Australian Commission on **Safety and Quality** in Health Care

# *Clostridioides difficile* infection

Data snapshot report 2022-23

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# Summary

*Clostridioides difficile,* also known as *Clostridium difficile,* is a gram-positive spore-forming bacterium that can cause severe gastrointestinal illness and even lead to death.[1,2]

Exposure to antimicrobials, gastric acid suppression medications (especially proton pump inhibitors) and environmental contamination are modifiable risk factors. Addressing these factors can decrease the risk for the onset and spread of *Clostridioides difficile* infection (CDI) in both healthcare settings and the community.

The rate of CDI in Australia has been increasing in recent years, largely due to an increasing prevalence of community-onset CDI.[3, 4] This trend marks a shift in the epidemiology of CDI in Australia and suggests that CDI is a larger community health problem than previously understood.[5, 6]

While most cases occur in the community, it is in hospital where most cases are detected due to the opportunity to test symptomatic patients. This report examines the burden of CDI in Australian public hospitals in 2022 and 2023.

## Key findings

### What does the analysis show about CDI in Australia in 2022 and 2023?

- Separations with a CDI diagnosis decreased between 2022 and 2023 by 6.19%.
- Community-onset CDI accounted for nearly 80% of all separations with a CDI diagnosis.
- More than half of all individuals with community-onset CDI were female (56.51%), and 62.30% were in individuals aged over 65 years.
- Two-thirds of separations with a community-onset CDI diagnosis were in a major city (2022: 66.98%; 2023: 66.45%).

### What do these findings mean and why are they important?

These findings suggest that hospital-based prevention and control strategies are effective in limiting the spread and onset of CDI in hospitals. The increasing burden of community-onset CDI creates risks for the continuing effectiveness of infection prevention and control in the acute care sector.

The changing epidemiology of CDI in Australia should be considered in the development and promotion of interventions, such as antimicrobial stewardship programs in primary and community care settings, and hospital infection prevention and control programs.

# Introduction

## About Clostridioides difficile

*Clostridioides difficile (C. difficile)* spreads via the oral-faecal route and through contamination of and survival on environmental surfaces and in food.[6-8] Infection prevention and control and antimicrobial stewardship (AMS) interventions have been highly successful in reducing the transmission of *C. difficile* within healthcare settings.[6]

Symptomatic *C. difficile* infection (CDI) results in fever, abdominal pain, nausea, vomiting, and diarrhoea. Infections range from mild to severe, and can cause colitis, toxic megacolon, pseudomembranous colitis and death.[2,7]

CDI is an important infection for the economic sustainability of Australian primary and acute healthcare services.[8, 9]

## About this report

Data utilised for this report were extracted from the Admitted Patient Care National Minimum Data Set (APC NMDS), which provides information on patient diagnoses and the care provided during a patient's admission to an Australian public hospital.[10] Patient diagnoses are assigned a diagnostic ICD-10 code. The diagnostic code A04.7 *Enterocolitis due to Clostridium difficile* is used to identify separations affected by CDI[11] and is referred to in this report as a CDI diagnosis. Patient administrative data from the 2021−2022, 2022−2023, and 2023−2024 APC NMDS have been analysed to estimate the rate of CDI in Australian public hospitals.[12] Data from January 2022 to December 2023 are included in this report.

Use of the APC NMDS for monitoring national CDI rates by the Australian Commission on Safety and Quality in Health Care (the Commission) commenced in 2016. Patient administrative data for CDI are comparable to surveillance data collected for hospital-identified CDI (HI-CDI).[13, 14] As such, traditional CDI case exposure classifications, including healthcare-associated healthcare-facility (HCA-HCF) onset CDI, healthcare-associated community-onset CDI (HCA community-onset), and community-associated CDI (CA-CDI), can be applied to CDI diagnostic code categories.[3]

## Method

Exclusion and filtering criteria have not been applied to the APC NMDS. Patient bed days were extracted from the APC NMDS and are defined as the total number of days for all patients who were admitted for an episode of care and who separated during a specific reference period.[12] This includes a total hospital stay (from admission to separation), or a portion of a hospital stay that begins or ends with a change in the type of care provided to a patient.[10]

CDI diagnoses are categorised as either a principal diagnosis or a non-principal diagnosis. A non-principal diagnosis is further classified by Condition Onset Flags (COFs).[12, 15] Complete

definitions for these terms are included in the glossary of this report.

Further analysis of data for separations with pre-existing CDI symptoms was undertaken to better understand the factors that may be associated with community-onset CDI in Australia. These data relate to where the CDI diagnosis was made, rather than where the individual usually resided. Factors considered included patient demographics, admissions from residential aged care homes (RACHs), and incidence of readmission within 28 days of a previous separation.

Data for proton pump inhibitor (PPI) medicine prescribing was sourced from the Services Australia prescription database.[16] Data on antimicrobial prescribing was extracted from the Australian Pharmaceutical Benefits Scheme (PBS) and the Repatriation Pharmaceutical Benefits Scheme (RPBS).[17]

## Limitations and considerations for the interpretation of data

Access to information in the APC NMDS is dependent on the submission of hospital-level data by the states and territories and subsequent validation of these data. Currently there is a 14- to 18-month delay between documentation of diagnosis at the hospital and availability of the APC NMDS to the Commission.

Patient administrative data are not sufficiently sensitive to link comorbidities to the COF codes or identify severity of disease, and the effects of these elements are not adjusted for in the methodology. This data cannot be adjusted to account for or measure the impact of changes in CDI testing.

Unlike established healthcare-associated infection (HAI) surveillance by case exposure classification, the definition for a COF does not include a timeframe for when the onset of a condition is considered to have arisen during an episode of care. It is assumed that the 48-hour threshold for the onset of symptoms after admission used in hospital-based CDI surveillance programs can be applied to COF coding. However, this may limit the accuracy of applying CDI case exposure classifications to data from the APC NMDS. For example, separation with a CDI diagnosis identified as community-onset will likely include CDI acquired in the community, CDI acquired from a previous healthcare admission and separations where the onset is defined as indeterminate.[18]

Data included in this report are only applicable to Australian public hospitals and do not account for cases identified in private hospitals or community or residential aged care facilities where there was no admission to a public hospital.

Data collected on separations with a CDI diagnosis used for this report does not include history of either antimicrobial use or PPI use. Caution is required when interpreting community antimicrobial use and PPI use and CDI rates. These limitations are also acknowledged in literature on the use of coding data for the use of surveillance.[19]

Any association between length of stay and CDI should be interpreted with care. Length of stay may be impacted by many factors, such as underlying comorbidities, severity of disease and treatment modalities. As such, a prolonged length of stay cannot solely be attributed to the acquisition of CDI.[20]

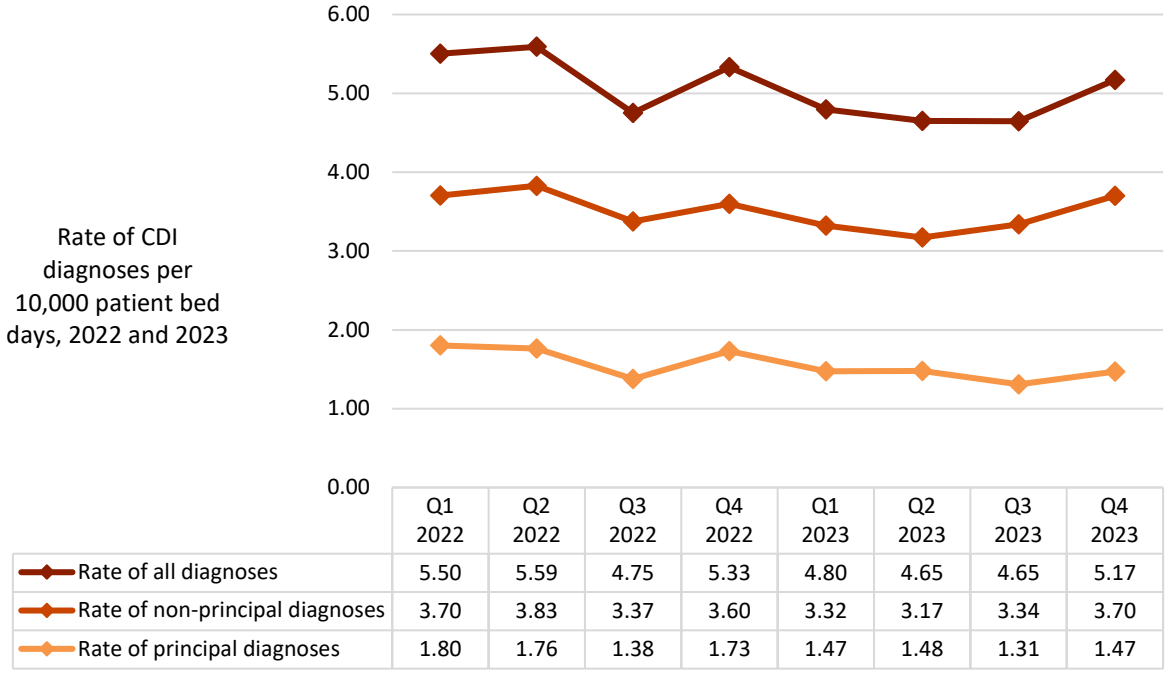
# Findings

## Overall burden of CDI in Australia

In 2022 and 2023, there were 11,942 and 11,202 separations with a CDI diagnosis respectively. Principal CDI diagnoses accounted for 30.93% of all CDI diagnoses in 2022 and 30.25% of all CDI diagnoses in 2023. Non-principal CDI diagnoses accounted for 69.07% of all CDI diagnoses in 2022 and 69.75% of all CDI diagnoses in 2023.

The average rate of all CDI diagnoses in 2022 was 5.24 diagnoses per 10,000 patient bed days. In 2023, the average rate of all CDI diagnoses decreased to 4.78 diagnoses per 10,000 patient bed days. Figure 1 shows the average national quarterly rates of CDI diagnoses.

**Figure 1.** Quarterly rate of CDI (A04.7) diagnoses* in Australian public hospitals per 10,000 patient bed days, 2022 and 2023




| | Q1 2022 | Q2 2022 | Q3 2022 | Q4 2022 | Q1 2023 | Q2 2023 | Q3 2023 | Q4 2023 |
|---|---|---|---|---|---|---|---|---|
| Rate of all diagnoses | 5.50 | 5.59 | 4.75 | 5.33 | 4.80 | 4.65 | 4.65 | 5.17 |
| Rate of non-principal diagnoses | 3.70 | 3.83 | 3.37 | 3.60 | 3.32 | 3.17 | 3.34 | 3.70 |
| Rate of principal diagnoses | 1.80 | 1.76 | 1.38 | 1.73 | 1.47 | 1.48 | 1.31 | 1.47 |

*Diagnostic code A04.7 (*enterocolitis due to Clostridium difficile infection*)
Notes: Number of Australian public hospitals, 2022, *n* = 683, 2023, *n* = 687
Total hospital separations, 2022, *n* = 7,395,209; 2023, *n* = 7,828,236

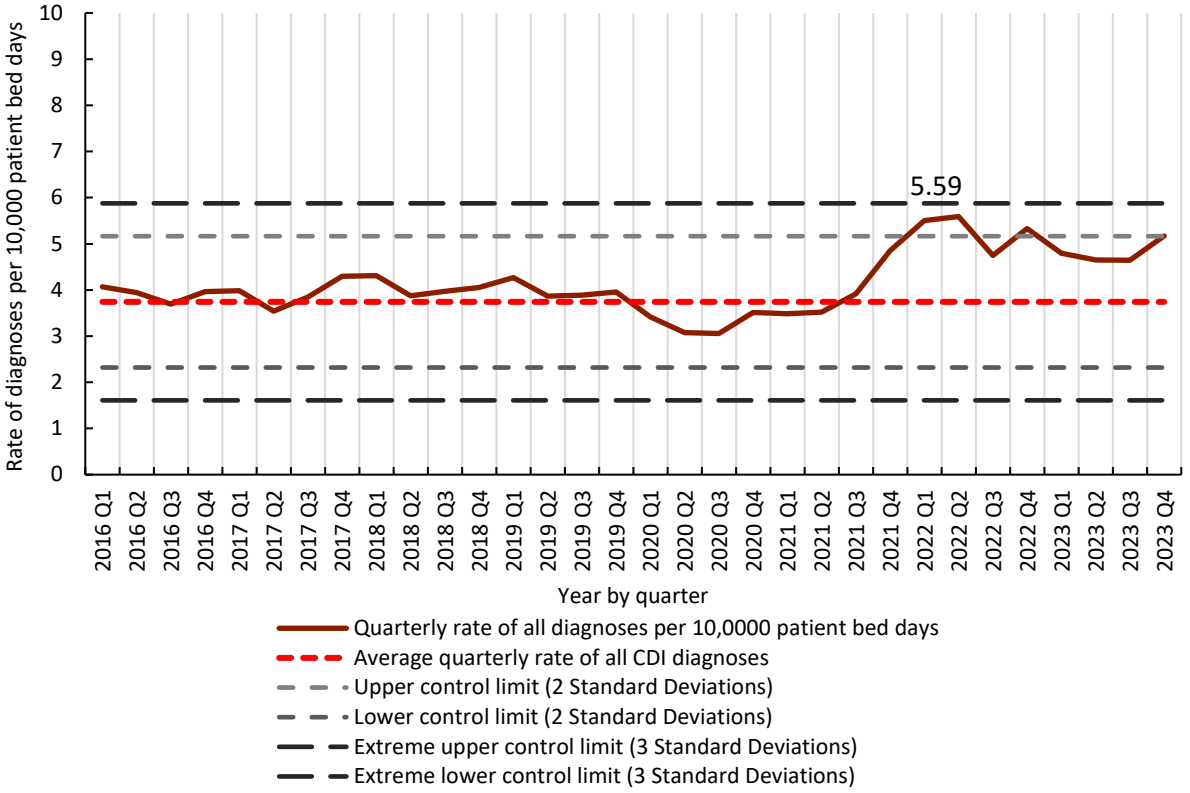
The quarterly rate of CDI diagnoses from 2016 to 2023 is presented in Figure 2. The use of a quarterly data interval is sensitive enough to identify sustained changes in the epidemiology of CDI over several years and is robust enough to filter out single-point events.[3]

There is no national benchmark for rates of CDI, therefore the average quarterly rate of CDI diagnosis does not represent a benchmark. The upper and lower control limits displayed in Figure 2 are set at two and three standard deviations, based on the average quarterly rate of CDI for the 7-year period. The average and the control limits are calculated from the first quarter of 2016 through to the last quarter of 2023. The application of the control limits helps to identify changes in rates and seasonal patterns of CDI diagnosis.

Since the last quarter of 2019, there has been wide variation in the quarterly rate of CDI. Quarterly CDI rates began increasing during the second half of 2021 and have remained higher than previous years. The highest rate of CDI (5.59 CDI diagnoses per 10,000 patient bed days) was observed during the second quarter of 2022, indicating a significant increase in CDI diagnoses in Australian public hospitals in early 2022.

The sharp increase in the rates of CDI separations from mid-2021 aligns with the reintroduction of elective surgery and relaxing of COVID-19 restrictions[21] and known variation in antimicrobial use.[22] International data on the rates of CDI during the COVID-19 pandemic vary. [22, 23] In Australia, increases in the rate of CDI occurred later than in the northern hemisphere.[23]

**Figure 2.** Statistical process control chart for CDI (A04.7) diagnoses in Australian public hospitals,2016–2023




## Non-principal CDI diagnoses

Data presented in Figure 3 and Figure 4 include rates of separations with COF coding from 2020 to 2023 to allow comparison of each category of CDI separations over four years. Data are drawn from hospitals that reliably assign COFs for cases of CDI. This dataset excludes:

- hospitals with an overall low volume of activity (less than 100 episodes of care per month)
- hospitals where COF coding was very low (less than 1%) for any condition arising during an episode of care
- hospitals where the COF was coded as ‘unknown onset’ for any diagnoses in more than 10% of patient records.[24]

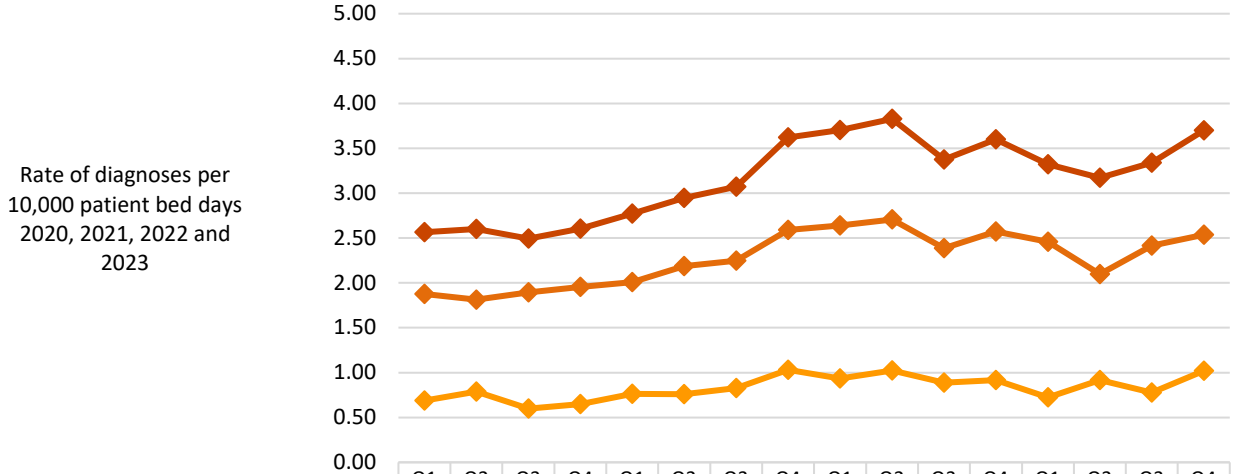
The number of hospitals considered to have highly reliable COF coding has increased year-on-year since 2020 (2020 *n* = 502, 2021 *n* = 519, 2022 *n* = 524 and 2023 *n* = 525 hospitals).

In 2022 and 2023, there were 8,248 and 7,813 separations respectively with a non-principal CDI diagnosis. This increased compared with 2020 and 2021, when there were 5,357 separations and 6,783 separations respectively.[5] The quarterly rate of all non-principal CDI diagnoses has been trending up since 2020 and varied widely across 2022 and 2023. The highest quarterly rate was observed in Q2 2022 (3.83 separations per 10,000 patient bed days).

A COF2 code refers to a condition previously existing or suspected on admission that is not the primary reason for admission to hospital.[25] Separations coded as a non-principal CDI COF2 account for over 70% of all separations with a CDI diagnoses. In 2022 and 2023, non-principal CDI separations coded as a COF2 accounted for 73.49% (*n* = 5,895) and 72.81% (*n* = 5,432) of all non-principal CDI diagnoses respectively.

A COF1 code refers to a condition that arose during an inpatient admission, and may be considered directly related to the health care provided for the separation for which the CDI diagnosis was assigned.[25] Although the number of separations with a non-principal CDI diagnosis with COF1 has increased year-on-year since 2020, (*n* = 1,371 in 2020, *n* = 1,835 in 2021, *n* = 2,134 in 2022 and *n* = 2,029 in 2023), this category of CDI diagnosis continues to account for less than 20% of all CDI diagnoses in Australian public hospitals.

**Figure 3:** Quarterly rate of CDI (A04.7) non-principal diagnoses by Condition Onset Flag (COF) in Australian public hospitals, 2020 to 2023*




| | Q1 2020 | Q2 2020 | Q3 2020 | Q4 2020 | Q1 2021 | Q2 2021 | Q3 2021 | Q4 2021 | Q1 2022 | Q2 2022 | Q3 2022 | Q4 2022 | Q1 2023 | Q2 2023 | Q3 2023 | Q4 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate of non-principal diagnoses | 2.56 | 2.60 | 2.49 | 2.60 | 2.77 | 2.95 | 3.07 | 3.62 | 3.70 | 3.83 | 3.37 | 3.60 | 3.32 | 3.17 | 3.34 | 3.70 |
| Rate of non-principal diagnoses, with COF2 | 1.87 | 1.81 | 1.89 | 1.95 | 2.01 | 2.19 | 2.25 | 2.59 | 2.64 | 2.71 | 2.39 | 2.57 | 2.46 | 2.10 | 2.42 | 2.54 |
| Rate of non-principal diagnoses, with COF1 | 0.69 | 0.79 | 0.60 | 0.65 | 0.76 | 0.76 | 0.83 | 1.03 | 0.93 | 1.02 | 0.89 | 0.92 | 0.72 | 0.92 | 0.78 | 1.02 |

*Based on Australian public hospitals with highly reliable COF coding only (2020 *n* = 502, 2021 *n* = 519, 2022 *n* = 524, 2023 *n* = 525)

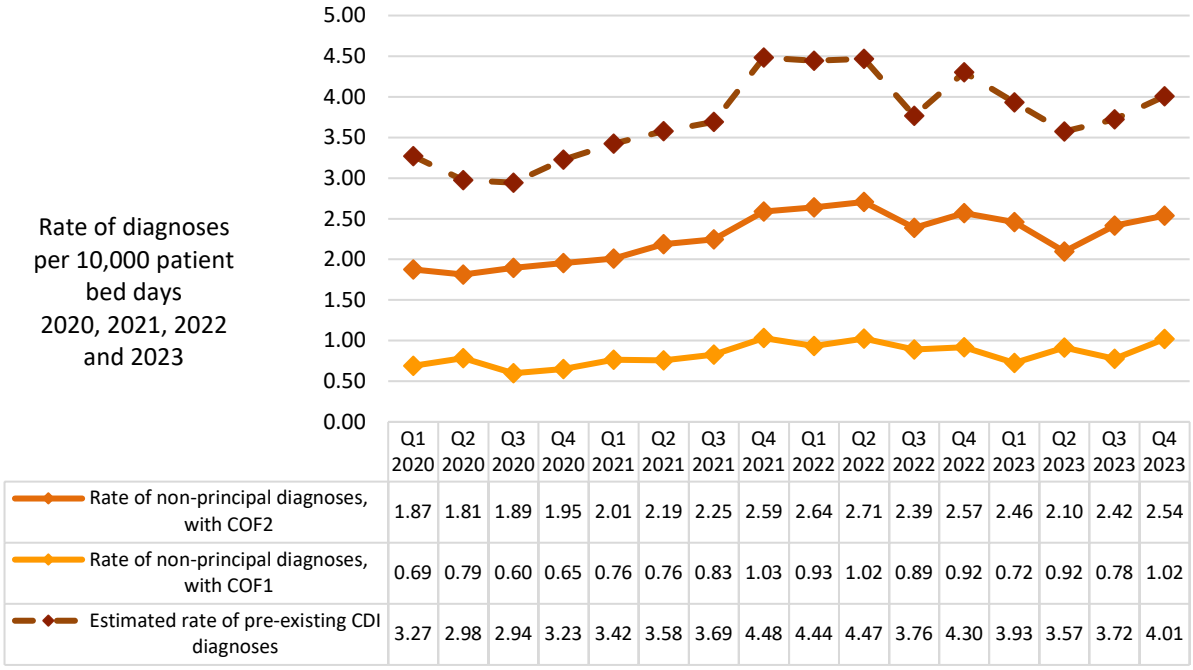
Notes: Non-principal diagnosis COF1: A condition that has arisen during the episode of admitted care that would not have been present or suspected on admission.[25]

Non-principal diagnosis COF2: A condition previously existing or suspected on admission such as the presenting problem, a comorbidity or chronic disease.[25]

Figure 4 shows the estimated quarterly rates of patients admitted to Australian public hospitals with pre-existing CDI symptoms in 2022 and 2023. This patient cohort includes individuals with a principal CDI diagnosis, and those with a non-principal CDI diagnosis with a COF2 (i.e. CDI is acquired either in the community or during a previous healthcare admission [HCA-community-onset, CA-CDI, or indeterminate CDI-onset]).

In both 2022 and 2023, the majority of patients admitted to Australian public hospitals with a CDI diagnosis presented with pre-existing CDI symptoms; this is consistent with 2020 and 2021.[5] In 2022, there were 9,589 (80.29%) separations with pre-existing CDI symptoms; this decreased to 8,821 (78.74%) separations in 2023.

**Figure 4:** Estimated quarterly rates of pre-existing CDI symptoms (A04.7) presenting to Australian public hospitals, 2020, 2021, 2022 and 2023*




| | Q1 2020 | Q2 2020 | Q3 2020 | Q4 2020 | Q1 2021 | Q2 2021 | Q3 2021 | Q4 2021 | Q1 2022 | Q2 2022 | Q3 2022 | Q4 2022 | Q1 2023 | Q2 2023 | Q3 2023 | Q4 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate of non-principal diagnoses, with COF2 | 1.87 | 1.81 | 1.89 | 1.95 | 2.01 | 2.19 | 2.25 | 2.59 | 2.64 | 2.71 | 2.39 | 2.57 | 2.46 | 2.10 | 2.42 | 2.54 |
| Rate of non-principal diagnoses, with COF1 | 0.69 | 0.79 | 0.60 | 0.65 | 0.76 | 0.76 | 0.83 | 1.03 | 0.93 | 1.02 | 0.89 | 0.92 | 0.72 | 0.92 | 0.78 | 1.02 |
| Estimated rate of pre-existing CDI diagnoses | 3.27 | 2.98 | 2.94 | 3.23 | 3.42 | 3.58 | 3.69 | 4.48 | 4.44 | 4.47 | 3.76 | 4.30 | 3.93 | 3.57 | 3.72 | 4.01 |

*Based on Australian public hospitals with highly reliable COF coding only (2020 *n* = 502, 2021 *n* = 519, 2022 *n* = 524, 2023 *n* = 525)

Notes: Non-principal diagnosis COF1: A condition that has arisen during the episode of admitted care that would not have been present or suspected on admission.[25]

Non-principal diagnosis COF2: A condition previously existing or suspected on admission such as the presenting problem, a comorbidity or chronic disease.[25]

**Table 1** shows the average yearly rate of separations with pre-existing CDI symptoms since 2016. There was little change in the number of separations with pre-existing CDI symptoms from 2017 to 2020. Separations with pre-existing CDI symptoms increased by 12.83% from 2021 to 2022 and decreased by 8.01% from 2022 to 2023.

**Table 1.** Average yearly rate of separations with pre-existing CDI (A04.7), 2016−2023

| Year | Average rate of CDI per 10,000 patient bed days |
|---|---|
| 2016 | 2.92 separations per 10,000 patient bed days (*n* = 5,243) |
| 2017 | 2.95 separations per 10,000 patient bed days (*n* = 6,094 |
| 2018 | 3.18 separations per 10,000 patient bed days (*n* = 6,664) |
| 2019 | 3.19 separations per 10,000 patient bed days (*n* = 6,887) |
| 2020 | 3.22 separations per 10,000 patient bed days (*n* = 6,630) |
| 2021 | 3.89 separations per 10,000 patient bed days (*n* = 8,499) |
| 2022 | 4.26 separations per 10,000 patient bed days (*n* = 9,589) |
| 2023 | 3.77 separations per 10,000 patient bed days (*n* = 8,821) |

## Separations in 2022 and 2023

The total number of all separations from Australian public hospitals declined between 2021 (*n* = 7,580,271) and 2022 (*n* = 7,395,209) by 2.44%, but separations with a CDI diagnosis increased during this period (Table 2). By contrast, the total number of separations increased by 5.85% from 2022 to 2023 (*n* = 7,828,236) and separations with a CDI diagnosis decreased between 2022 and 2023. Table 2 provides a comparison of categories of separations with a CDI diagnosis between 2021, 2022 and 2023.

**Table 2.** Number of CDI-related separations (A04.7) in Australian public hospitals in 2021, 2022 and 2023*

| Separation | 2021 | 2022 | 2023 | Relative change year on year |
|---|---|---|---|---|
| Number of separations in Australian public hospitals | 7,580,271 | 7,395,209 | 7,828,236 | 2021 − 2022 ↓ 2.44%<br>2022 − 2023 ↑ 5.85% |
| Number of separations with a CDI diagnosis | 10,512 | 11,942 | 11,202 | 2021 − 2022 ↑ 13.60%<br>2022 – 2023 ↓ 6.19% |
| Number of separations with a principal CDI diagnosis | 3,551 | 3,694 | 3,389 | 2021 − 2022 ↑ 4.03%<br>2022 − 2023 ↓ 8.25% |
| Number of separations with a non-principal CDI diagnosis | 6,961 | 8,248 | 7,813 | 2021 – 2022 ↑ 18.48%<br>2022 – 2023 ↓ 5.27% |

| | | | | |
|---|---|---|---|---|
| Number of separations with a non-principal diagnosis, with COF1* | 1,835 | 2,134 | 2,029 | 2021 – 2022 ↑ 16.29%<br>2022 – 2023 ↓ 4.92% |
| Number of separations with a non-principal CDI diagnosis, with COF2* | 4,948 | 5,895 | 5,432 | 2021 – 2022 ↑ 19.14%<br>2022 – 2023 ↓ 7.85% |
| Estimated pre-existing burden (Principal CDI + non-principal CDI, COF2*) | 8,499 | 9,589 | 8,821 | 2021 – 2022 ↑ 12.83%<br>2022 – 2023 ↓ 8.01% |

*Australian public hospitals with highly reliable COF coding only (2021 *n* = 519, 2022 *n* = 524, 2023 *n* = 525)

## Length of stay for patients with CDI diagnoses

Table 3 shows the change in the length of stay each year since 2016 for patients admitted to Australian public hospitals with a CDI diagnosis. Data from the Australian Institute of Health and Welfare (AIHW) indicate that the average length of stay for all public hospital admissions was 2.70 days, and has remained steady since 2019.[12]

Table 3 shows the length of stay for patients with a CDI diagnosis since 2016. Overall, the average length of stay for patients with a CDI diagnosis has remained steady since 2016 and is more than five times longer (16.06 days) than the average length of stay.

An extended length of stay is often associated with vulnerable patients (more comorbidities, older age) and can increase the cost of health care for these patients. It is estimated that an initial infection with CDI can cost up to $18,795.00 AUD for admission and treatment of infection per separation[8]. In addition, the affected individual will incur social and health costs, such as loss of income and the potential for recurrent infection.

**Table 3.** Average length of stay for patients with a CDI diagnosis in Australian public hospitals, 2016–2023

| Year | Length of stay in days | | |
|---|---|---|---|
| | Principal CDI diagnosis | Non-principal CDI diagnosis | Any CDI diagnosis |
| 2016 | 7.38 | 19.78 | 16.08 |
| 2017 | 7.76 | 19.99 | 16.16 |
| 2018 | 7.01 | 19.56 | 15.64 |
| 2019 | 6.94 | 20.11 | 15.97 |
| 2020 | 7.30 | 19.39 | 15.46 |
| 2021 | 7.45 | 19.89 | 15.69 |
| 2022 | 7.56 | 21.24 | 17.01 |
| 2023 | 7.43 | 20.41 | 16.48 |

A lengthy hospital stay can compromise patient outcomes and is a burden on healthcare resources.[26] Patients who have an extended length of stay generally require invasive treatments and interventions, are often elderly, have chronic underlying comorbidities, and have a higher risk of acquiring infections.[26] These are generally the same factors that increase the risk for CDI.[27]

## Community-onset CDI

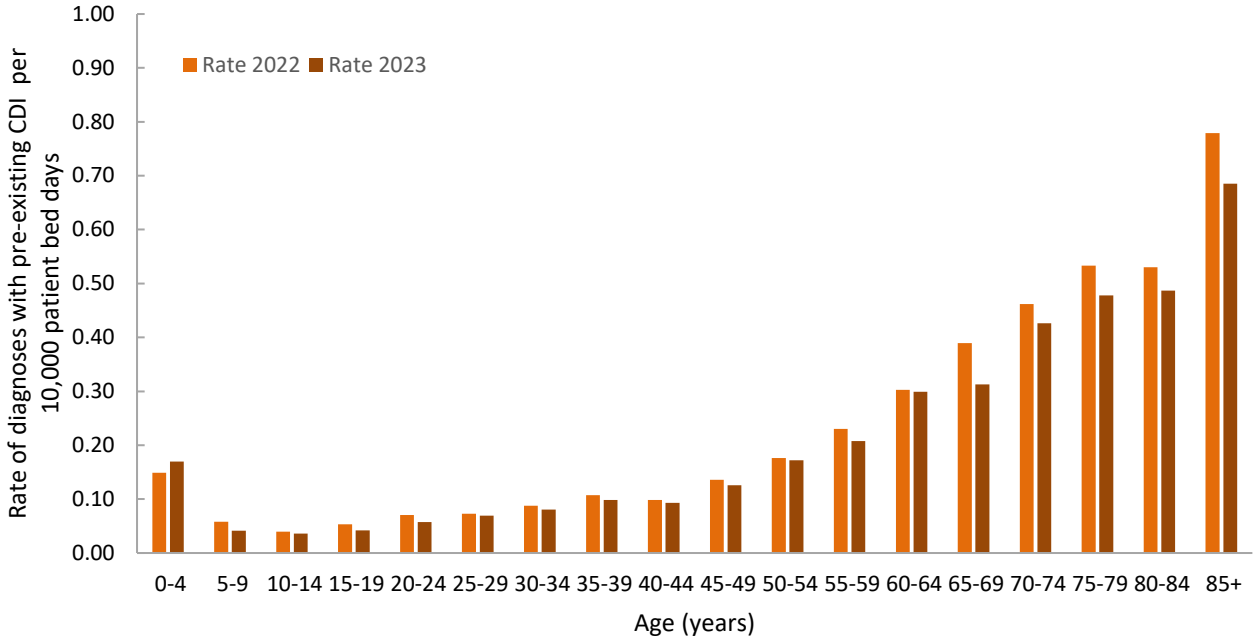
Almost 80% of all separations assigned a CDI diagnosis were estimated to have pre-existing CDI symptoms on admission in 2022 (80.29%) and 2023 (78.74%).

To better understand the factors associated with community-onset CDI in Australia, further analysis was performed for separations with pre-existing CDI symptoms. Data were analysed by age, gender, geographic location at time of diagnosis, whether the individual was admitted from a RACH, and history of previous hospital admission (readmitted within 28 days) prior to the onset of CDI symptoms.

**Demographic information: age and gender**

Figure 5 shows the rate of CDI diagnosis with pre-existing symptoms by age group for 2022 and 2023. Individuals aged 65 years or older accounted for 62.30% of all patients admitted to Australian public hospitals with pre-existing CDI symptoms for 2022 and 2023. Individuals aged 85 years or older were the largest cohort in this group (2022 *n* = 1,776 and 2023 *n* = 1,605). Females accounted for more than half of all separations with pre-existing CDI symptoms in both 2022 and 2023 (2022 *n* = 5,482 and 2023 *n* = 5,165). These characteristics are consistent with demographic data from studies of patients with community-onset CDI.[26, 28-30]

**Figure 5.** Separations with pre-existing CDI symptoms by age group, 2022 and 2023

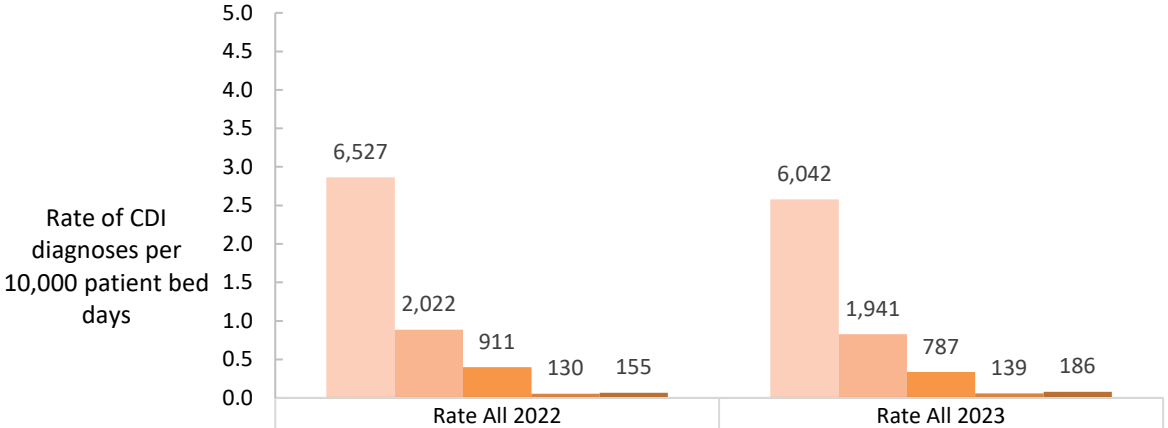



It should be noted that due to asymptomatic carriage of *C. difficile* in children 2 years and under, routine testing for CDI is not recommended.[31, 32]

### Demographic information: geographic location

Two-thirds of separations where there were pre-existing CDI symptoms were in major cities (2022 *n* = 6,627 and 2023 *n* = 6,042). Figure 6 provides details of the geographic location/remoteness for separations where there were pre-existing CDI symptoms. The rate of separations for a diagnosis with CDI for different geographical locations is shown in Figure 6.

**Figure 6.** Separations with pre-existing CDI symptoms by geographic location*, 2022 and 2023




| | Rate All 2022 | Rate All 2023 |
|---|---|---|
| Major Cities | 2.86 | 2.58 |
| Inner Regional | 0.89 | 0.83 |
| Outer Regional | 0.40 | 0.34 |
| Remote | 0.06 | 0.06 |
| Other/Unknown | 0.07 | 0.08 |

*Geographical data is extracted from ABS Australian Statistical Geography Standard (ASGS) remoteness structure

### Readmission within 28 days

Onset of CDI within 28 days of a previous hospital admission is classified as a HAI.[33] This definition is consistent with the nationally-agreed exposure classification definitions used in Australia for CDI surveillance.[18] During 2022 and 2023, 7% (*n* = 1,316) of all separations with pre-existing CDI symptoms were identified as being readmitted to hospital within 28 days of a previous admission (2022 *n* =701; 2023 *n* = 615).

### Community-onset CDI and residential aged care home residents

There is limited information on the burden of CDI in RACH residents in Australia. Surveillance for CDI in Australia is focused on hospital-identified CDI. Only Victoria has an established program to monitor HAIs in RACHs and data from this program are not currently published.[34] In the APC NMDS, less than 2% (*n* = 304) of all separations with pre-existing CDI symptoms were identified as individuals residing in a RACHs at the time of diagnosis (2022:1.40%, *n* = 136 and 2023:1.85%, *n* = 168). Only 14 of these individuals were identified as having had a readmission within 28 days in 2022 and 2023. The small proportion of patients from RACHs with CDI symptom onset identified in this analysis is comparable to Australian data reported elsewhere (1.20%).[27] Despite only a very small proportion of separations with a CDI diagnosis are identified as individuals residing in RACHs, it is important that both healthcare and aged care workers are aware of the risk of infection to this population, and use infection prevention strategies to lower this risk for older people.

# Risk factors for community-onset CDI

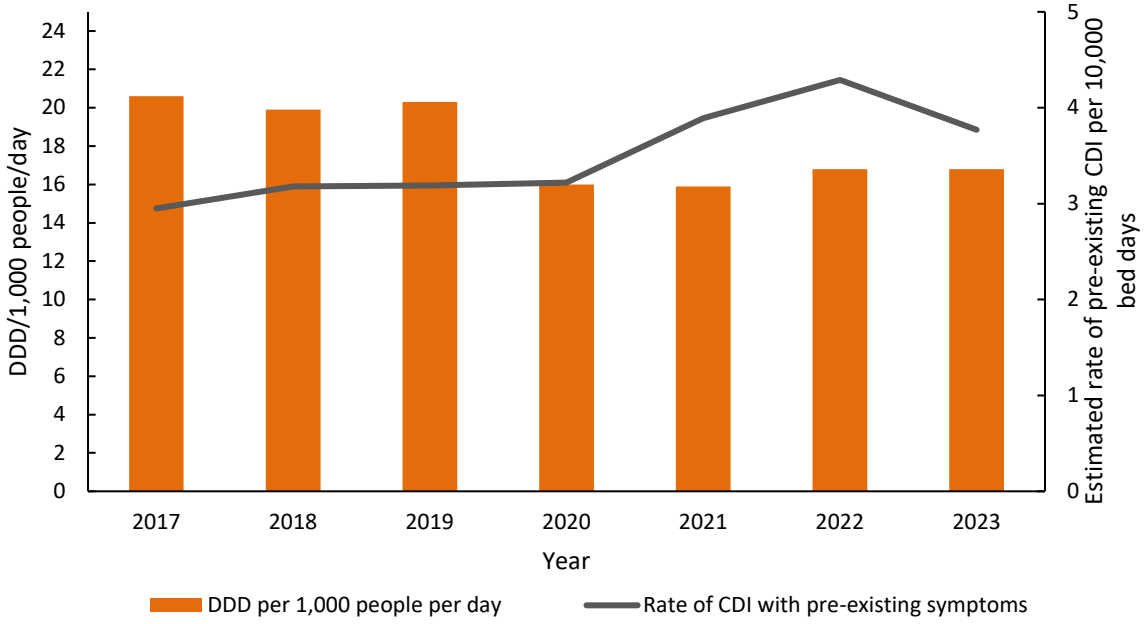
Use of antimicrobials is strongly associated with the onset of CDI and the concurrent use of PPI medicine can further increase the risk for CDI.[35, 36] Data from the PBS and RPBS is used to monitor the community use of antimicrobials and PPI medicines.[16, 37]

### Antimicrobial usage

All classes of antimicrobials can disrupt the balance of the gut microbiome, leading to conditions that support an overgrowth of *C. difficile*[2, 7, 8] but penicillins and cephalosporins are most frequently associated with the risk of developing CDI.[38, 39]

Community antimicrobial use decreased between 2019 and 2020 and has remained consistently lower that pre-pandemic years.[17] By contrast, the rate of separations with pre-existing CDI symptoms increased sharply in the second half of 2021 and has remained high. Figure 7 shows antimicrobial use in the community and the rate of separations with pre-existing CDI symptoms from 2017 to 2023.

**Figure 7.** Antimicrobial utilisation in the community* and the rate of separations with pre-existing CDI symptoms, 2017−2023




*Data sourced from Antimicrobial use in the community: 2023
†DDD = defined daily dose

In 2022 and 2023, people who were aged 75 years and over were dispensed the highest number of antimicrobial prescriptions.[17, 37] Tetracyclines, followed by penicillins with extended spectrum (amoxicillin, cefalexin and amoxicillin–clavulanic acid) and first-generation cephalosporins, are the most commonly dispensed classes of antimicrobials in Australia.[17, 37]

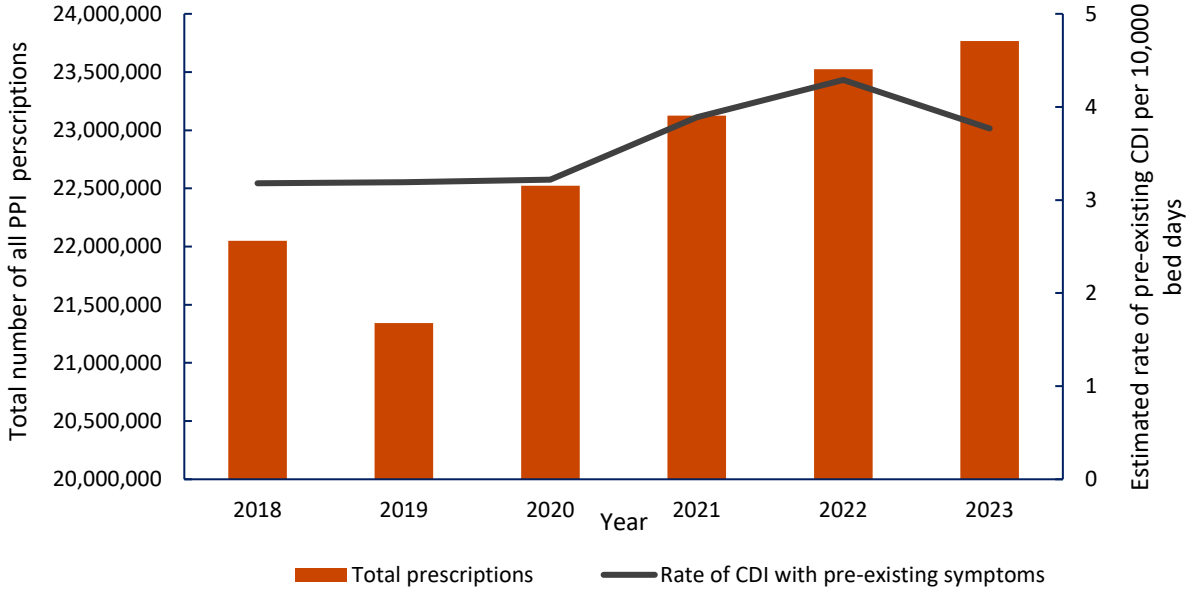
### PPI medicine dispensing

The use of PPI medicines has been positively associated with the onset of CDI, with some

studies suggesting the risk for CDI is twice as likely for patients prescribed a PPI medicine compared to those who have no history of PPI use, and the risk may remain for up to one year after the use of PPI medicines has ceased.[28, 35, 40] PPI medicines alter gastric pH, which may support *C. difficile* survival in the gut[40], and are often used inappropriately and prescribed for longer than recommended.[16]

Dispensing of PPI medicines has increased since 2017, with the largest increase occurring between 2019 and 2020.[16] Figure 8 shows community dispensing of PPI medicines in Australia from 2017 to 2023 and the rate of separations with pre-existing CDI symptoms for that time period.

**Figure 8.** PPI medicine dispensing in the community and the rate of separations with pre-existing CDI symptoms, 2017−2023




*Data source from Pharmaceutical Benefits Scheme (PBS) | Analysis of proton pump inhibitor (PPI) medicines used in the management of gastrointestinal acid related disorders, June 2022, and ACSQHC analysis of the PBS claims data, extraction date 3 March 2025.

Dispensing of PPI medicine decreased in 2019 after restrictions on prescribing high dose PPI medicines were introduced, however there were increases in dispensing in 2020 for low and standard dose PPI medicines.[16] One Australian study found that PPI medicines were prescribed more frequently for patients aged 70 years and over and that esomeprazole and pantoprazole were prescribed more frequently for females than for males.[16] There are no data on over-the-counter and private prescribing of PPIs .

# Conclusion

While CDI diagnoses decreased between 2022 and 2023 in Australia, the rate of CDI has been increasing since 2019, largely due to the increasing prevalence of community-onset CDI.

Hospital-onset CDI accounts for the majority of CDI diagnoses reported for the United Kingdom, Europe and the United States.[41-43] In Australia, over 80% of CDI cases presenting to Australian hospitals in 2022 and 2023 developed symptoms in the community, and many had previous healthcare exposure, either in the community or during a previous hospital admission.

Significant variations in the rates of CDI were observed during the COVID-19 pandemic and post pandemic period. It is likely multiple factors, such as changes to care access and delivery, antimicrobial use and infection prevention and control interventions, had some influence on the rates of CDI observed during this time. Other factors, such as changes to CDI testing methodologies or sensitivities, may also influence diagnosis and reporting. Health service organisations should consider investigating these changes to testing if they observe increased rates of CDI.

An analysis of community-onset CDI data indicates that females and individuals 65 years of age and over appear to be at higher risk of developing CDI symptoms in the community. This group is also prescribed antimicrobial and PPI medicines more frequently than other groups in the community, which is consistent with the findings of other studies that examined the risks for CDI in the community.[16, 17, 36, 28, 35, 44]

Increased awareness of the risk factors for CDI in the community (e.g. older women)[36, 40] can support primary healthcare providers to prevent, diagnose and treat CDI in the community. Simple interventions, such as implementing AMS programs in primary care, avoiding prolonged use of PPI medicines,[36] and limiting the combined use of antimicrobial and PPI medicines may reduce the risk of CDI in the community. Other strategies, such as appropriate testing of stool specimens for *C. difficile* for patients with diarrhoea of unknown aetiology, may assist with early detection, prevent further transmission of infection and support appropriate treatment of CDI in the community.[28, 44]

Awareness of the potential for recurrent and severe disease is also important for primary healthcare providers. Recurrent disease occurs in approximately 15% to 30% of patients with CDI[44] and the risk of severe disease and mortality is similar for both hospital-onset and community-onset CDI.[28] Risk factors for recurrent CDI are the same as for the initial infection (advanced age, previous antimicrobial exposure, gastric acid suppression medication, underlying chronic disease and previous hospital admission).[36]

## What can be done to reduce the risk of CDI in Australia?

The following strategies should be considered for acute and primary care settings to reduce the risk of CDI for all patient groups:

- promote awareness of CDI prevention strategies
  - prescribe antimicrobial and PPI medicines appropriately
  - implement AMS programs in hospital, community and primary healthcare, and aged care settings
- promote early detection and management of CDI
  - know the high-risk patient groups for CDI

  - know the signs and symptoms of CDI
  - timely and appropriate testing of diarrhoea of unknown aetiology
  - treat appropriately, including not prescribing antimicrobials for asymptomatic persons
- promote infection prevention and control interventions for patients that develop diarrhoea, such as:
  - appropriate patient placement
  - standard and contact precautions
  - hand hygiene
  - environmental cleaning to prevent environmental contamination and infection transmission
  - CDI surveillance to help understand the local burden of CDI
  - educate patients and their carers about CDI.

# Glossary

| Terminology | Definition |
|---|---|
| **A04.7 Enterocolitis due to Clostridium difficile** | The code used to identify separations affected by CDI.[11] |
| **Admitted Patient Care National Minimum Data Set (APC NMDS)** | The data set that provides information on patient diagnoses and the care provided during a patient's admission to an Australian public hospital.[15] |
| **Community-associated Clostridioides difficile infection (CA-CDI)** | The CDI case exposure classification used to describe CDI symptom onset (or date and time of stool specimen collection if a laboratory system is used) in the community or within 48 hours of admission to a healthcare facility, provided that symptom onset was more than 12 weeks after the last discharge from a healthcare facility.[18] |
| **Condition Onset Flags (COFs)** | A qualifier for each coded diagnosis to indicate the onset of the condition relative to the beginning of the episode of care, as represented by a code.[25] |
| **Clostridioides difficile** | Also known as *Clostridium difficile,* is a gram-positive, spore-forming bacterium that most often causes infection associated with excessive antimicrobial exposure.[1,2] |
| **Defined daily doses** (DDD) | The average daily dose prescribed according to a representative sample of prescriptions. Source: Defined Daily Dose (DDD) (who.int) |
| **ICD-10 code** | Principal diagnoses are classified according to International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). |
| **Indeterminate CDI-onset** | The CDI case exposure classification used to describe a patient that does not fit any of the above criteria for exposure setting (for example, onset in the community but within four and 12 weeks of discharge from a healthcare facility).[18] |
| **Healthcare-associated healthcare-facility (HCA-HCF) onset CDI** | The CDI case exposure classification used to describe CDI symptom onset (or date and time of stool specimen collection if a laboratory system is used) more than 48 hours after admission to a healthcare facility.[18] |

| | |
|---|---|
| **Healthcare-associated (HCA) community-onset CDI** | The CDI case exposure classification used to describe CDI symptom onset (or date and time of stool specimen collection if a laboratory system is used) in the community, or within 48 hours of admission to a healthcare facility, provided that symptom onset was less than four weeks after the last discharge from a healthcare facility.[18] |
| **Hospital-identified (HI) CDI** | The CDI case exposure classification used to describe the burden of CDI disease identified at an individual hospital.[18] |
| **Non-principal diagnosis (or additional diagnosis)** | Terminology used to describe a condition that may have contributed to the admission but is not the main reason for admission to hospital. This category of patients includes cases of CDI that develop during an inpatient admission.[11] |
| **Non-principal diagnosis COF1** | Terminology used to describe a condition that has arisen during the episode of admitted care that would not have been present or suspected on admission.[25] Separations coded as a non-principal CDI diagnosis with a COF1 may be described as healthcare-associated inpatient-onset CDI. |
| **Non-principal diagnosis COF2** | Terminology used to describe to a condition previously existing or suspected on admission such as the presenting problem, a comorbidity or chronic disease.[25] Separations coded as non-principal CDI diagnoses with a COF2 may describe either a healthcare-associated community-onset CDI or a community-associated CDI. |
| **Patient bed days** | Terminology used to describe the total number of days for all patients who were admitted for an episode of care and who separated during a specific reference period.[12] |
| **Principal diagnosis** | Terminology to describes the primary condition resulting in admission of an individual to hospital. This may include cases of CDI that develop in the community or may be attributed to a previous hospital admission.[11] |
| **Separation** | Describes completion of a patient's care from hospital by discharge, death or transfer.[12] |

# References


1. Knight DR, Riley TV. Genomic Delineation of Zoonotic Orgins of Clostridium difficile. Frontiers in Public Health. 2019;7.

2. Czepiel J, Dróżdż M, Pituch H, Kuijper EJ, Perucki W, Mielimonka A, et al. Clostridium difficile infection: review. European Journal of Clinical Microbiology and Infectious Diseases. 2019 Jul;38(7):1211-1221.

3. Australian Commission on Safety and Quality in Health Care. Technical report: Monitoring the national burden of Clostridioides difficile infection in Australian public hospitals: 2016 to 2018. Sydney: 2021.

4. Hong S, Putsathit P, George N, Hemphill C, Huntington PG, Korman TM, et al. Laboratory-based surveillance of Clostridium difficile infection in Australian health care and community settings, 2013 to 2018. Journal of Clinical Microbiology. 2020;58(11):10.1128/jcm.01552-01520.

5. Australian Commission on Safety and Quality in Health Care. Clostridioides difficile infection: Data snapshot report 2020−2021. Sydney: 2023.

6. Larcombe S, Williams GC, Amy J, Lim SC, Riley TV, Muleta A, et al. A genomic survey of Clostridioides difficile isolates from hospitalized patients in Melbourne, Australia. Microbiology Spectrum. 2023 Dec 12;11(6):e0135223.

7. Buddle JE, Fagan RP. Pathogenicity and virulence of Clostridioides difficile. Virulence. 2023 Dec;14(1):2150452.

8. Brain D, Yakob L, Barnett A, Riley T, Clements A, Halton K, et al. Economic evaluation of interventions designed to reduce Clostridium difficile infection. PLoS One. 2018;13(1):e0190093.

9. Barker AK, Scaria E, Safdar N, Alagoz O. Evaluation of the Cost-effectiveness of Infection Control Strategies to Reduce Hospital-Onset Clostridioides difficile Infection. JAMA Network Open. 2020 Aug 3;3(8):e2012522.

10. Australian Institute of Health and Welfare. Admitted patient care NMDS 2024-25 Sydney AIHW: 2023.

11. Australian Institute of Health and Welfare. Principal diagnosis data cubes. 2023 12 April 2024. Available from: http://www.aihw.gov.au/hospitals-data/principal-diagnosis-data-cubes/.

12. Australian institue of Health and Welfare. Admitted patient activity 2022-23. Sydney: 2022.

13. Daveson K, Kennedy K. Hospital-acquired complications and Clostridium difficile surveillance in the Australian context. Poster session at the Antimicrobial Society Australia conference; February 2019; Sydney: 2019.

14. Public Health Services, Department of Health and Human Services. Clostridium difficile infection (CDI) surveillance. The sensitivity and PPV of administrative data sets. Presentation at Healthcare-Associated Infections Advisory Committee meeting, ACSQHC; November 2019; Sydney: 2019.

15. Australian Institute of Health and Welfare. National Health Data Dictionary; version 16.2. Canberra: 2015.

16. Drug utilisation sub-committee, (DUSC). Analysis of proton pump inhibitor (PPI) medicines used in the management of gastrointestinal acid related disorders. 2022.

17. Gadzhanova S, Roughead E. on behalf of the Australian Commission on Safety and Quality in Health Care. Analysis of 2015–2022 PBS and RPBS antimicrobial dispensing data. Sydney: 2023.

18. Australian Commission on Safety and Quality in Health Care. Implementation guide for the Surveillance of Clostridioides difficile Infection. Sydney: 2020.

19. Pfister T, Rennert-May E, Ellison J, Bush K, Leal J. Clostridioides difficile infections in Alberta: The validity of administrative data using ICD-10 diagnostic codes for CDI surveillance versus clinical infection surveillance. American Journal of Infectection Control. 2020 Dec;48(12):1431-1436.

20. Jeon CY, Neidell M, Jia H, Sinisi M, Larson E. On the role of length of stay in Healthcare-Associated Bloodstream Infection. Infection Control and Hospital Epideminology. 2012;33 (12):1213-1218.

21. Sine K, Appaneal H, Dosa D, LaPlante KL. Antimicrobial prescribing in the telehealth setting: Framework for stewardship during a period of rapid acceleration within primary care. Clinical Infectious Diseases. 2022 Dec 19;75(12):2260-2265.

22. Spigaglia P. Clostridioides difficile infection (CDI) during the COVID-19 pandemic. Anaerobe. 2022 Apr;74:102518.

23. Zouridis S, Sangha M, Feustel P, Richter S. Clostridium difficile infection rates during the pandemic in New York Capital area: A single-center study. Cureus. 2023 Apr;15(4):e37576.

24. Pricing and Funding for Safety and Quality. Risk Adjustment Model for Hospital Acquired Complications – March 2019.

25. Australian Institute of Health and Welfare. METEOR Metadata online registry. Episode of admitted patient care—condition onset flag, code N. 2024.

26. Finn E, Andersson FL, Madin-Warburton M. Burden of Clostridioides difficile infection (CDI) - a systematic review of the epidemiology of primary and recurrent CDI. BMC Infectious Diseases. 2021 May 19;21(1):456.

27. Stewart AG, Chen SCA, Hamilton K, Harris-Brown T, Korman TM, Figtree M, et al. Clostridioides difficile infection: Clinical practice and health outcomes in 6 large tertiary hospitals in eastern Australia. Open Forum Infectious Diseases. 2023 Jun;10(6):ofad232.

28. Clohessy P, Merif J, Post JJ. Severity and frequency of community-onset Clostridium difficile infection on an Australian tertiary referral hospital campus. International Journal of Infectious Diseases. 2014 Dec;29:152-155.

29. Balsells E, Shi T, Leese C, Lyell I, Burrows J, Wiuff C, et al. Global burden of Clostridium difficile infections: a systematic review and meta-analysis. Journal of global health. 2019 Jun;9(1):010407.

30. Mora Pinzon MC, Buie R, Liou JI, Shirley DK, Evans CT, Ramanathan S, et al. Outcomes of community and healthcare-onset Clostridium difficile infections. Clinical Infectious Disease. 2019 Apr 8;68(8):1343-1350.

31. Stuart RL, Marshall C, Harrington G, Sasko L, McLaws ML, Ferguson J. ASID/ACIPC position statement - Infection control for patients with Clostridium difficile infection in healthcare facilities. Infection, disease & health. 2019 Feb;24(1):32-43.

32. Public Health Laboratory Network. Clostridiodes difficile infection (Clostridioides difficile) Laboratory case definition. May 2016.

33. European Centre for Disease Prevention and Control. European Surveillance of Clostridioides (Clostridium) difficile infections. Surveillance protocol version 2.4 ed. Stockholm: 2019.

34. Watson E, Rajkhowa A, Dunt D, Bull A, Worth LJ, Bennett N. Evaluation of an infection surveillance program in residential aged care facilities in Victoria, Australia. BMC Public Health. 2024 Jan 22;24(1):254.

35. Inghammar M, Svanström H, Voldstedlund M, Melbye M, Hviid A, Mølbak K, et al. Proton-pump inhibitor use and the risk of community-associated Clostridium difficile infection. Clinical Infectious Disease. 2021 Jun 15;72(12):e1084-e1089.

36. Moreels N, Boven A, Gressani O, Andersson FL, Vlieghe E, Callens S, et al. The combined effect of systemic antibiotics and proton pump inhibitors on Clostridioides difficile infection and recurrence. The Journal of antimicrobial chemotherapy. 2024 Mar 1;79(3):608-616.

37. Australian Commission on Safety and Quality in Health Care. Antimicrobial use in the community: 2023. Sydney:2024.

38. Feuerstadt P, Theriault N, Tillotson G. The burden of CDI in the United States: a multifactorial challenge. BMC Infectious Diseases. 2023 2023/03/07;23(1):132.

39. Markantonis JE, Fallon JT, Madan R, Alam MZ. Clostridioides difficile infection: Diagnosis and treatment challenges. Pathogens. 2024 Jan 27;13(2).

40. Tawam D, Baladi M, Jungsuwadee P, Earl G, Han J. The positive association between proton pump inhibitors and Clostridium difficile infection. Innovations in Pharmacy. 2021;12(1).

41. UK Health Security Agency. National statistics, Annual epidemiology commentary: Gram-negative, MRSA, MSSA bacteraemia and C.difficile infections, up to and including financial year 2022 to 2023. England 2024.

42. European centres for disease prevention and control. Clostridioides difficile infections. In: ECDC. Annual epidemiological report for 2018−2020. Stockholm: May 2024.

43. Centers for Disease Control and Prevention. Emerging infections program, Healthcare-associated infections – Community interface surveillance report, Clostridioides difficile infection (CDI), 2022. 2024.

44. Song JH, Kim YS. Recurrent Clostridium difficile Infection: Risk factors, treatment, and prevention. Gut Liver. 2019 Jan 15;13(1):16-24.

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