Emerging Infections Program
Healthcare-Associated Infections–Community Interface Report
Clostridioides difficile infection, 2019

Surveillance Catchment Areas

California (1 county San Francisco area), Colorado (5 county Denver area); Connecticut (1 county New Haven area); Georgia (8 county Atlanta area); Maryland (9 eastern shore and 2 western counties); Minnesota (5 counties); New Mexico (1 county Albuquerque area); New York (1 county Rochester area); Oregon (1 rural county); and Tennessee (1 county Nashville area).

Population

The surveillance area represents 12,058,331 persons.
Source: U.S. Census Bureau, Population Division, Vintage 2019 Special Tabulation.

Case Definition

An incident case of *Clostridioides difficile* infection (CDI) was defined as a *C. difficile*-positive stool test (toxin or molecular assay) from a person ≥1 year old with no positive test in the prior 8 weeks.

Methods

Case finding was active, laboratory-based, and population-based. Laboratories serving the surveillance catchment areas reported all positive *C. difficile* tests to EIP staff and were routinely audited to ensure complete case ascertainment.

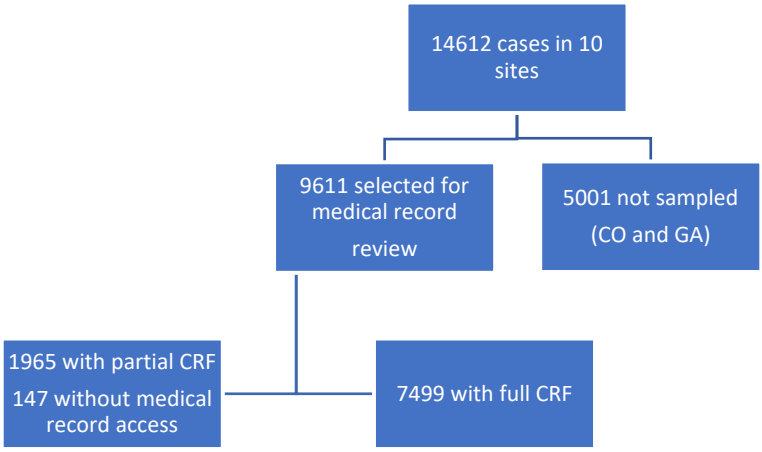
An initial chart review was performed on all CDI cases in eight EIP sites and on all pediatric cases and a 1/3 random sample of cases age 18 years and older in the two remaining EIP sites with the largest surveillance catchment areas (CO and GA). A subsequent comprehensive chart review was performed on all community-associated cases and a subset of healthcare facility onset cases.

A standardized case report form (CRF) was completed for each incident case through review of medical records. Inpatient and outpatient medical records were reviewed for information on patient demographics, clinical syndrome, outcome of illness, and relevant healthcare exposures.

A convenience sample of stool specimens or swabs was sent to reference laboratories for *C. difficile* isolation. Recovered isolates were sent to CDC for molecular typing and characterization. From 2012-2018, PCR-ribotyping was used for EIP strain typing. Beginning in 2018, whole genome sequencing (WGS) and analysis were used for the molecular characterization of *C. difficile* isolates. *C. difficile* isolates were sequenced (Illumina MiSeq and NovaSeq) by CDC or the Minnesota Department of Health Public Health Laboratory. Assembly and multi-locus sequence typing (MLST) were performed using CDC's in-house PHoeNIx pipeline (https://github.com/CDCgov/phoenix).

A CDI case was classified as community-associated (CA) if the *C. difficile*-positive stool specimen was collected on an outpatient basis or within 3 days after hospital admission in a person with no documented overnight stay in a healthcare facility in the preceding 12 weeks. All CDI cases that do not meet the aforementioned criteria were classified as healthcare-associated (HA). HA cases with disease onset outside of a healthcare facility but with documented overnight stay in a healthcare facility in the preceding 12 weeks were classified as community-onset, healthcare-facility associated (CO-HCFA). HA cases with disease onset in a healthcare facility were classified as healthcare-facility onset (HCFO). HCFO cases were further classified into hospital onset or long-term care facility onset. Incidence rates were calculated using US Census population estimates.

CDI surveillance data undergo regular data cleaning to ensure accuracy and completeness. Patients with complete case report form data as of 10/12/2021 were included in this analysis. Because data can be updated as needed, analyses of datasets generated on a different date may yield slightly different results.



Results

Table 1 – Reported Number of CDI Cases and Crude Incidence by Sex, Age Group, Race, and Epidemiologic Classification Among the 10 EIP Sites

Sex	Population ≥1 Year of Age	Community-Associated CDI[a], No.[b]	Community-Associated CDI[a], Incidence[c]	Healthcare-Associated CDI[a], No.[b]	Healthcare-Associated CDI[a], Incidence[c]	All CDI[a], No.[b]	All CDI[a], Incidence[c]
Male	5,900,745	2947	49.9	3276	55.5	6223	105.5
Female	6,157,586	4681	76.0	3708	60.2	8389	136.2

Age group	Population ≥1 Year of Age	Community-Associated CDI[a], No.[b]	Community-Associated CDI[a], Incidence[c]	Healthcare-Associated CDI[a], No.[b]	Healthcare-Associated CDI[a], Incidence[c]	All CDI[a], No.[b]	All CDI[a], Incidence[c]
1-17 years	2,514,825	650	25.8	225	8.9	875	34.8
18-44 years	4,732,015	1912	40.4	849	17.9	2761	58.3
45-49 years	799,563	422	52.7	325	40.7	747	93.4
50-54 years	774,350	482	62.3	366	47.3	848	109.5
55-59 years	791,036	660	83.4	602	76.1	1262	159.5
60-64 years	711,025	709	99.6	714	100.5	1423	200.1
65-70 years	586,891	670	114.2	840	143.1	1510	257.3
70-74 years	455,710	714	156.8	805	176.6	1519	333.3
75-79 years	296,135	505	170.5	772	260.8	1277	431.2
80+ years	396,781	904	227.8	1486	374.5	2390	602.3

Race[a]	Population ≥1 Year of Age	Community-Associated CDI[a], No.[b]	Community-Associated CDI[a], Incidence[c]	Healthcare-Associated CDI[a], No.[b]	Healthcare-Associated CDI[a], Incidence[c]	All CDI[a], No.[b]	All CDI[a], Incidence[c]
White	8,073,623	5980	74.1	4907	60.8	10887	134.9
Other	3,984,708	1648	41.3	2077	52.1	3725	93.5

Total	Population ≥1 Year of Age	Community-Associated CDI[a], No.[b]	Community-Associated CDI[a], Incidence[c]	Healthcare-Associated CDI[a], No.[b]	Healthcare-Associated CDI[a], Incidence[c]	All CDI[a], No.[b]	All CDI[a], Incidence[c]
Total	12,058,331	7628	63.3	6984	57.9	14612	121.2

[a] The epidemiologic classification was statistically imputed for 2% of the CDI cases selected for medical record review, and race was statistically imputed for 18% of the CDI cases selected for medical record review. The weighted frequency of cases in Colorado and Georgia was based on 33% random sampling for cases aged ≥18 years.

[b] Subcategories may not add to total due to rounding

[c] Cases per 100,000 persons

Table 2 – Diagnostic Assay Results of CDI Cases (N=14612)

Diagnostic assay	N	%
Toxin positive	3998	27
Nucleic acid amplification test (NAAT) positive/toxin negative	4851	33
NAAT positive/toxin result unknown[a]	5741	39
Other methods[b]	22	<1

[a]Includes cases diagnosed mainly by NAAT or multiplex PCR panel (i.e., toxin enzyme immunoassay or cell cytotoxicity assay was not performed) or by NAAT as part of a multistep algorithm where the toxin result was not readily known
[b]Includes cases diagnosed by culture or unspecified assay

Table 3 – CDI Cases by Epidemiologic Classification (N=14612)

Epidemiologic classification	N	%
Hospital onset	1594	11
LTCF onset	908	6
COHCFA	2002	14
CA	4913	34
Unknown[a]	5195	36

[a] Includes 5001 non-sampled cases

Table 4 – CDI Cases by Race and Ethnicity (N=14612)

Race/Ethnicity	N	%
Hispanic, any race	1061	7
Not known to be Hispanic[a] - White[b]	6935	47
Not known to be Hispanic[a] - Black or African American[c]	2139	15
Not known to be Hispanic[a] - Asian[d]	321	2
Not known to be Hispanic[a] - Other or multiple races[e]	224	2
Non-Hispanic- Unknown race	197	1
Unknown ethnicity and race	3735	26

[a] Records either indicated ethnicity was non-Hispanic, or ethnicity was not known
[b] 716 cases with unknown ethnicity
[c] 153 cases with unknown ethnicity
[d] 50 cases with unknown ethnicity
[e] American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or ≥2 races reported; 79 cases with unknown ethnicity

Table 5 – Location of CDI Cases on the Third Calendar Day Before Incident Specimen Collection (N=9611)

Location of patient before incident specimen collection	N	%
Private residence	6827	71
Long-term care facility	930	10
Acute-care hospital (inpatient)	1523	16
Long-term care acute care hospital	49	<1
Homeless	70	<1
Incarcerated	10	<1
Other	4	<1
Unknown	198	2

Table 6 – Location of CDI Cases at Time of Incident Specimen Collection (N=9611)

Location of incident specimen collection	N	%
Outpatient setting or emergency department	5049	53
Acute care hospital	3696	38
Long-term care facility	643	7
Long-term acute care hospital	40	<1
Other	1	<1
Unknown	182	2

Table 7 – Selected Clinical Characteristics of CDI Cases (N=7499)

Clinical characteristic	N	%
Charlson comorbidity index - 0	3208	43
Charlson comorbidity index - 1	1334	18
Charlson comorbidity index - ≥2	2957	39
Underlying conditions - Cardiovascular disease[a,b]	1542	21
Underlying conditions - Diabetes mellitus[a]	1658	22
Underlying conditions - Chronic pulmonary disease[a,c]	1413	19
Underlying conditions - Gastrointestinal disease[a,d]	1776	24
Underlying conditions - Gastrointestinal disease – Diverticular disease[a]	784	10
Underlying conditions - Gastrointestinal disease – Inflammatory bowel disease[a]	536	7
Underlying conditions - Gastrointestinal disease – Peptic ulcer disease[a]	186	2
Underlying conditions - Gastrointestinal disease – Short gut syndrome[a]	26	<1
Underlying conditions - Gastrointestinal disease – Liver disease[a]	428	6
Underlying conditions - Chronic renal disease[a]	1289	17
Underlying conditions - Neurologic condition, any[a]	1223	16
Underlying conditions - Malignancy (hematologic or solid organ)[a]	1244	17
Underlying conditions - Transplant (hematopoietic stem cell or solid organ)[a]	233	3

[a] Underlying conditions are not mutually exclusive

[b] Defined as myocardial infarction, congestive heart failure, congenital heart disease, stroke, transient ischemic attack, or peripheral vascular disease

[c] Defined as cystic fibrosis or any chronic respiratory condition resulting in symptomatic dyspnea

[d] Defined as diverticular disease, inflammatory bowel disease, peptic ulcer disease, short gut syndrome, or liver disease

Table 8 – Selected Healthcare Exposures and Risk Factors of Incident CDI Cases in the 12 Weeks Before the Date of Incident Specimen Collection by Epidemiologic Classification[a] (N=7452)

	CA CA (N=4912)	CA (N=4912)	COH CFA (N=2002)	COH CFA (N=2002)	HCFO (N=538)	HCFO (N=538)
Healthcare Exposure[b]	**N**	**%**	**N**	**%**	**N**	**%**
Acute care hospitalization	0	0	1963	98	286	53
Long-term care facility residence	0	0	245	12	232	43
Long-term acute care hospitalization	0	0	8	<1	15	3
Surgery	164	3	529	26	127	24
Emergency room	1030	21	789	39	154	29
Observation unit	97	2	87	4	19	4
Chronic dialysis	117	2	189	9	57	11

[a]Excludes 47 cases with full CRF that had unknown epidemiologic classification

[b]Healthcare exposure categories are not mutually exclusive

Table 9 – Antibiotic Use in the 12 Weeks Before the Date of Incident Specimen Collection (N=7499)

Antibiotic[a]	N	%
Any antibiotic	4532	60
Aminoglycosides	87	1
Beta-lactam / beta-lactamase inhibitor combinations	1495	20
Carbapenems	209	3
Cephalosporins	2221	30
Clindamycins	560	7
Fluoroquinolones	1033	14
Glycopeptides	1327	18
Macrolides	295	4
Monobactam	24	<1
Penicillins	460	6
Trimethoprim or Trimethoprim/Sulfamethoxazole	374	5
Tetracyclines	308	4
Other antibiotic	1288	17

[a] Antibiotic use categories are not mutually exclusive.

Table 10 – Treatment of Incident CDI Cases (N=7499)

Treatment[a]	N	%
Any treatment[b]	6242	83
Oral or rectal vancomycin (excluding vancomycin tapers)	4951	66
Vancomycin tapers	377	5
Metronidazole	1847	25
Fidaxomicin	217	3
Bezlotoxumab	9	<1
Stool transplant	71	<1

[a] Treatment categories are not mutually exclusive.

[b] Includes any course of CDI antibiotic therapy, bezlotoxumab, or stool transplant.

Table 11 – Outcomes of Incident CDI Cases (N=7499, except where indicated)

Outcome	N	%
Toxic megacolon[a]	25	<1
Ileus[a]	180	2
Pseudomembranous colitis[a]	29	<1
White blood cell count >= 15,000/µl[a]	1192	16
Recurrent infection[a]	897	12
Hospitalization on the day of or within 6 days after the date of incident specimen collection[a, b]	3171	42
ICU admission one day before, the day of, or within 6 days after the date of incident specimen collection [a]	485	6
In-hospital death[a]	148	2
Discharge location after acute-care hospitalization among patients who survived[c] - Private Residence	2438	81
Discharge location after acute-care hospitalization among patients who survived[c] - Long-term care facility	491	16
Discharge location after acute-care hospitalization among patients who survived[c] - Long-term acute care hospital	21	<1
Discharge location after acute-care hospitalization among patients who survived[c] - Other	63	2
Discharge location after acute-care hospitalization among patients who survived[c] - Unknown	10	<1

[a] Outcomes, except for location of discharge from acute care hospitalization, are not mutually exclusive.
[b] Data include 353 cases considered to be hospital-onset
[c] N=3023

Laboratory Characterization

In 2019, 1129 *C. difficile* isolates were submitted to CDC for further analysis. The total number of isolates received from each site ranged from 49 to 298, with a median of 77. Most isolates (95%) were collected in metropolitan areas.

Among all isolates submitted, 117 distinct multi-locus sequence types (STs) were detected. Of the 617 community-associated isolates, 95 STs were observed and ST42 was predominant (75/617, 12.2%), followed by ST2 (8.9%), ST8 (8.6%), ST3 (4.5%), and ST1 (4.4%); all other STs consisted of <4% of isolates (Table 1). Of the 512 healthcare-associated isolates, 74 STs were observed and ST42 was predominant (68/512, 13.3%), followed by ST2 (11.7%), ST1 (11.3%), and ST8 (9.0%); all other STs consisted of <4% of isolates (Table 2).

Historically, ST1 was the predominant US strain type, but it has been replaced by a distribution of different STs in both community- and healthcare-associated isolates. A crosswalk to assist with evaluation of ST data with previous ribotype data is provided in Appendix 2.

Table 12 – Frequency of Sequence Types Among Community-Associated *C. difficile* Isolates, 2019 (N=617)

Sequence Type (ST)	Number of Isolates	% Isolates
ST42	75	12
ST2	55	9
ST8	53	9
ST3	28	5
ST1	27	4
ST43	21	3
ST14	20	3
ST34	19	3
ST55	18	3
ST10	17	3
All Other STs	284	46

Table 13 – Frequency of Sequence Types Among Healthcare-Associated *C. difficile* Isolates, 2019 (N=512)

Sequence Type (ST)	Number of Isolates	% Isolates
ST42	68	13
ST2	60	12
ST1	58	11
ST8	46	9
ST110	20	4
ST14	19	4
ST3	17	3
ST34	15	3
ST11	14	3
ST43	14	3
All Other STs	181	35

Summary

Surveillance data from 2019 represent the ninth year of population-based surveillance for CDI conducted among all 10 Emerging Infections Program sites. The crude overall incidence rate of CDI in 2019 was 121.2 cases per 100,000 persons, with a higher incidence of community associated cases (63.2 cases per 100,000 persons) compared with healthcare-associated cases (57.9 cases per 100,000 persons). The incidence rate of CDI increased with age and was higher in women than in men and higher in White persons than in persons of other races.

Underlying conditions were commonly reported among CDI cases, with 39 having a Charlson comorbidity index of ≥2. Antibiotic use in the prior 12 weeks was reported for 60 percent of CDI cases. Eighty-three percent of CDI cases were treated, with vancomycin being the most common treatment given. CDI-related complications, such as toxic megacolon and ileus, were rare.

Citation

Centers for Disease Control and Prevention. 2025. Emerging Infections Program, Healthcare-Associated Infections – Community Interface Surveillance Report, *Clostridioides difficile* infection (CDI), 2019. Available at: [Insert link to the report].

For more information, visit our web sites:

- *Clostridioides difficile* Infection (CDI) Tracking (https://www.cdc.gov/healthcare-associated-infections/php/haic-eip/cdiff.html)
- Healthcare-Associated Infections - Community Interface Data Visualization (HAICViz) (https://www.cdc.gov/healthcare-associated-infections/php/haic-eip/haicviz.html)
- *Clostridioides difficile* Infection (https://www.cdc.gov/c-diff/about/)

Appendix 1*

The percentages of community- and healthcare-associated CDI cases with *C. difficile* recurrence, hospitalization, and in-hospital deaths stratified by age group are shown in the following table.

Table A1. Percentage of CDI Cases with First Recurrence, Hospitalization, and In-hospital Death by Age Group and Epidemiologic Classification

Age group and Epidemiologic Classification, Community-associated CDI cases[a]	First Recurrence[b]	Hospitalization[c]	In-hospital Death[d]
1-49 years	9	23	0.4
50-54 years	8	41	0.6
55-59 years	13	37	0.5
60-64 years	11	32	2
≥65 years	14	41	2

Age group and Epidemiologic Classification, Healthcare-associated CDI cases[a]	First Recurrence[b]	Hospitalization[c]	In-hospital Death[d]
1-49 years	11	71	2
50-54 years	11	79	6
55-59 years	11	72	5
60-64 years	12	69	5
≥65 years	14	66	6

[a] A CDI case was classified as community-associated if the *C. difficile*-positive stool specimen was collected on an outpatient basis or within 3 days after hospital admission in a person with no documented overnight stay in a healthcare facility in the preceding 12 weeks. All CDI cases that do not meet the aforementioned criteria were classified as healthcare associated.

[b] First recurrence refers to the first recurrent CDI episode, defined as a positive stool specimen within 2 to 8 weeks after the initial positive test.

[c] Hospitalization includes admission at the time of or within seven days of CDI diagnosis.

[d] In-hospital deaths refer to deaths that occurred during hospitalization.

*The appendix Includes results of special analyses that are requested or of interest during a particular surveillance year.

Appendix 2*

A collection of isolates representing common ribotypes observed from previous EIP surveillance years underwent whole genome sequencing and MLST. Some STs corresponded to a single ribotype and some to multiple and/or overlapping ribotypess. Table A2 represents a crosswalk to assist with evaluation of previous ribotype data for the top ten Community-Associated and Healthcare-Associated STs observed in 2019.

Table A2. *C. difficile* Multi-locus Sequence Types (STs) and Associated PCR Ribotypes

MLST (ST)	Associated PCR Ribotype(s)
ST1	027, 036, A75
ST2	014, 020, 076, 077, 207, A27, A30
ST3	001_072, 009, 305
ST8	002
ST10	015
ST11	078, 126
ST14	014, 077, 207, A27
ST34	056
ST42	106, 002, 077
ST43	054
ST55	070, A12
ST110	014, 020, 076, 154, 207, A27

*The appendix includes results of special analyses that are requested or of interest during a particular surveillance year.