

# DEATHS REGISTERED IN NORTHERN IRELAND WITH CLOSTRIDIUM DIFFICILE MENTIONED ON THE DEATH CERTIFICATE (2001-2007)



9.30am – Thursday, 29 May 2008

## Introduction

1. There has been significant public interest regarding healthcare-associated infection (HCAI) in recent years and in particular the number of *Clostridium Difficile* and MRSA related deaths. This report looks at *Clostridium difficile*, and provides an update to mortality statistics published by the Northern Ireland Statistics and Research Agency (NISRA) in June 2007 on deaths registered in Northern Ireland where *Clostridium Difficile* was recorded on the death certificate.
2. Mandatory surveillance of *Clostridium difficile* associated diseases was introduced to Northern Ireland during 2005. Surveillance of patients aged 65 years and over is carried out by the Communicable Disease Surveillance Centre Northern Ireland (CDSCNI), which is part of the Health Protection Agency, and they publish quarterly figures on the number of episodes of *Clostridium difficile* in acute hospitals in Northern Ireland. This information can be obtained from the CDSC website<sup>1</sup>.
3. *Clostridium difficile* (so called because when it was first discovered it was difficult to grow in the laboratory) is a cause of diarrhoea. Although in most cases it causes a relatively mild illness, occasionally and particularly in elderly patients, it may result in serious illness and even death. Infection is often associated with, and triggered by, the use of antibiotics prescribed to treat or prevent other conditions.
4. Trends in mortality are normally monitored using the underlying cause of death (the disease which initiated the train of events leading directly to death). However *Clostridium difficile* is not always recorded as the underlying cause of death. Those who die with *Clostridium difficile* are usually patients who were already very ill and it is their existing illness, rather than *Clostridium difficile*, which is often designated as the underlying cause of death. There is therefore an interest in the number of deaths where *Clostridium difficile* contributed to the death – only conditions which contribute

<sup>1</sup> [www.cdscni.org.uk](http://www.cdscni.org.uk)

directly to the death should be recorded on the death certificate. Results presented in this report identify deaths where the underlying cause was *Clostridium difficile* and also where *Clostridium difficile* was not the underlying cause but was a contributory factor in the death. (Further information on *Clostridium difficile* is provided in Annex A).

5. It is not possible to identify directly from the International Classification of Diseases, Tenth Revision all deaths where *Clostridium difficile* contributed to the death. However deaths caused by “enterocolitis due to *Clostridium difficile*” infection, can be identified using the International Classification of Diseases, Tenth Revision, code A.04.7. Additional work is then done looking at the ICD codes that are related to *Clostridium difficile* and searching the cause of death text field on the death certificate for mentions of *Clostridium difficile*, *C.difficile* or pseudomembranous colitis. A detailed description of the method used to identify these deaths is given in Annex A.
6. For the period 2001 to 2007 the total number of deaths registered in Northern Ireland each year where *Clostridium difficile* was mentioned on the death certificate is given in the tables below. The report contains five tables:
  - Table 1: Number of deaths with *Clostridium difficile* mentioned and recorded as the underlying cause on the death certificate by registration year 2001-2007
  - Table 2: Age-standardised mortality rates for deaths with *Clostridium difficile* mentioned on the death certificate by sex, 2001 - 2007
  - Table 3: Number of deaths and age-specific mortality rates for deaths with *Clostridium difficile* mentioned on the death certificate by sex and age, 2007
  - Table 4: Number and percentage of deaths with *Clostridium difficile* mentioned on the death certificate by underlying cause of death (ICD), 2007
  - Table 5: Number of deaths with *Clostridium difficile* mentioned on the death certificate by place of death, 2001-2007

7. Also published today by NISRA is a report on the number of deaths registered in Northern Ireland with Methicillin Resistant *Staphylococcus Aureus* (MRSA) mentioned on the death certificate (1997-2007), which can be found on the NISRA website<sup>2</sup>.

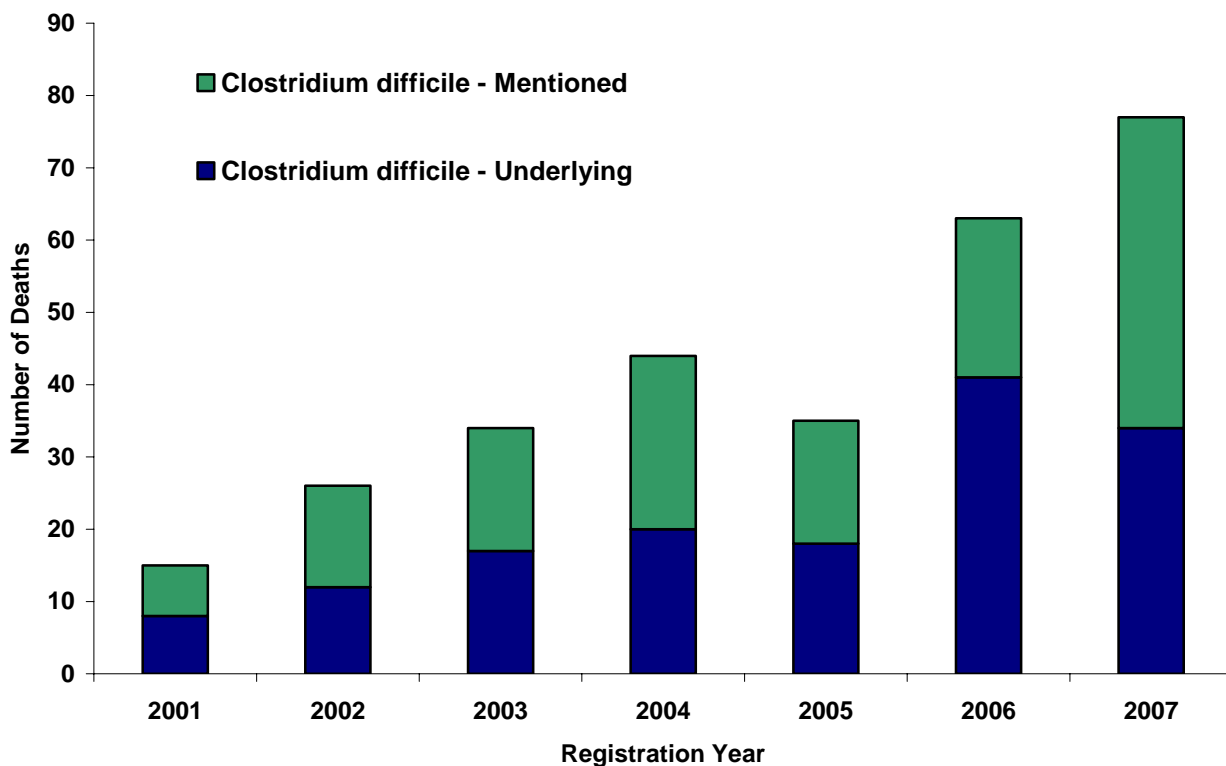
**Table 1: Number of deaths with *Clostridium difficile* mentioned and recorded as the underlying cause on the death certificate by registration year, 2001-2007**

Year	2001	2002	2003	2004	2005	2006	2007 <sup>P</sup>	Total (2001-2007) <sup>P</sup>
<b><i>Clostridium difficile</i> mentioned on the death certificate</b>	15	26	34	44	35	63	77	<b>294</b>
<b>Of which <i>Clostridium difficile</i> is the underlying cause of death</b>	8	12	17	20	18	41	34	<b>150</b>
<b>Underlying cause as a percentage of all mentions</b>	53%	46%	50%	45%	51%	65%	44%	<b>51%</b>

<sup>P</sup> Provisional data

<sup>2</sup> [http://www.nisra.gov.uk/archive/demography/publications/mrsa\\_papers/MRSA\\_2007.pdf](http://www.nisra.gov.uk/archive/demography/publications/mrsa_papers/MRSA_2007.pdf)

**Figure 1: Number of deaths with *Clostridium difficile* mentioned and recorded as the underlying cause on the death certificate by registration year, 2001-2007**



8. Table 1 and Figure 1 shows that the number of deaths with *Clostridium difficile* recorded on the death certificate has generally increased year on year over the period 2001 to 2007, with the exception of 2005 when there was a small decrease in the number of mentions. Despite the increase of the number of deaths with *Clostridium difficile* recorded on the death certificate, between 2006 and 2007 from 63 to 77 deaths, the number of deaths with *Clostridium difficile* recorded as the underlying cause of death has fallen from 41 deaths in 2006 to 34 in 2007.

9. Between 2001 and 2007, *Clostridium difficile* was mentioned on 294 death certificates and 150 (51%) of those deaths had *Clostridium difficile* recorded as the underlying cause. In the period 2001-2007, there were 101,320 deaths registered and thus deaths with *Clostridium difficile* mentioned make up only 0.29% of all deaths.

**Table 2: Age-standardised mortality rates, per 1,000,000 population, for deaths with *Clostridium difficile* mentioned on the death certificate by sex, 2001 – 2007**

Registration Year	Age-standardised mortality rate for deaths with <i>Clostridium difficile</i> mentioned		
	Male	Female	Person
2001	4.7	6.5	6.4
2002	8.6	12.0	11.0
2003	13.8	14.1	13.9
2004	15.4	20.6	18.8
2005	15.4	13.6	14.5
2006	20.5	26.4	24.3
2007 <sup>P</sup>	20.1	33.9	28.7

<sup>P</sup> Provisional data

\* Rate per million population, standardised using European standard population

10. Table 2 shows that generally age-standardised mortality rates for those deaths with *Clostridium difficile* mentioned on the death certificate were highest for females. Rates for deaths with *Clostridium difficile* among both males and females both increased by 4 and 5 times respectively between 2001 and 2007.

**Table 3: Number of deaths and age-specific mortality rates, per 1,000,000 population, for deaths with *Clostridium difficile* mentioned on the death certificate by sex and age, 2007<sup>P</sup>**

Age-group	Deaths with <i>Clostridium difficile</i> mentioned 2007 <sup>P</sup>					
	Number			Age Specific Mortality Rate*		
	Male	Female	All Persons	Male	Female	All Persons
Under 45	-	-	-	-	-	-
45-74	3	7	10	11.4	25.1	18.4
75+	17	50	67	407.2	714.7	599.8
<b>All ages</b>	<b>20</b>	<b>57</b>	<b>77</b>	<b>23.2</b>	<b>63.5</b>	<b>43.7</b>

<sup>P</sup> Provisional data

\* Rate per million population

11. Table 3 shows that the majority of deaths with *Clostridium Difficile* mentioned on the death certificate relate to the elderly. In 2007, of the 77 deaths recorded which included a mention of *Clostridium difficile*, 87% related to those aged 75 years or older. This compares to 62% of deaths due to all causes relating to those aged 75 years or older.

12. Age-specific rates for deaths with *Clostridium difficile* mentioned on the death certificate in 2007 show there have been almost 600 deaths per million people in the 75 and over group compared with 18 deaths per million people in the 45 to 74 age group. There were no deaths with *Clostridium difficile* recorded on the death certificate to those aged under 45 at the time of death.

**Table 4: Number and percentage of deaths with *Clostridium difficile* mentioned on the death certificate by underlying cause of death (ICD), 2007<sup>P</sup>**

Underlying Cause of Death (ICD)	ICD10 code	Deaths with <i>Clostridium difficile</i> mentioned 2007 <sup>P</sup>	
		Number	Percentage of all causes
Infectious & Parasitic Diseases	A00-B99	37	48%
Neoplasms	C00-D48	4	5%
Mental and Behavioural Disorders	F00-F99	2	3%
Diseases of Nervous System And Sense Organs	G00-H95	5	6%
Diseases of the Circulatory System	I00-I99	11	14%
Diseases of the Respiratory System	J00-J99	8	10%
Diseases of the Digestive System	K00-K93	4	5%
Diseases of the Genitourinary System	N00-N99	3	4%
External causes of mortality	V01-Y98	3	4%
<b>All Causes of Death</b>		<b>77</b>	<b>100%</b>

<sup>P</sup> Provisional data

13. Patients who die with *Clostridium difficile* are often already seriously ill with another condition. Table 4 shows that where *Clostridium difficile* is mentioned on a death certificate, the most likely underlying cause of death is either Infectious & Parasitic Diseases (48%) or Diseases of the Circulatory System (14%). All deaths that have *Clostridium difficile* recorded as the underlying cause of death are coded to Infectious & Parasitic Diseases.

**Table 5: Number of deaths with *Clostridium difficile* mentioned on the death certificate by place of death, 2001-2007<sup>P</sup>**

Place of Death	Registration Year							2001 to 2007 <sup>P</sup>		
	2001	2002	2003	2004	2005	2006	2007 <sup>P</sup>	C. Difficile related deaths	All deaths	C. Difficile deaths as a percentage of all deaths
Altnagelvin Area Hospital	-	1	2	2	-	6	3	14	3,752	0.4%
Antrim Area Hospital	-	3	2	-	-	5	18	28	4,384	0.6%
Ards Community Hospital	-	-	-	-	-	1	-	1	129	0.8%
Belfast City Hospital	1	3	4	8	3	8	8	35	6,215	0.6%
Braid Valley Hospital	-	-	1	-	3	-	3	7	533	1.3%
Causeway Hospital	-	1	1	-	4	2	2	10	1,812	0.6%
Craigavon Area Hospital	2	1	2	9	4	4	6	28	4,679	0.6%
Daisy Hill Hospital	1	-	1	2	-	-	1	5	2,269	0.2%
Downe Hospital	1	1	1	1	1	-	-	5	1,112	0.4%
Erne Hospital	1	1	2	1	-	3	1	9	1,868	0.5%
Lagan Valley Hospital	-	2	3	4	2	1	1	13	2,042	0.6%
Lurgan Hospital	-	-	2	3	2	2	-	9	400	2.3%
Mater Infirmorum Hospital	-	1	3	-	-	2	1	7	2,783	0.3%
Mid-Ulster Hospital	2	-	2	-	1	2	1	8	1,358	0.6%
Mullinure Hospital	-	-	1	-	-	-	-	1	144	0.7%
Musgrave Park Hospital	-	-	1	1	1	1	-	4	291	1.4%
Robinson Memorial Hospital	1	-	-	-	1	-	2	4	487	0.8%
Royal Group of Hospitals	-	7	2	7	2	1	5	24	6,169	0.4%
St Lukes Hospital	-	-	-	-	-	2	-	2	82	2.4%
Tyrone County Hospital	2	-	2	-	2	1	-	7	1,311	0.5%
Ulster Hospital	2	3	1	4	7	11	13	41	6,596	0.6%
Whiteabbey Hospital	1	-	-	2	1	2	6	12	1,713	0.7%
All Other Hospitals*	-	-	-	-	-	-	-	-	2,407	-
Nursing Home	1	1	-	-	1	6	4	13	16,350	0.1%
All Other Places**	-	1	1	-	-	3	2	7	32,434	0.0%
<b>All places</b>	<b>15</b>	<b>26</b>	<b>34</b>	<b>44</b>	<b>35</b>	<b>63</b>	<b>77</b>	<b>294</b>	<b>101,320</b>	<b>0.3%</b>

<sup>P</sup> Provisional data

\*All Other hospitals are hospitals in which deaths occurred but none relating to *Clostridium difficile*

\*\*Other place of death include those deaths which occurred at home

14. In 2007, more than half of all deaths registered in Northern Ireland occurred in a hospital (51%); in contrast 92% of deaths with *Clostridium difficile* mentioned on the death certificate between 2001 and 2007 occurred in a hospital. The place of death is not necessarily the place where an infection occurred - in a small number of cases the doctor registering the death has explicitly indicated that the *Clostridium difficile* was acquired in the Community and not in the Hospital.

15. Figures may differ from hospital to hospital for a variety of reasons such as the number of beds occupied in each hospital, the number of patients in intensive care and high dependency units and the age profile of patients.

## Further Information

16. Further information on the statistics provided in this publication can be obtained from:

NISRA Customer Services

McAuley House

2-14 Castle Street

BELFAST

BT1 1SA

Phone: 02890 348160

Faxsimile: 02890 348161

E-mail: [census.nisra@dfpni.gov.uk](mailto:census.nisra@dfpni.gov.uk)

## Annex A

1. *Clostridium difficile* is predominantly seen in patients who have been treated with broad spectrum antibiotics for other infections. The overuse of antibiotics may alter the normal intestinal balance of micro-organisms and increase the risk of developing *Clostridium difficile* thus leading to diarrhoea, etc. Those at highest risk of severe infection and death are the very elderly, those who had stomach or bowel surgery and/or long stays in healthcare settings.
2. The infection can spread from person to person because those suffering from *Clostridium difficile* associated disease shed spores in their faeces. Spores can survive for a very long time in the environment and can be transported on the hands of health care personnel who have direct contact with infected patients or with environmental surfaces (floors, bedpans, toilets etc) contaminated with *Clostridium difficile*.
3. Routine death statistics are usually based on a single cause for each death. This is the underlying cause of death, defined by the World Health Organisation as:
  - the disease which initiated the train of events leading to death; or
  - the circumstances of the accident/violence which produced a fatal injury.
4. Since 2001, in line with the rest of the UK, the Tenth Revision of the International Statistical Classification of Diseases, Injuries and Causes of Death (ICD10) is used to classify cause of death in Northern Ireland. The Tenth Revision of the International Classification of Diseases (ICD-10) does not include a specific code for *Clostridium difficile*.
5. *Clostridium difficile* causes a range of clinical illness with enterocolitis being its most common manifestation. The ICD10 code used for “enterocolitis due to clostridium difficile” is A04.7. In the period 1979 to 2000 the ninth revision of the International Statistical Classification of Diseases, Injuries and Causes of Death (ICD9) was used to classify cause of death. There is no ICD9 code for “enterocolitis due to clostridium difficile”. In the late 1970s *Clostridium difficile* was also identified to be the cause of pseudomembranous colitis. Pseudomembranous colitis is a complication of antibiotic therapy often caused by *Clostridium difficile* infection which causes severe inflammation in areas of the colon.

6. For causes other than enterocolitis that are also known to be associated with *Clostridium difficile*, it is not possible to identify from ICD codes alone the number of deaths where *Clostridium difficile* actually contributed to the death. However it has been possible to identify a small number of additional deaths in which *Clostridium difficile* was mentioned on the death certificate but not coded as A.04.7 by examining, both electronically and manually, the cause of death written by the doctor on the death certificate. To assist this process research has been undertaken in England and Wales to identify which ICD codes are related to *Clostridium difficile*<sup>3</sup>. The text of these records was then searched manually for mentions of *Clostridium difficile*, *C.difficile* or pseudomembranous colitis. This information has been used in the analysis undertaken for this paper.
7. Prior to 2006 pseudomembranous colitis was coded as K.52.9 (Noninfective gastroenteritis and colitis, unspecified altered) and therefore not picked up in the searches. Since 2006 pseudomembranous colitis has been coded to A.04.7 (Enterocolitis due to *Clostridium difficile*) and is now being picked up. To make historical data consistent with the latest data the previous year's figures have been revisited to include any mentions of pseudomembranous colitis between 2001 and 2005 and as a result figures may vary from those previously published in the June 2006 paper.
8. Codes used to identify deaths where *Clostridium difficile* was the underlying cause of death (on deaths where *Clostridium difficile* was mentioned) were A.04.7, A.09, A.41.4 and A.49.8.
9. NISRA now produce quarterly figures on *Clostridium difficile* deaths in the Registrar General Quarterly reports<sup>4</sup> and provide information to the Health Trusts on a weekly basis to help with better monitoring of deaths from healthcare-associated infections.
10. The Office for National Statistics (ONS) publish annual figures for *Clostridium difficile* deaths for England and Wales in their Health Statistics Quarterly publication<sup>3</sup>.

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<sup>3</sup> "Deaths involving *Clostridium difficile*: England and Wales, 1999-2006". Health Statistics Quarterly 33, p52-56. Available at [http://www.statistics.gov.uk/downloads/theme\\_health/HSQ37.pdf](http://www.statistics.gov.uk/downloads/theme_health/HSQ37.pdf)

<sup>4</sup> The latest Registrar General Quarterly Report is available at: [http://www.nisra.gov.uk/archive/demography/publications/qtr\\_report/qtr4\\_2007.pdf](http://www.nisra.gov.uk/archive/demography/publications/qtr_report/qtr4_2007.pdf)

11. Different hospitals, and doctors, have different procedures for death certification therefore some hospitals may be more likely to record *Clostridium difficile* than others. In addition, some hospitals may undertake more comprehensive screening for *Clostridium difficile* on a regular basis and so it is more likely that infections are reported on death certificates for patients in these hospitals. This means figures may not be entirely comparable between hospitals.
  
12. Hospitals and nursing homes can deal with different types of patients. It would be expected that higher numbers of *Clostridium difficile* cases would be apparent in establishments which treat those who are seriously ill or the elderly.
  
13. NISRA does not have any direct measure of the number of patients at risk, for example, data on the numbers of patients treated, or the total number of in-patient days, in each hospital. We have reported the number of deaths where *Clostridium difficile* was mentioned on the death certificate as a proportion of the total number of registered deaths that occurred in each hospital. Higher numbers of deaths would be expected in larger hospitals.