

## ***Clostridium difficile* in Illinois Hospitals**

This section presents information about *C. difficile* from the Illinois Hospital Discharge Dataset for 1999-2008, with emphasis on 2008. The primary utility of the Hospital Discharge Dataset is to follow overall trends in the burden of *C. difficile* in Illinois hospitals.

The data presented in this section should be interpreted with caution. Hospital discharge data are collected for billing, rather than disease surveillance. A 2007 study in an Illinois hospital found that only 31% of confirmed Methicillin-resistant *Staphylococcus aureus* cases were identified using the first nine diagnosis codes from the Hospital Discharge Dataset (Schaefer, SHEA Annual Scientific Meeting, 2008). However, administrative coding may be more accurate for estimating *C. difficile* rates; one study found the sensitivity to be 78% (Dubberke, Emerging Infectious Diseases, 2006). Through 2007, only nine diagnosis codes, out of up to 25 collected codes, were available to the Illinois Department of Public Health (IDPH).

The ICD-9 diagnosis code 008.45, appearing anywhere in the list of discharge diagnoses, was used to select cases for this study.

### ***C. difficile* Trends, 1999-2008**

The data presented in this section include the first nine diagnosis codes listed for each discharge. Rates are calculated by dividing the number of *C. difficile* cases in a given year by the total number of discharges for that year.

Table 1 shows *C. difficile* infections per 1,000 discharges in Illinois for the years 1999-2008. Overall, *C. difficile* rates among patients at Illinois hospitals during this time period increased from 4.5 per 1,000 discharges to 9.6 per 1,000 discharges. During 2008, the last year for which data are available for Illinois, there were 16,260 *C. difficile* infections among 1,699,853 discharges; approximately 1% of all hospital discharges had diagnosis codes indicating *C. difficile* infection.

Table 1. Number of *C. difficile* Infections per 1,000 hospital discharges, 1999-2008

<b>Year</b>	<b>Total number of <i>C. difficile</i> discharges</b>	<b>Total number of discharges</b>	<b>Number of <i>C. difficile</i> discharges per 1,000 discharges</b>
<b>1999</b>	7082	1,581,086	4.5
<b>2000</b>	7586	1,636,046	4.6
<b>2001</b>	8204	1,684,089	4.9
<b>2002</b>	10,309	1,685,051	6.1
<b>2003</b>	11,053	1,677,125	6.6

<b>2004</b>	14,066	1,710,389	8.2
<b>2005</b>	15,570	1,725,033	9.0
<b>2006</b>	15,359	1,724,612	8.9
<b>2007</b>	15,412	1,713,279	9.0
<b>2008</b>	16,260	1,699,853	9.6

Figure 1. Number of *C. difficile* Infections per 1,000 hospital discharges, 1999-2008

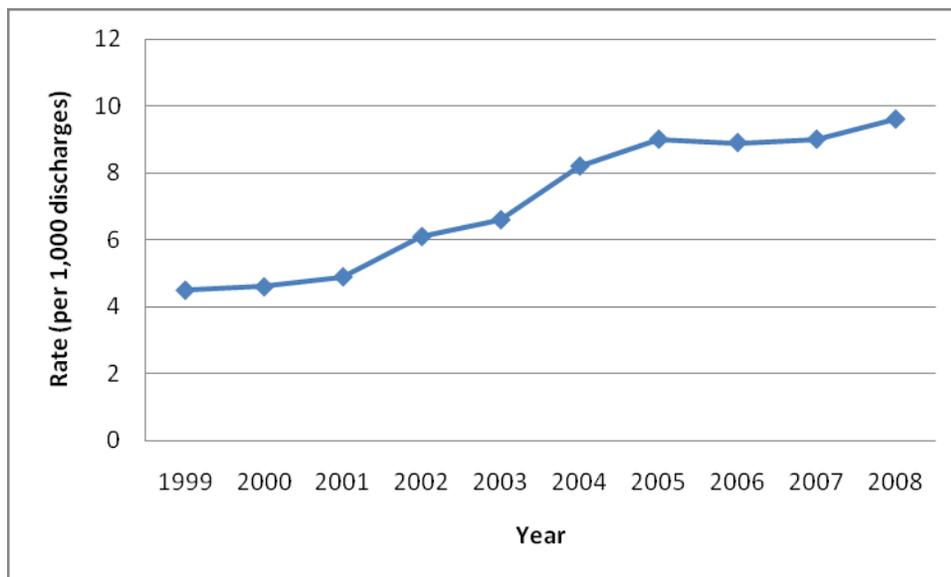


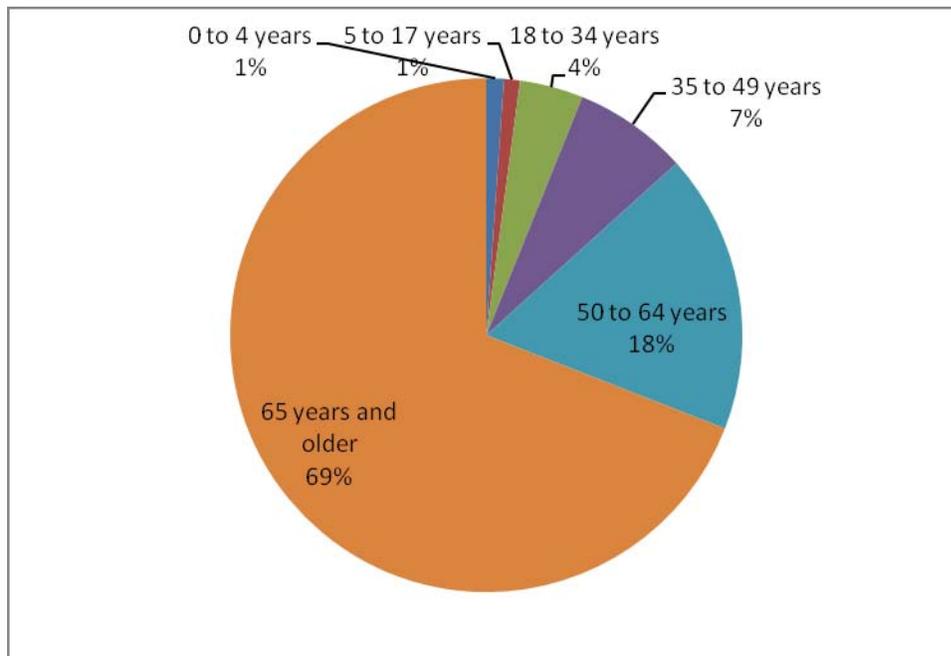
Table 2 shows the number (N) of *C. difficile* infections stratified by age group for the years 2004-2008. The number of *C. difficile* infections increased in each age group during this time period. School aged children (5-17) had the lowest burden of *C. difficile* infections among hospitalized patients, and the greatest burden of *C. difficile* infections occurred among older individuals, especially those over 65. Throughout 2004-2008, approximately 70% of all *C. difficile* infections occurred among individuals aged 65 and older.

Table 2. Age distribution of *C. difficile* infections among hospitalized patients, 2004-2008

Age range (years)	2004	2005	2006	2007	2008
	N (%)				
0-4	174 (1.2)	143 (0.9)	176 (1.1)	188 (1.2)	180 (1.1)
5-17	105 (0.7)	107 (0.7)	109 (0.7)	126 (0.8)	168 (1.0)

18-34	592 (4.2)	627 (4.0)	596 (3.9)	564 (3.7)	657 (4.0)
35-49	1,123 (8.0)	1,211 (7.8)	1,202 (7.8)	1,198 (7.8)	1,178 (7.2)
50-64	2,147 (15.3)	2,521 (16.2)	2,490 (16.2)	2,723 (17.7)	2,862 (17.6)
65 and older	9,925 (70.6)	10,961 (70.4)	10,786 (70.2)	10,613 (68.9)	11,215 (69.0)

Figure 2. Age distribution of *C. difficile* infections among hospitalized patients, 2008



The sex distribution of *C. difficile* cases remained relatively stable during this period (2004-2008), with females accounting for 57-60% of *C. difficile* discharges.

Table 3. Sex distribution of *C. difficile* infections among hospitalized patients, 2004-2008

Sex	2004	2005	2006	2007	2008
Male	5,705 (40.6)	6,419 (41.2)	6,513 (42.4)	6,377 (41.4)	6,853 (42.1)
Female	8,361 (59.4)	9,151 (58.8)	8,846 (57.6)	9,035 (58.6)	9,407 (57.9)

1. For a detailed report of *C. difficile* rates in specific populations for 2004-2007, click here [http://www.idph.state.il.us/patientsafety/c-diff\\_rpt.pdf](http://www.idph.state.il.us/patientsafety/c-diff_rpt.pdf).

### ***C. difficile* in Illinois Hospitals, 2008**

Beginning in 2008, 25 diagnosis codes were available to IDPH for each discharge. Using all 25 codes, 17,369 discharges with a *C. difficile* diagnosis code occurred in 2008, or 10.2 *C. difficile* cases per 1,000 discharges.

Also beginning in 2008, a code was included with each diagnosis to indicate whether the condition was present on admission to the hospital. This code, along with the source of the admission (i.e. emergency department, non-healthcare facility, skilled nursing facility) and the dates of previous hospital admissions, can inform estimates of the proportions of *C. difficile* infections in hospitalized patients that are acquired in healthcare settings.

Table 4 uses the information described above to estimate the proportions of *C. difficile* infections acquired in different settings.

Table 4. Present on admission status and recent healthcare exposures for *C. difficile* cases, 2008

<b>Present on admission and healthcare exposures</b>	<b>Frequency</b>	<b>Percent</b>
Infection not present on admission	4,153	23.9
Infection present on admission, with recent healthcare exposure documented in discharge data*	3,424	19.7
Infection present on admission, with no recent healthcare exposure documented in discharge data	9,651	55.6
Unavailable	141	0.8
Total	17,369	100.0

\* A patient is considered to have had recent healthcare exposure if a previous admission is documented in the four weeks before the current admission or if the patient was admitted from a different hospital, a skilled nursing or intermediate care facility, a healthcare facility, an ambulatory surgery center, or hospice, or if the source of admission is same facility, separate claim.

### **Conclusions**

This report summarizes trends in *C. difficile* in Illinois hospitals from 1999-2008. The burden of *C. difficile* in Illinois hospitals is significant, and the number of cases has more than doubled since 1999.

These data are not without limitations and caution is advised in their interpretation. Due to hospital discharge dataset coding modifications implemented in 2008, the 2008 *C. difficile* discharge data were analyzed using two approaches. In order to compare 2008 *C. difficile* discharge rates with those from 1999-2007, the rates were calculated based on the first nine discharge diagnosis codes. However, when the *C. difficile* rate for 2008 was calculated using 25 discharge diagnoses codes, the rate was, as might be expected, greater in large part due to the increased pool of discharge diagnoses codes. Future trend analyses will have to account for this shift in coding practices to make valid temporal comparisons.

To have a better understanding of the burden of *C. difficile* in Illinois hospitals, it is necessary to distinguish between healthcare-facility onset and community-onset cases. Historically, discharge data have not been able to discern where a disease or condition was acquired. Beginning in 2008, hospitals were required to include a present on admission (POA) code with each diagnostic code. The mandated use of this code, which indicates whether each diagnosis occurred before or after hospital admission, was part of the Centers for Medicare and Medicaid Services' (CMS) Hospital-Acquired Conditions Initiative, in which CMS would no longer pay hospitals extra when patients developed specified complications after admission.

Because the implementation of the POA code was part of a quality improvement strategy explicitly linking payment with healthcare outcomes, its use in epidemiological studies has not been explored. No published studies have evaluated the validity of the POA variable in hospital discharge data with respect to healthcare-associated infections such as *C. difficile* and MRSA.

Initial analysis of the *C. difficile* infection data for 2008, using the Illinois Hospital Discharge Dataset, revealed trends in POA coding that bring into question the accuracy and usefulness of this variable in differentiating between community-acquired infections and hospital-acquired infections. Attempts were made to refine the POA status using a coding algorithm that incorporated elements from the discharge dataset that identified the source of admission (i.e. emergency department, non-healthcare facility, skilled nursing facility) and the dates of previous hospital admissions, which can serve as a proxy for recent healthcare exposure. This index is not without its limitations. Possible sources of error could be the inaccurate coding of the POA variable and/or the inaccurate or incomplete coding of the date of previous admission, which would underestimate the percentage of discharges having had an admission within the past 28 days. Also, the source of the majority of admissions was the emergency room; it is not known whether these patients were residents of long-term care facilities prior to their emergency room visits.

Reliance on administrative databases, such as the Illinois Hospital Discharge Dataset, to assess trends in healthcare-associated infections, detect outbreaks, and provide inter-facility comparisons is not ideal. Further study will be required to validate the POA coding. A personal healthcare identification number would facilitate linkage of medical records over time and across facilities – both acute and long-term care. This would help identify previous healthcare exposures and track infections.

A hospital-based infection surveillance program, such as the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN), which is currently being used to track central line-associated bloodstream infections in intensive care units in all hospitals in Illinois, would provide more useful data on healthcare-associated infections. NHSN has the capacity to monitor *C. difficile* rates using laboratory data.

