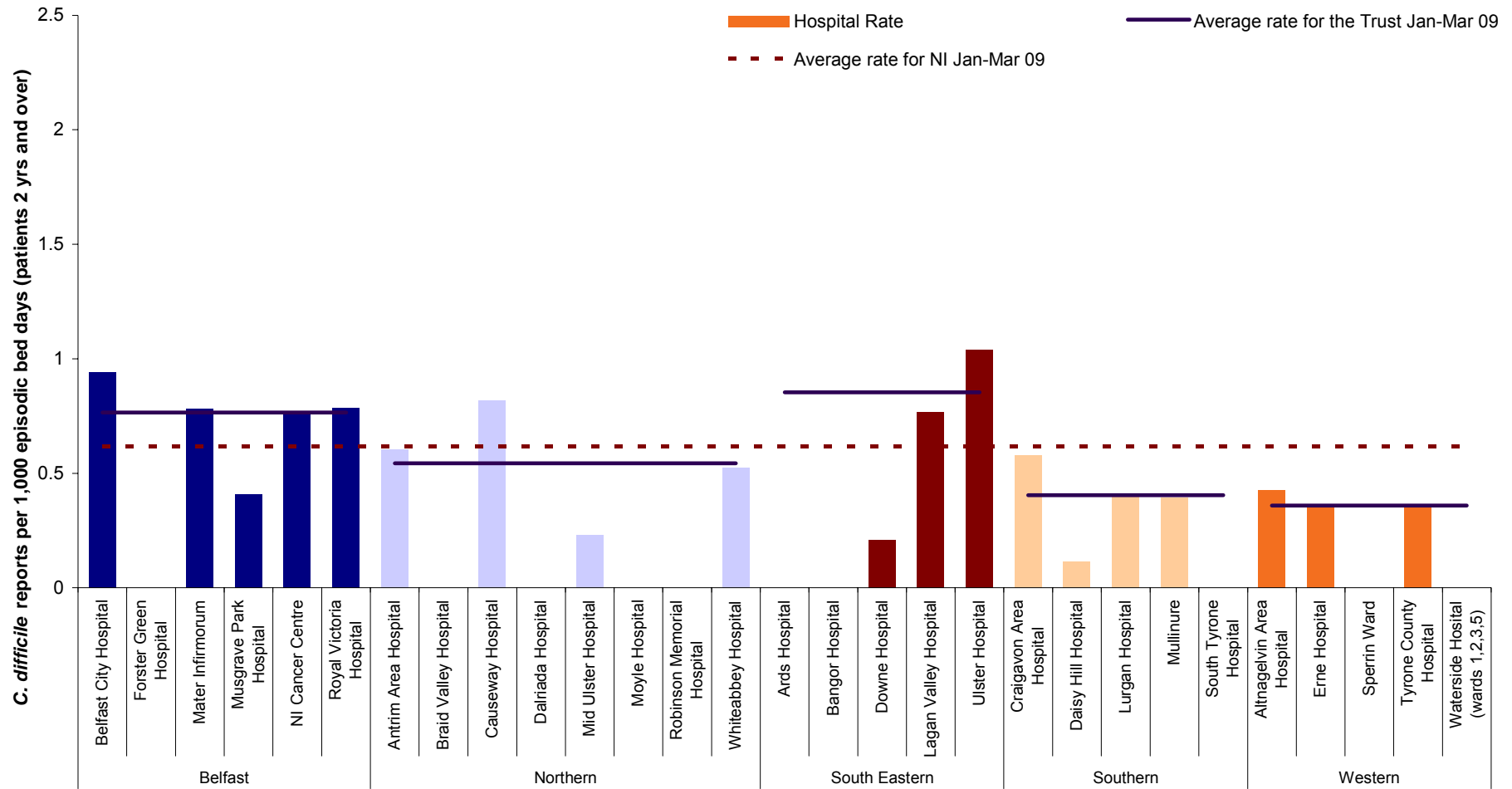


Figure 5: Rates of *Clostridium difficile* by individual Hospitals, 2009 Quarter 1 (inpatients 2 years and over), including the quarterly Trust rates and an average rate for NI, gaps represent zero episodes (see appendix A Table 2).

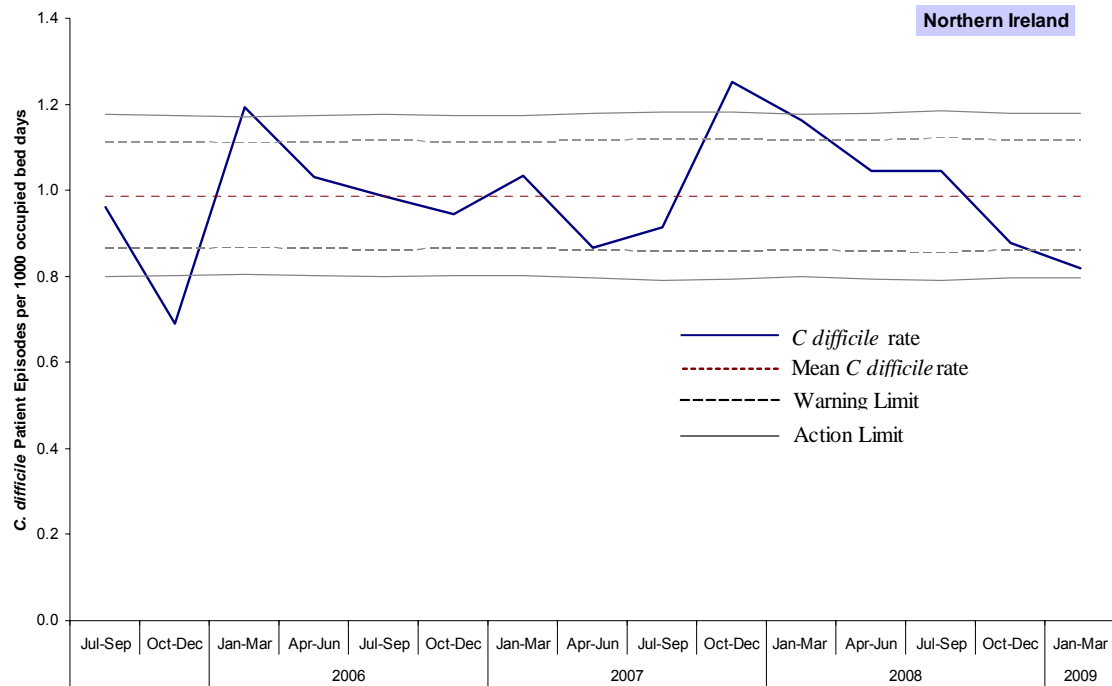


Figure 6: Statistical Process Control chart for quarterly *C difficile* rates in inpatients aged 65 years and over, in Northern Ireland (For Trust level see Appendix B).

Appendix A

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

Hospital	Jan - Mar 2009	
	Episodes	Rate
Belfast City Hospital	30	1.170
Forster Green Hospital	0	0.000
Mater Infirmorum	17	1.261
Musgrave Park Hospital	7	0.626
NICCO (formerly at Belvoir Park)	2	0.638
Royal Victoria Hospital	29	1.030
Belfast Health & Social Care Trust	85 (66)	1.038
Antrim Area Hospital	14	0.829
Braid Valley Hospital	0	0.000
Causeway Hospital	11	1.028
Dalriada Hospital	0	0.000
Mid Ulster Hospital	2	0.296
Moyle Hospital	0	0.000
Robinson Memorial Hospital	0	0.000
Whiteabbey Hospital	4	0.536
Northern Health & Social Care Trust	31 (38)	0.640
Ards Hospital	0	0.000
Bangor Hospital	0	0.000
Downe Hospital	1	0.260
Lagan Valley Hospital	4	0.608
Ulster Hospital	39	1.504
South Eastern Health & Social Care Trust	44 (29)	1.123
Craigavon Area Hospital	13	0.811
Daisy Hill Hospital	1	0.106
Lurgan Hospital	3	0.483
Mullinure	1	0.540
South Tyrone Hospital	0	0.000
Southern Health & Social Care Trust*	18 (59)	0.490
Altnagelvin Area Hospital	13	0.752
Erne Hospital	5	0.659
Sperrin Ward (T&F)	0	0.000
Tyrone County Hospital	2	0.456
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000
Western Health & Social Care Trust	20 (21)	0.557
NI TOTAL	198 (213)	0.818
NI Community TOTAL	71 (82)	-

Appendix A

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

Hospital	Jan - Mar 2009	
	Episodes	Rate
Belfast City Hospital	41	0.940
Forster Green Hospital	0	0.000
Mater Infirmorum	19	0.783
Musgrave Park Hospital	8	0.407
NICCO (formerly at Belvoir Park)	5	0.755
Royal Victoria Hospital	42	0.785
Belfast Health & Social Care Trust	115 (94)	0.765
Antrim Area Hospital	20	0.604
Braid Valley Hospital	0	0.000
Causeway Hospital	16	0.818
Dalriada Hospital	0	0.000
Mid Ulster Hospital	2	0.232
Moyle Hospital	0	0.000
Robinson Memorial Hospital	0	0.000
Whiteabbey Hospital	5	0.526
Northern Health & Social Care Trust	43 (45)	0.544
Ards Hospital	0	0.000
Bangor Hospital	0	0.000
Downe Hospital	1	0.209
Lagan Valley Hospital	7	0.768
Ulster Hospital	47	1.040
South Eastern Health & Social Care Trust	55 (31)	0.853
Craigavon Area Hospital	21	0.577
Daisy Hill Hospital	2	0.113
Lurgan Hospital	3	0.412
Mullinure	1	0.394
South Tyrone Hospital	0	0.000
Southern Health & Social Care Trust*	27 (73)	0.404
Altnagelvin Area Hospital	16	0.425
Erne Hospital	5	0.359
Sperrin Ward (T&F)	0	0.000
Tyrone County Hospital	2	0.350
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000
Western Health & Social Care Trust	23 (28)	0.359
NI TOTAL	263 (271)	0.619
NI community TOTAL	88 (97)	-

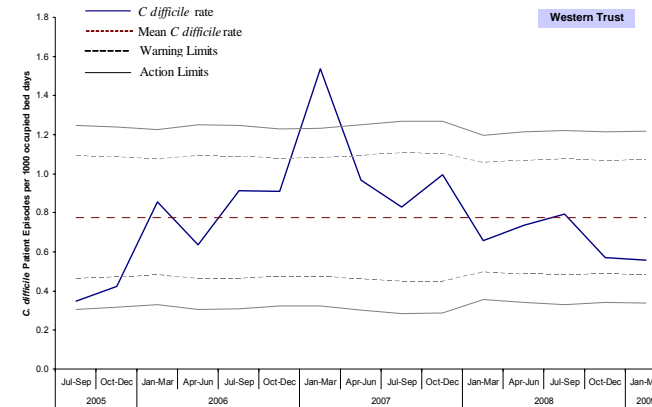
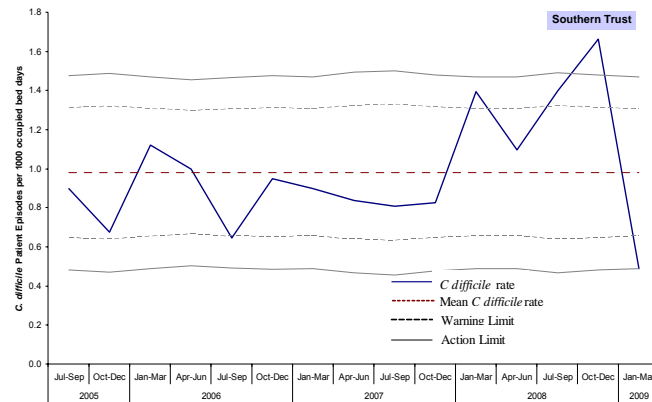
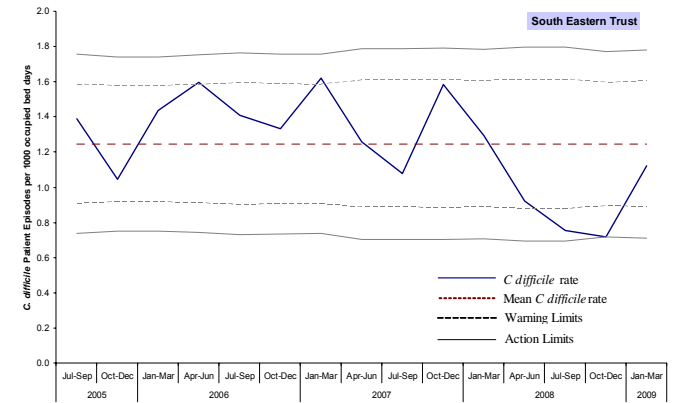
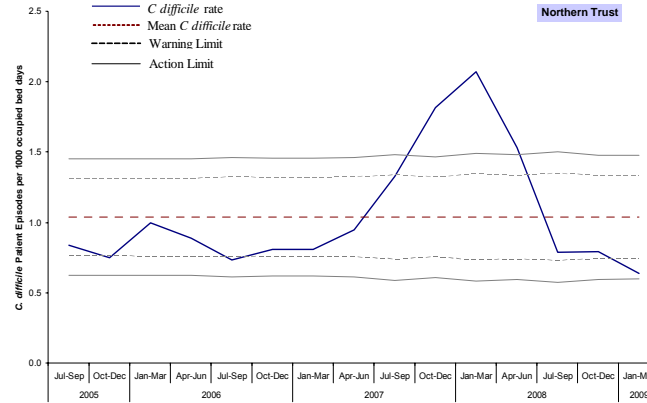
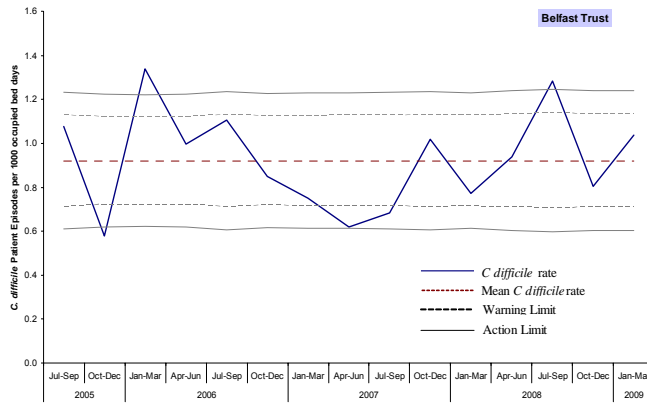
Appendix A

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

Hospital	Jan - Mar 09
	Episodes
Belfast City Hospital	11
Forster Green Hospital	0
Mater Infirmorum	2
Musgrave Park Hospital	1
NICCO (formerly at Belvoir Park)	3
Royal Victoria Hospital	13
Belfast Health & Social Care Trust	30 (28)
Antrim Area Hospital	6
Braid Valley Hospital	0
Causeway Hospital	5
Dalriada Hospital	0
Mid Ulster Hospital	0
Moyle Hospital	0
Robinson Memorial Hospital	0
Whiteabbey Hospital	1
Northern Health & Social Care Trust	12 (7)
Ards Hospital	0
Bangor Hospital	0
Downe Hospital	0
Lagan Valley Hospital	3
Ulster Hospital	8
South Eastern Health & Social Care Trust	11 (2)
Craigavon Area Hospital	8
Daisy Hill Hospital	1
Lurgan Hospital	0
Mullinure	0
South Tyrone Hospital	0
Southern Health & Social Care Trust	9 (14)
Altnagelvin Area Hospital	3
Erne Hospital	0
Sperrin Ward (T&F)	0
Tyrone County Hospital	0
Waterside Hospital (Wards 1, 2, 3, 5)	0
Western Health & Social Care Trust	3 (7)
NI TOTAL	65 (58)
NI community TOTAL	17 (15)

Appendix B

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



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

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	330
Northern	184	172	297	175
South Esatern	243	256	199	135
Southern	168	130	134	164
Western	96	132	109	96
Northern Ireland	1043	1026	1019	900