
## Introduction

June 2010

*Each hospital licensed by the Tennessee Department of Health, by law (Tennessee Code Annotated, Section 68-1-108), quarterly reports selected information on each inpatient discharged during the period. This data is included in the Tennessee Hospital Discharge Data System (HDDS). The annual number of reported inpatient records is approximately 900,000.*

The increase in drug resistant disease strains, such as extensive drug-resistant tuberculosis or methicillin-resistant staphyloccus aureus (MRSA), has received considerable attention in the mass media. Another problematic interaction between antibiotics and infectious disease is now occurring, but this problem has received less attention. This occurs when the antibiotic treatment for a harmful bacteria kills off other harmless bacteria. When these harmless bacteria are inhibiting the growth of a second harmful bacteria, this allows that second bacteria to become a danger.

One example of this is the development of an infection of Clostridium difficile (C-diff), after antibiotic treatment. C-diff is found in soil and is very common in the intestines of infants and young children. It is generally less common in adults where other intestinal bacteria keep it in check. In situations where antibiotic use is common, such as in hospitals, C-diff can become a problem in persons of any age.

Once C-diff is present in an environment it can be difficult to eradicate. It produces spores that are resistant to most disinfectants. Those containing bleach are generally more effective at destroying the spores than standard disinfectants. Also, many newer strains of C-diff have developed that are resistant to many antibiotics.

Examination of inpatient data from the Tennessee Hospital Discharge Data System indicates a considerable increase in C-diff diagnoses. From 1997 until 1999, the number of diagnosed cases of C-diff for inpatients was fairly stable (2,043 in 1997 and 2,031 in 1998). Since then, the number of cases has risen steadily from 2,059 in 1999 to 6,126 in 2008.

Table 1 gives the increase in diagnoses of C-diff from 1999 through 2008. Those listed as principal diagnoses are cases where C-diff is the most important condition faced by the patient. Those listed as other diagnoses are cases where a problem with C-diff is in addition to some other condition diagnosed as principal.

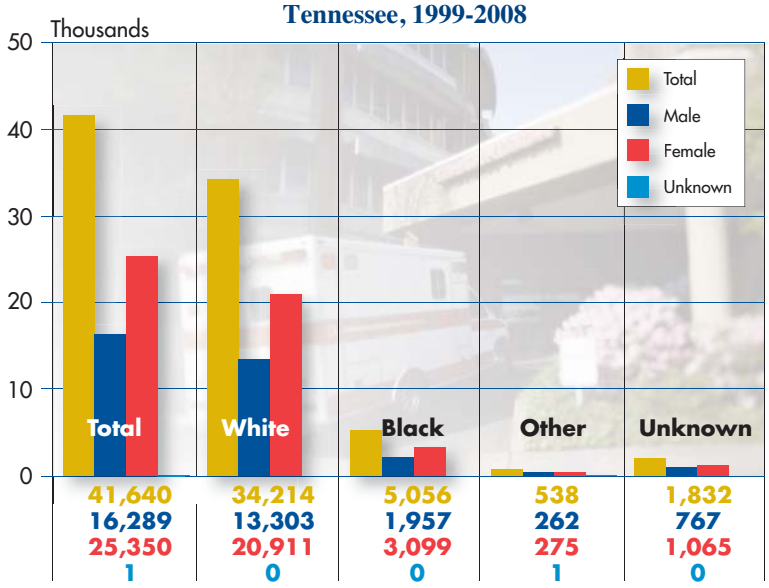
**Table 1. CLOSTRIDIUM DIFFICILE INPATIENT CASES BY PRINCIPAL AND OTHER DIAGNOSES TENNESSEE, 1999-2008**

| | Diagnosis | | |
|---|---|---|---|
| **Year** | **Principal** | **Other** | **Total** |
| 1999 | 580 | 1,479 | 2,059 |
| 2000 | 659 | 1,793 | 2,452 |
| 2001 | 785 | 1,984 | 2,769 |
| 2002 | 898 | 2,534 | 3,432 |
| 2003 | 972 | 2,495 | 3,467 |
| 2004 | 1,246 | 3,062 | 4,308 |
| 2005 | 1,535 | 3,831 | 5,366 |
| 2006 | 1,813 | 3,917 | 5,730 |
| 2007 | 2,134 | 3,797 | 5,931 |
| 2008 | 2,244 | 3,882 | 6,126 |
| **Total** | **12,866** | **28,774** | **41,640** |

Source: Tennessee Hospital Discharge Inpatient Data

Figure 2 gives a frequency of C-diff as either a principal or other diagnosis from 1999-2008 by race and gender. Nearly 61 percent of the total number of cases were diagnosed in females.

**Figure 2. Number of Inpatient Cases with Clostridium Difficile as a Principal or Other Diagnosis By Race and Gender, Tennessee, 1999-2008**




Source: Tennessee Hospital Discharge Inpatient Data

**Table 3. Clostridium Difficile Inpatient Cases By Age Group and Gender, Tennessee, 1999-2008**

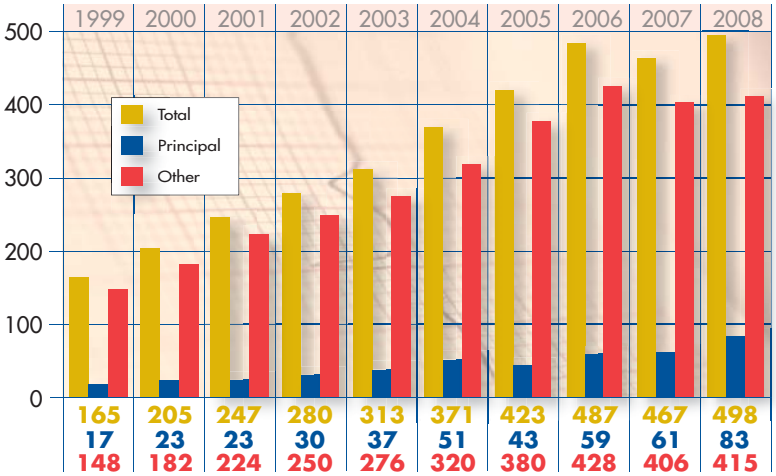
| | Gender | | | |
|---|---|---|---|---|
| **Age** | **Male** | **Female** | **Unknown** | **Total** |
| 0-9 | 807 | 604 | - | 1,411 |
| 10-19 | 353 | 278 | - | 631 |
| 20-29 | 388 | 587 | 1 | 976 |
| 30-39 | 668 | 989 | - | 1,657 |
| 40-49 | 1,277 | 1,763 | - | 3,040 |
| 50-59 | 2,088 | 2,706 | - | 4,794 |
| 60-69 | 3,053 | 4,012 | - | 7,065 |
| 70-79 | 4,054 | 6,356 | - | 10,410 |
| 80-89 | 3,011 | 6,411 | - | 9,422 |
| 90-99 | 577 | 1,611 | - | 2,188 |
| 100+ | 12 | 31 | - | 43 |
| Unknown | 1 | 2 | - | 3 |
| **Total** | **16,289** | **25,350** | **1** | **41,640** |

Source: Tennessee Hospital Discharge Inpatient Data

Table 3 shows the frequency of C-diff as a principal or other diagnosis from 1999-2008 by gender and age. The higher frequency of C-diff in females over males occurs over all age groups except the two youngest groups of 0-9 and 10-19.

Figure 4 shows the deaths of persons diagnosed with C-diff from 1999-2008. Over the 10-year period, there were 3,456 inpatient deaths with 427 having C-diff as the principal diagnosis and 3,029 deaths for which C-diff was not the principal diagnosis. These are all deaths that occurred in the hospitalizations shown in Table 1. These were all cases with a patient status of "deceased". However, these patients would not necessarily have died of C-diff; the underlying cause of death could have been from some other condition, particularly among those for which C-diff was not the principal diagnosis.

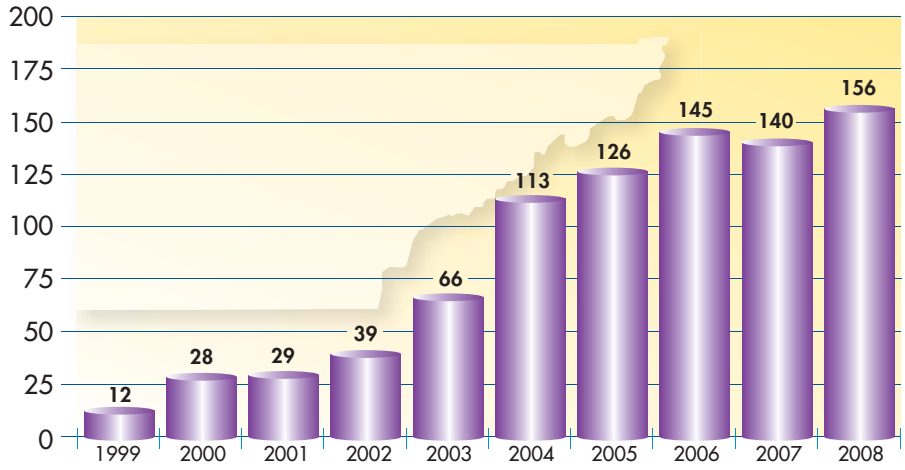
**Figure 4. Inpatient Deaths Involving Clostridium Difficile By Principal and Other Diagnoses By Year of Discharge, Tennessee, 1999-2008**




Source: Tennessee Hospital Discharge Inpatient Data

An alternate source of information on deaths is from death certificate data compiled by Tennessee's Office of Vital Records. Figure 5 gives the number of recorded deaths by year with an underlying cause of C-diff. Since the data in Figures 4 and 5 are from two independent sources, the deaths do not match on a case by case basis. However, it would appear that most of the deaths diagnosed with a principal diagnosis of C-diff in the HDDS data would also be found with a diagnosis of C-diff in the death certificate data. The greater number in the death certificate data would appear to be those where the principal cause of hospitalization was some other cause, but the underlying cause of death was from C-diff. Also, a few cases in the death certificate data may be for deaths outside the hospital setting.

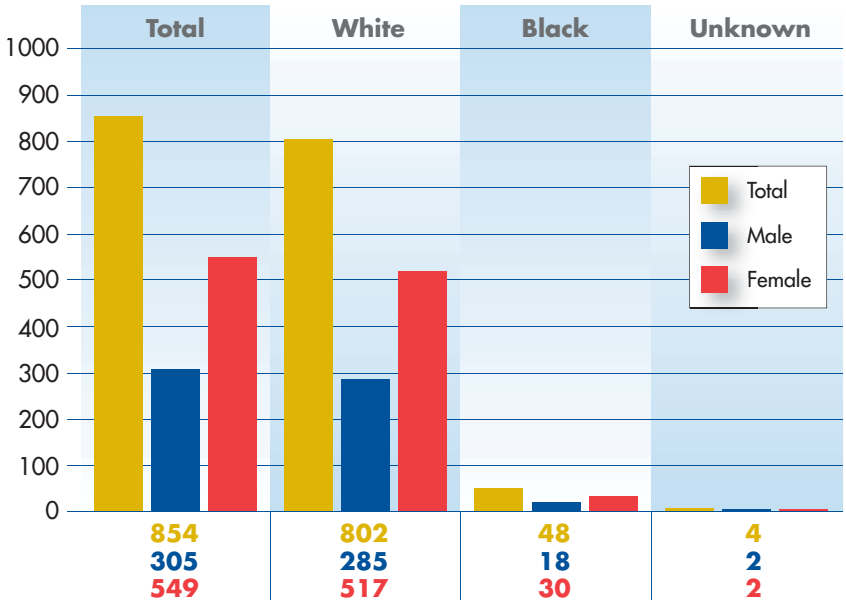
**Figure 5. Recorded Deaths from Clostridium Difficile By Year, Tennessee, 1999-2008**




Source: Tennessee Death Certificate Data

Figure 6 and Table 7 give information comparable to Figure 2 and Table 3 but are based on deaths from death certificate data rather than hospitalizations. Deaths from C-diff among females are about 64 percent of the total. This parallels the higher female incidences (61 percent) shown in Figure 2 and Table 3.

**Figure 6. Recorded Deaths from Clostridium Difficile By Race and Gender, Tennessee, 1999-2008**




Source: Tennessee Death Certificate Data

In summary, an examination of both hospital discharge and death certificate data shows a steady increase in Clostridium difficile. It is a problem of considerable magnitude now, and if current trends continue, will become a significantly greater one in the future.

**Table 7. Recorded Deaths From Clostridium Difficile By Age Group and Gender, Tennessee, 1999-2008**

| | Gender | | |
|---|---|---|---|
| **Age** | **Male** | **Female** | **Total** |
| 0-9 | - | - | - |
| 10-19 | - | - | - |
| 20-29 | - | 2 | 2 |
| 30-39 | 3 | 3 | 6 |
| 40-49 | 1 | 2 | 3 |
| 50-59 | 13 | 15 | 28 |
| 60-69 | 29 | 50 | 79 |
| 70-79 | 105 | 135 | 240 |
| 80-89 | 118 | 230 | 348 |
| 90-99 | 35 | 111 | 146 |
| 100+ | 1 | 1 | 2 |
| **Total** | **305** | **549** | **854** |

Source: Tennessee death certificate data

Please visit the **Division of Health Statistics** pages on the Tennessee Department of Health Web site by selecting Statistics and Reports at: tennessee.gov/health

Tennessee Department of Health, Web site only (06-10)

*Clostridium Difficile Infections in Tennessee 1999-2008*
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