# Annual Epidemiological Report

December 2022

## *Clostridioides difficile* infection in Ireland, 2021

### Key Facts

- Due to the impact of the COVID-19 pandemic on access to healthcare in 2020, whilst 2020 rates were used for comparison within the report, we also present the annual mean of the five preceding years (2015-2019), for a more representative comparison
- In 2021, 1,766* cases of CDI were notified to public health. Of these, 1,532 (87%) were classified as new cases, 109 (6%) as recurrent and 125 (7%) as unknown case type. The national crude incidence rate for new and recurrent CDI per 100,000 population was higher than that reported in 2020 (32.8 versus 30.7; and lower than 39.0, the annual mean of 2015-2019). The majority of CDI was reported in patients aged ≥65 years (65%)
- The vast majority of notified cases of CDI were also reported to the voluntary enhanced CDI surveillance scheme (n=1,774; 97%) by 59 participating hospitals. Healthcare-associated (HCA) CDI accounted for the origin of 54% (n=964) of all cases, equating to a national incidence rate for new and recurrent HCA-CDI, that originated within the participating hospital, of 2.1 per 10,000 bed days used (BDU), which was lower than that of 2020 (2.4); and of the 2015-2019 annual mean (2.4)
- Information on the patient's location at CDI symptom onset showed 46% of patients were in the community and 11% were reported as healthcare onset in a long-term care facility
- Of community-acquired (CA) CDI, 93% experienced onset of symptoms in the community outside of a HCF and without discharge from a HCF in the previous 12 weeks
- Just 20% (n=356) of CDI cases reported to enhanced surveillance had associated ribotyping data, with 25 hospitals providing this information. The most frequently isolated ribotypes in 2021 were: 078 (n=58; 16%), 002 (n=33; 9%), 014 (n=32; 9%), 020 (n=29; 8%) and 005 (n=24; 7%)

*A further 67 late notifications of 2021 cases were notified to public health in 2022 bringing the total to 1,833

Suggested citation: HSE Health Protection Surveillance Centre. *Clostridioides difficile* infection in Ireland 2021: Dublin HSE HPSC; 2022

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# Background

New cases of *Clostridioides difficile* infection (CDI) in persons aged two years or older became notifiable in May 2008 to Departments of Public Health via the Computerised Infectious Disease Reporting (CIDR) system. In January 2012, recurrent CDI cases also became notifiable[1].

Since August 2009, enhanced data on CDI origin, onset and severity is captured through the voluntary national enhanced surveillance system, rather than on CIDR, according to a standardised surveillance protocol[2]. By 2021, 59 acute hospitals (47 publicly-funded and 12 private) participated in enhanced CDI surveillance.

# Epidemiology

## Notifiable *C. difficile* infection

In 2021, 1,766* CDI cases were notified to Departments of Public Health. The national crude incidence rate (CIR) for new and recurrent CDI per 100,000 population was higher than that reported in 2020 (32.8 versus 30.7), but lower than the mean of the previous five years 2015-2019 (39.0) as shown in Table 1.

An increase in the rate of CDI notifications was evident in 2021, when compared with 2020, which would have been impacted by the COVID-19 pandemic, as shown in Figure 1. The proportion of notifications assigned a case type (new or recurrent) increased from 89% in 2020 to 93% in 2021 (and decreased slightly from the mean of 91% for 2015-2019) with the proportion of those without an assigned case type decreasing from 11% in 2020 to 7% in 2021 (with an annual mean of 9% for 2015-2019).

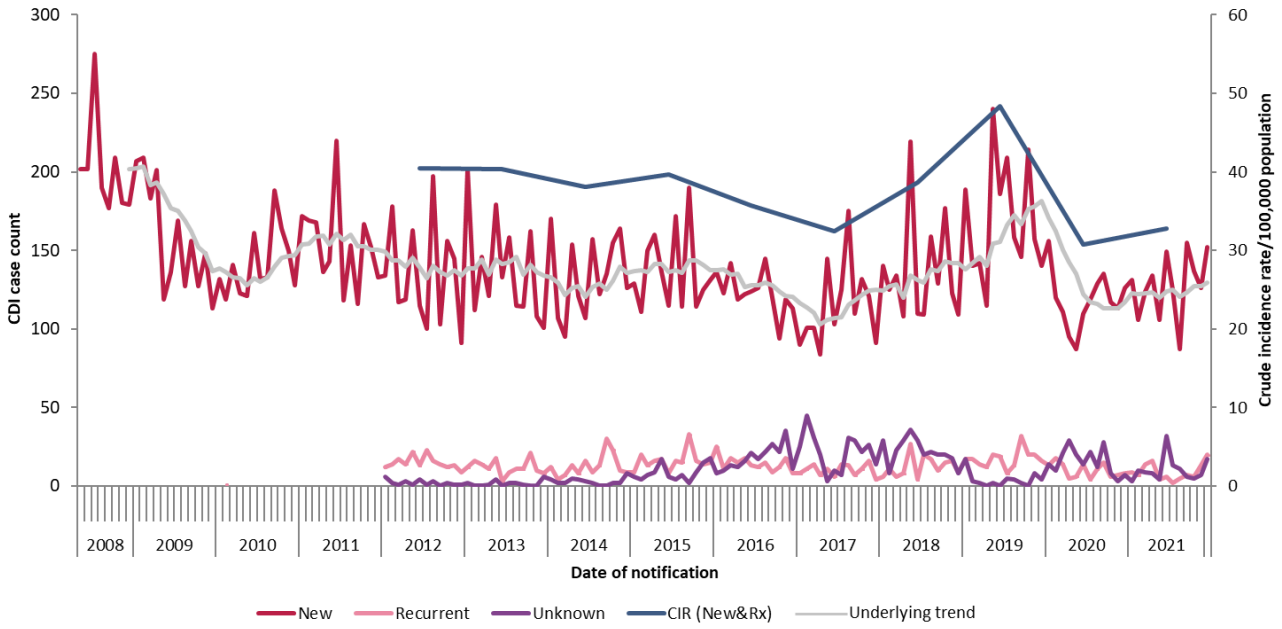
**Table 1. CDI notifications reported to CIDR, 2015-2021**

| Mandatory CIDR notifications to public health | 2021 | 2020 | 2015-2019 (mean) |
|---|---|---|---|
| **Number of notifications** | **1,766** | **1,727** | **1,984.2** |
| Number of new notifications | 1,532 (87%) | 1,418 (82%) | 1,637.2 (83%) |
| Crude incidence rate* (new & recurrent cases) | 32.8 | 30.7 | 39.0 |
| Number of outbreaks | 4 | 6 | 11.8 |

*Crude incidence rate is the number of new and recurrent notifications per 100,000 population. The 2020 & 2021 rates were calculated using the provisional 2022 census data, excluding children <2 years. The proportion aged <2 years was estimated using CSO population estimates for 2021. The 2015 to 2019 rates were based on 2016 census data. (Source: CIDR)

* One tertiary hospital in the Ireland East hospital group and one general hospital in the RCSI hospital group reported 67 late CIDR notifications to public health for 2021 in week 48, 2022, resulting in a true total of 1,833 notifications to public health for 2021

**Figure 1. Number of CDI notifications by month and case type in Ireland, 2008 – 2021**

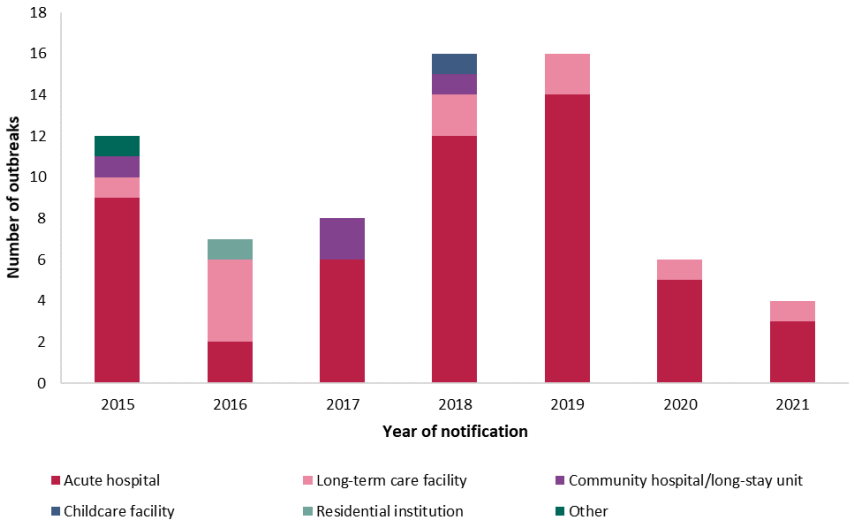



Source: CIDR

## Outbreaks of CDI

In 2020, four outbreaks of CDI were notified, all of which were healthcare-associated: three were associated with acute hospitals and one outbreak was reported in a long-term care facility (Figure 2).

**Figure 2. Number of CDI outbreaks by year and setting in Ireland, 2015 – 2021**




Source: CIDR

## Enhanced surveillance of *C. difficile* infection

There were 1,774 CDI cases reported to the voluntary enhanced surveillance scheme by 59† hospitals (96% of public hospitals and 67%[3] of the increasing number of private hospitals reported upon patients with CDI) (Table 2). Since 2012, participation in enhanced CDI surveillance has stabilised, with all tertiary and general hospitals providing data. One tertiary hospital was unable to provide returns for Q3 & Q4 2021, impacting on the reported rate for those quarters. Thus, the true burden of CDI in Q3 & Q4 2021 may have been greater than that reported.

Of 1,774 cases reported in 2021, 1,542 (87%) were new, 8.5% recurrent and 4.5% of unknown case type. The majority of cases occurred in females (60%), as shown in Figure 3. The mean age was 68.1 years (range: 2-99 years), with the highest proportion (n=1,200; 68%) in patients ≥65 years.

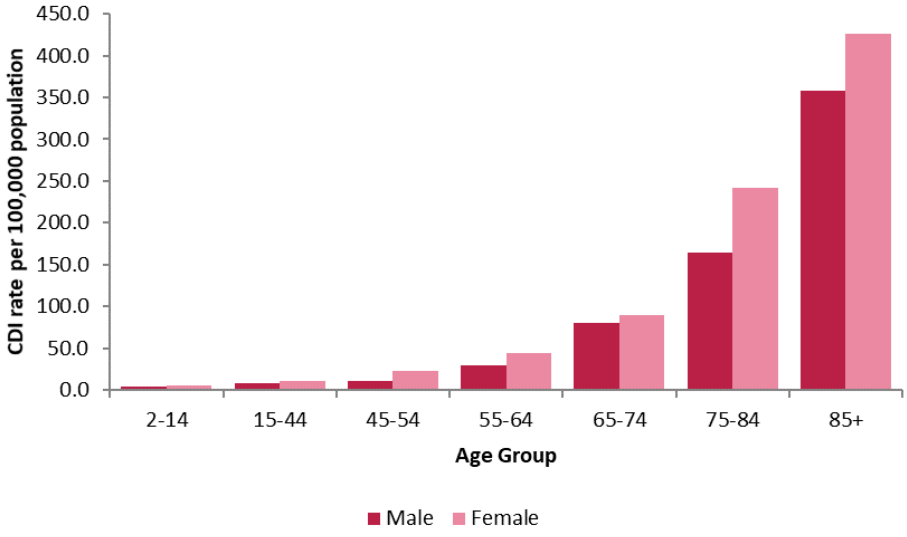
**Table 2. CDI cases reported to enhanced surveillance system in Ireland, 2020 & 2021**

| Voluntary enhanced surveillance system cases | 2021 | 2020 | 2015-2019** |
|---|---|---|---|
| **Cases reported to enhanced surveillance system** | **1,774** | **1,756** | **1,993.6** |
| Number of new cases | 1,542 (87%) | 1,513 (86%) | 1,694 (85%) |
| Number of hospitals participating (public & private) | 59 (47 & 12) | 57 (46 & 11) | 54-57 |
| CDI incidence rate* (all hospital-acquired cases) | 2.1 | 2.4 | 2.4 |
| **Origin: Location where infection was acquired** | | | |
| • Healthcare-associated cases | 964 (54%) | 993 (56%) | 1,218 (61%) |
| – *Reporting hospital* | *793 (82%)* | *840 (85%)* | *942.8 (77%)* |
| – *Long-term care facility* | *95 (10%)* | *80 (8%)* | *172.4 (14%)* |
| – *Other hospital* | *69 (7%)* | *67 (7%)* | *91 (7%)* |
| – *Unknown healthcare facility* | *7 (1%)* | *6 (1%)* | *11.8 (1%)* |
| • Community-associated cases | 591 (33%) | 509 (29%) | 472 (24%) |
| • Discharged within 4-12 wks from HCF | 114 (6%) | 138 (8%) | 137.6 (7%) |
| • Unknown origin | 105 (6%) | 116 (7%) | 166 (8%) |
| **Onset: Location where patient symptoms occurred** | | | |
| • Healthcare onset | 915 (52%) | 924 (53%) | 1,137.8 (57%) |
| – *Reporting hospital* | *764 (83%)* | *773 (84%)* | *881.8 (78%)* |
| – *Long-term care facility* | *97 (11%)* | *91 (10%)* | *171.6 (15%)* |
| – *Other hospital* | *37 (4%)* | *40 (4%)* | *58.4 (5%)* |
| – *Unknown location* | *17 (2%)* | *20 (2%)* | *26 (2%)* |
| • Community onset | 812 (46%) | 774 (44%) | 759.4 (38%) |
| • Unknown onset | 47 (3%) | 58 (3%) | 96.4 (5%) |
| **Severity** | | | |
| Requiring ICU admission or colectomy | 51 (3%) | 35 (2%) | 37 (2%) |

*CDI incidence rate is the number of new and recurrent cases per 10,000 bed days used. Bed days used data provided by HSE Business Information Unit. ** Annual mean number of cases reported for 2015-2019 inclusive. (Source: HPSC)

† One tertiary hospital in the South/South West hospital group did not provide CDI enhanced surveillance data for Q3 or 4, 2021, bringing the percentage of participating acute publicly-funded hospitals from 96% in Q1 & Q2 to 91% in Q3 & Q4

**Figure 3. Age and gender distribution of CDI in Ireland, 2021**

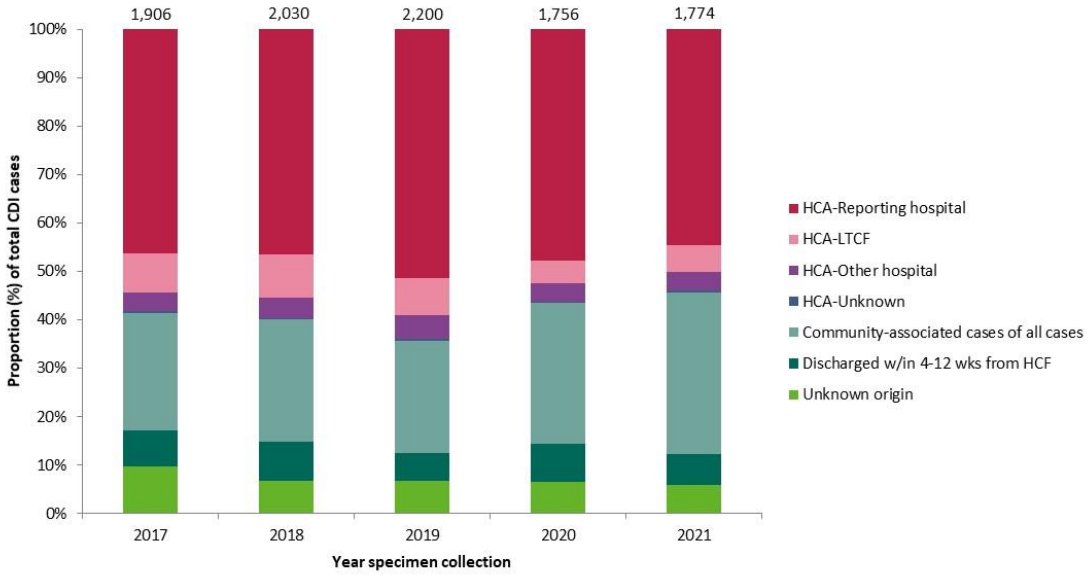



Rates calculated using CSO population estimates for April 2021 excluding children <2 years (Source: HPSC)

## Origin of infection

Figure 4 displays annual trends in the breakdown of CDI by origin of infection. Of all cases of CDI (new, recurrent and unknown case type) reported in 2021, 964 (54%) originated within a healthcare facility (HCA), compared with 56% in 2020 (and 61% for 2015-2019), with 45% (n=793) of all cases in 2021 originating within the reporting hospital. A greater proportion of CDI cases (n=591; 33%) in 2021 were community-associated (CA) compared with 2020 (29%) or between 2015-2019 (mean 24%).

**Figure 4. Origin of CDI in Ireland by facility type, 2017-2021**




Source: HPSC

Of 964 cases associated with a healthcare facility (HCA), 838 (87%) experienced onset of CDI symptoms at least 48 hours following admission to a healthcare facility (HCA, HO), Table 3. A further 13% (n=125) experienced symptom onset in the community within four weeks of discharge from a healthcare facility (HCA, CO).

Of 591 community-associated (CA) cases, 547 (93%) experienced CDI symptom onset while outside a healthcare facility and without history of discharge from a healthcare facility within the previous 12 weeks (CA, CO). Forty-four (7%) cases experienced symptom onset within the first 48 hours of admission to a healthcare facility, without a history of admission to, or residence in, a healthcare facility within the previous 12 weeks (CA, HO).

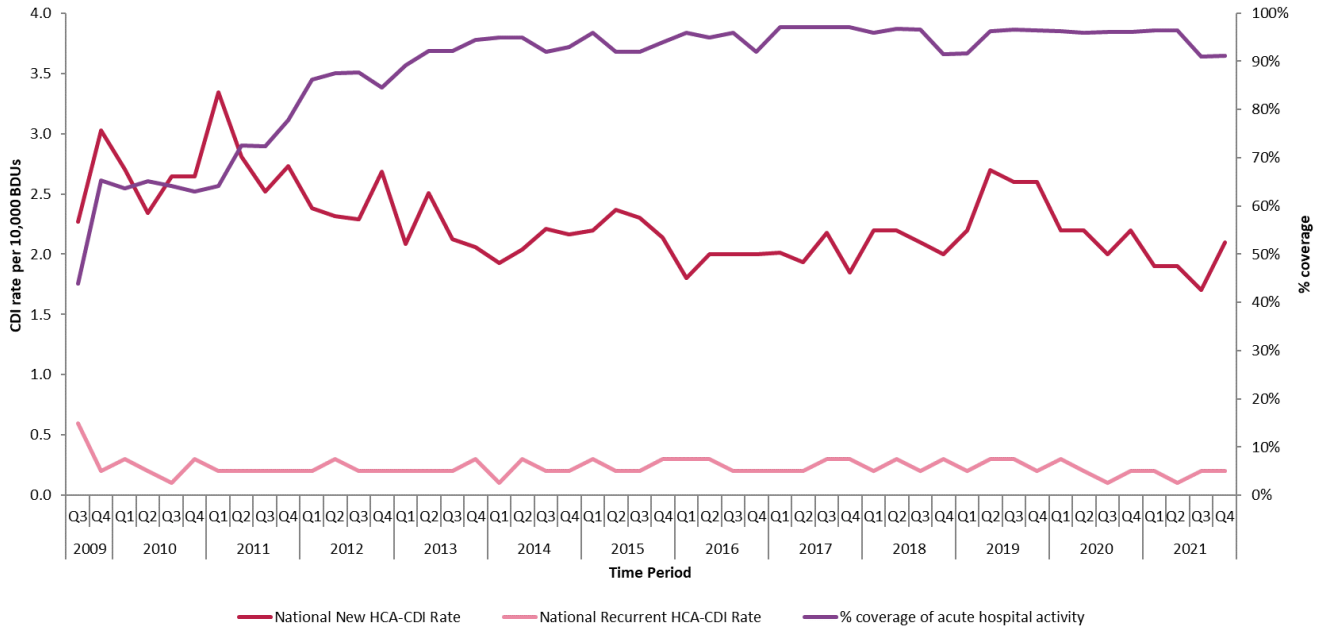
**Table 3. Origin of infection and location at onset of symptoms in CDI cases, 2021**

| | | | ONSET | | | | Total (%) |
|---|---|---|---|---|---|---|---|
| | | | Community onset (CO) | Healthcare onset (HO) | Unknown onset | *Total HCA* | |
| ORIGIN | Community-associated* (CA) | | 547 | 44 | 0 | | **591 (33%)** |
| | Healthcare-associated** (HCA) | *- Reporting hospital (HA)* | *98* | *695* | *0* | ***793*** | **964 (54%)** |
| | | *- Other hospital* | *24* | *44* | *1* | ***69*** | |
| | | *- Nursing home/LTCF* | *1* | *94* | *0* | ***95*** | |
| | | *- Unknown* | *2* | *5* | *0* | ***7*** | |
| | | | ***125 (13%)*** | ***838 (87%)*** | ***1*** | | |
| | Dx 4-12 weeks† (UA) | | 96 | 16 | 2 | | **114 (6%)** |
| | Unknown | | 44 | 17 | 44 | | **105 (6%)** |
| | Total (%) | | **812 (46%)** | **915 (52%)** | **47 (3%)** | | 1,774 |

*Community-association refers to cases which were not admitted to a HCF in the previous 12 weeks and may include cases with exposure to healthcare facilities for < 48 hours during that time. **Healthcare-association refers to cases admitted for > 48 hours to a healthcare facility anytime in the 4 weeks prior to symptom onset. Healthcare-association includes cases admitted to nursing homes/long-term care facilities (LTCF). HCA cases with 'other hospital' as facility refer to imported hospital-acquired (HA) CDI. †Dx 4-12 weeks is used where cases have been discharged from a healthcare facility between 4 and 12 weeks before symptom onset and as a result it is unclear whether infection was associated with hospital or community acquisition.

At 2.1 cases per 10,000 bed days used (BDU), the incidence of HCA-CDI was lower than in 2020 (2.4) or 2015-2019 (mean 2.4), as displayed in Figure 5. The breakdown of HCA-CDI by case type remained stable compared with 2020 and the rate remains slightly lower than levels pre-2019, when the national outbreak of HCA ribotype 002 occurred.

**Figure 5. Quarterly national rate of healthcare-associated CDI (new and recurrent) in Ireland, 2009-2021**




Source: HPSC

## Location at symptom onset

CDI symptom onset occurred in a healthcare facility (healthcare-onset; HO) for 52% of cases (n=915), while 46% (n=812) had symptom onset in the community (community-onset; CO). The location at CDI onset was unknown for 3% (n=47), see Table 2.

Of the 915 HO cases, 76% (n=695) had onset in the reporting hospital and 10% (n=94) in a long-term care facility, as shown in Table 3.

The proportion of CO cases increased from 38% in 2015-2019 (mean=759.4); to 44% (n=774) in 2020; and 46% (n=812) in 2021, the highest proportion to date. Of the 812 cases with onset in the community, 67% (n=547) were also acquired in the community and without admission for >48 hours to a healthcare facility in the previous 12 weeks (CO, CA) and 15% (n=125) had been discharged from a healthcare facility within the previous four weeks (CO, HA), Table 3.

## Severe CDI

A severe case is defined as (i) a patient requiring admission to an intensive care unit (ICU) for treatment of CDI or its complications or (ii) requiring colectomy surgery or (iii) death within 30 days after diagnosis. Information on patient outcome is not currently collected in CDI enhanced surveillance, so two markers of severity, surgery and ICU admission are captured. There were 51 severe CDI cases (3%) reported in 2021, higher than the 35 (2%)

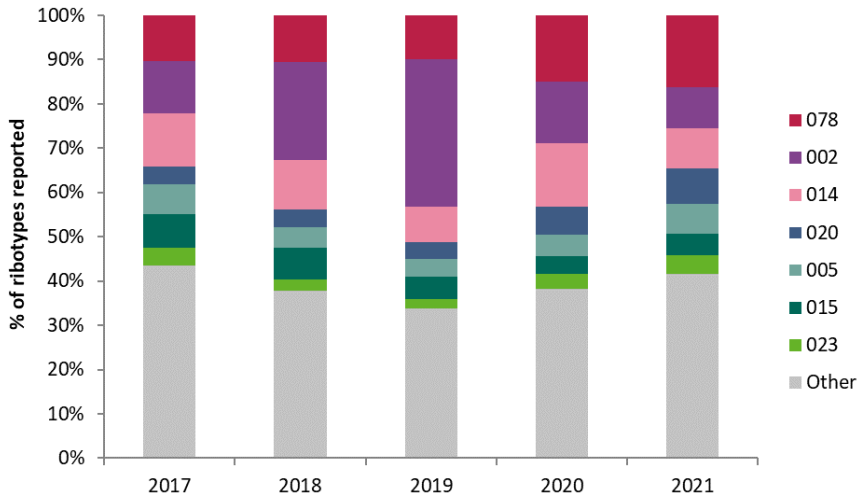
reported in 2020 and the annual mean of 37 for 2015-2019 and the highest number of severe CDI cases reported to the scheme to date. Thirty-six patients required ICU admission without surgery, 11 patients required surgery without ICU admission, two required ICU admission with surgery status reported as unknown and two patients required both surgery and an ICU admission.

## *C. difficile* PCR ribotyping

Ribotyping information was reported for just 356 (20%) cases of CDI reported to enhanced surveillance. As Ireland had no designated national *C. difficile* reference laboratory in 2021, microbiology laboratories referred specimens to reference laboratories abroad for ribotyping. The most frequently reported ribotypes in 2021 were: 078 (16%), 002 and 014 with equal frequency (9% each), 020 (8%) and 005 (7%). The same five most frequently reported ribotypes were associated with similar frequency in both new and recurrent infections. Ribotype 078 was associated with three of the severe cases of CDI in 2021.

With the national profile of the most frequently detected ribotypes was similar in recent years (Figure 6), the increase in ribotype 002 which had peaked at 33% of ribotyped cases in 2019 has fallen back to historical levels of 9% in 2021. A slow increase in the proportion of cases with ribotype 020 year on year is becoming evident, which is at 8% (n=29) of ribotpyed cases in 2021 (with 6% in 2020 and 4% in 2019). No cases of the virulent ribotype 027 were detected in Ireland in 2021.

**Figure 6. Most frequently reported *C. difficile* ribotypes in Ireland: 2017-2021**




Source: HPSC

### *C. difficile* treatment

Fifty-eight percent of cases (n=1,026) reported the antibiotic used as a first line of treatment for *C. difficile* infection. Of these, 50% (n=516 cases) were reported as having received metronidazole; 33% (n=339) received vancomycin; and 14% (n=147) received fidaxomycin. A further 2% (n=20 cases) were administered metronidazole & vancomycin; two cases received a combination of vancomycin & piperacillin/tazobactam and two cases were reported as having received fidaxomycin & vancomycin.

Metronidazole was the treatment most frequently administered to patients presenting with new cases of CDI (31%) and vancomycin was most frequently used for treatment of recurrent CDI (30%).

## Discussion

The COVID-19 pandemic had an impact on the access of patients to healthcare in 2020 resulting in a reduction of reported cases of CDI to both surveillance systems that year. We had observed an increase in hospital-acquired CDI in 2019 (due to a national outbreak of ribotype 002) and in order to present accurate comparisons of the annual rate for 2021, we have included that of 2020 and of the annualised mean of the preceding five years, 2015-2019.

The collation of national CDI data through notifications and the enhanced surveillance system has provided a valuable insight into its epidemiology and burden in Ireland. The reduction in numbers of CDI cases which had been reported to both systems in 2020, most likely impacted by the COVID-19 pandemic in Ireland, increased slightly to both in 2021. The true number of cases is underestimated due to (i) the lack of reporting of cases to the enhanced surveillance system by one tertiary hospital for quarters 3 and 4 and (ii) delayed reporting of mandatory notifications to public health by two hospitals.

The trend towards community-acquisition of CDI in Ireland was again evident in 2021 with the highest proportion to date (one-third) of all CDI cases originating within the community. Onset of symptoms of CDI occurred in the community for 46% of patients, a trend which has also been shown to be increasing in recent years. Of these patients with community onset, a significant 93% had acquired the infection in the community and without admission for 48 hours or more to a healthcare facility in the previous 12 weeks. A more accurate understanding of what constitutes a case defined as community-associated needs to be further explored, with more patients accessing medical treatment in outpatient settings.

With the rise of community onset and acquisition, a concurrent continued reduction in the proportion of hospital-acquired CDI was seen in 2021.

The proportion of cases associated with long-term care facilities has increased slightly, reversing a trend seen in recent years, to just 5.4% of all (10% of healthcare-associated) cases in 2021.

2021 also saw the greatest impact of CDI with the highest number of severe cases observed since enhanced surveillance began.

The number of outbreaks is also thought to be an under-estimation of the true situation in Ireland. It is hoped that improved reporting of hospital and community-based outbreaks will occur and that the provision of whole genome sequencing by a national reference laboratory will facilitate this.

While the newly commissioned national *C. difficile* reference laboratory has been established in 2022, the limitation of not having one in 2021 means an up-to-date picture of the epidemiology of *C. difficile* in Ireland is not available.

## Public health implications

The continued excellent participation in the voluntary CDI enhanced surveillance scheme ensures that valuable additional information is collected regarding the epidemiology and burden of CDI in Ireland. The National Clinical Guidelines on the Surveillance, Diagnosis and Management of CDI in Ireland[4] were updated in 2013 and endorsed by the National Clinical Effectiveness Committee in 2014.

## Technical notes

Data used in this report were extracted from CIDR on 25/09/2022.

Crude incidence rates were calculated using census of the population denominator data or population estimates (available from the Central Statistics Office (CSO) www.cso.ie). The population aged 2 years and above was taken from Census 2016 for analysis of the 2015-2019 data and from CSO preliminary results for 2022 for analysis of the 2020 & 2021 data with the proportion < 2 years old in 2022 estimated using 2021 population estimates. The data were presented per 100,000 population. (https://www.cso.ie/en/releasesandpublications/ep/p-cpr/censusofpopulation2022-preliminaryresults/)

Hospital acquired rates of CDI were calculated using the denominator of bed days used (BDU) per quarter/year. BDU data for publicly-funded hospitals were provided by the Business Information Unit of the HSE. The figures were presented per 10,000 BDU.

## Further information available on HPSC website

https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/clostridioidesdifficile/

## Acknowledgements

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## Report prepared by:

**Tara Mitchell and Susanna Frost, HPSC**

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2. Health Protection Surveillance Centre. Enhanced Surveillance of *Clostridium difficile* infection in Ireland. Protocol for Completion of Enhanced Surveillance Information v3.5. July 2014.
   Available from: https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/clostridioidesdifficile/enhancedsurveillance/File,13927,en.pdf
3. The number of acute private hospitals is taken from the acute private hospitals participating in the Private hospitals Association (PHA) http://privatehospitals.ie/members/ and Beacon hospital, Dublin who participate in the enhanced surveillance scheme
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