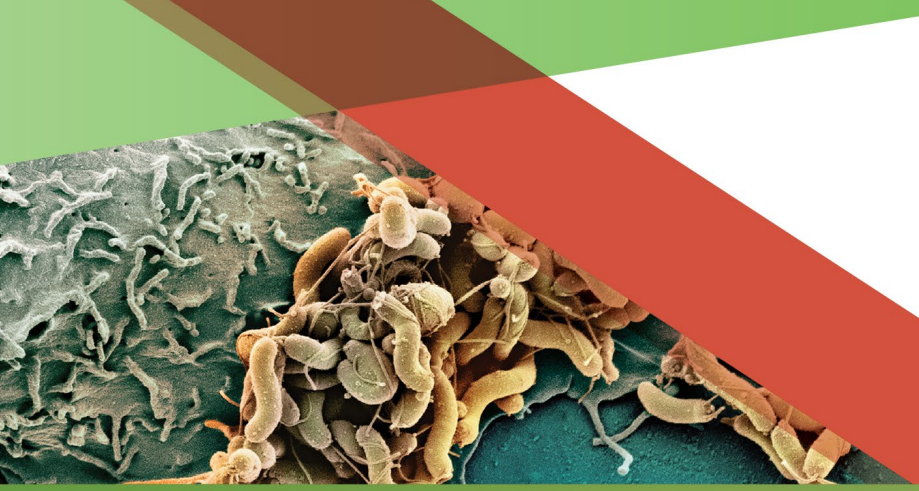

SURVEILLANCE REPORT

Campylobacteriosis

Annual Epidemiological Report for 2021

Key facts

- Campylobacteriosis is the most commonly reported gastrointestinal disease in the EU/EEA.
- In 2021, 30 EU/EEA countries reported 129 960 confirmed cases of campylobacteriosis, with Liechtenstein reporting cases for the first time.
- The overall EU/EEA notification rate was 44.5 cases per 100 000 population.
- The campylobacteriosis notification rate was highest in children under five years of age.
- Campylobacteriosis notification rates in the five years preceding the COVID-19 pandemic have been stable. After a significant decline in cases in 2020, primarily as a consequence of the pandemic, case numbers increased by 5.6% in 2021.
- Campylobacteriosis shows clear seasonality, with a sharp peak of cases in the summer months and a smaller peak at the beginning of the year.

Introduction

Campylobacteriosis is an acute diarrhoeal enteritis mainly caused by one of the two species: *Campylobacter jejuni* or *C. coli*. The incubation period is typically 2–5 days after infection. The symptoms start with abdominal cramps followed by watery diarrhoea, which is often accompanied with fever, headache, and muscle aches. In about one third of cases, blood may appear in stools. The infection is usually self-limiting within a week but may require hospital care in about 5–10% of cases. Acute infection may lead to rare late-onset complications like reactive arthritis or Guillain-Barré syndrome, acute neuromuscular paralysis. *Campylobacter* bacteria are common in animals (e.g. poultry, cattle, pigs, and wild birds), which serve as reservoirs and develop no clinical symptoms. Human infection usually occurs via the consumption of contaminated food (e.g. poultry meat) or drinking water from private wells. Swimming in natural waters has also been shown as a risk factor for infection.

Methods

This report is based on data for 2021 retrieved from The European Surveillance System (TESSy) on 9 October 2022. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

For a detailed description of methods used to produce this report, please refer to the Methods chapter in Introduction to the Annual Epidemiological Report [1]. An overview of the national surveillance systems is available online [2].

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Stockholm, December 2022

A subset of the data used for this report is available through ECDC's online Surveillance Atlas of Infectious Diseases [3].

The notification of campylobacteriosis is mandatory in 22 EU Member States, Iceland, Liechtenstein, and Norway. In five EU Member States (Belgium, France, Greece, Italy, and the Netherlands) notification is voluntary. The surveillance systems for campylobacteriosis have full national coverage in all EU Member States except four (France, Italy, the Netherlands, and Spain). The coverage of the surveillance system in 2021 is estimated to be 20% in France and 64% in the Netherlands. These proportions were used when calculating notification rates for these two EU Member States. No estimate of population coverage in Italy and Spain was provided, so notification rates were not calculated for these two countries. The drop in cases in Luxembourg in 2019 is a surveillance artefact caused by a change to non-culture-based methods (PCR) in private laboratories, resulting in a reduced number of isolates sent to the national reference laboratory. From 2020, laboratory confirmation with PCR is included in the notification system which, along with a new electronic laboratory notification system, is expected to result in an increase in *Campylobacter* notifications. Greece has reported data on laboratory-confirmed cases collected from public hospitals from 2018 onwards. For 2020 and 2021, Spain has not yet received data from all regions normally reporting and the case numbers are therefore lower than expected. All countries reported case-based data except Belgium, Bulgaria, and Greece, which report aggregated data. Both reporting formats were included to calculate numbers of cases, notification rates, disease trends, and age and gender distributions.

For 2020–2021, no data were reported by the United Kingdom (UK) due to its withdrawal from the EU on 31 January 2020.

Twenty-four EU/EEA countries reported antimicrobial resistance data for *Campylobacter* spp. for 2021. Twenty-two countries reported phenotypic resistance data (15 as disk zones or MIC values, and seven as interpretation with clinical breakpoints). Two countries reported resistance predicted from whole genome sequencing.

Epidemiology

For 2021, 30 EU/EEA countries reported 129 960 confirmed cases of campylobacteriosis, including data for Liechtenstein for the first time since 2008 (Table 1). This represents a slight increase by 5.6 % compared with cases reported in 2020 in the EU/EEA (the UK not reporting data from 2020 onwards). Between 2017 and 2021, Czechia, Germany, and Spain accounted for 12.5%, 36.9%, and 8.7%, respectively, of all confirmed cases in the EU/EEA in this five-year period. The overall EU/EEA notification rate in 2021 was 44.5 cases per 100 000 population (range by countries 1.6–152.4) (Table 1). The countries with the highest notification rates were Czechia and Slovakia (Table 1, Figure 1). The lowest rates were reported in Bulgaria, Cyprus, Greece, Poland, and Romania. Compared with 2017, the most notable reductions (≥ 50%) in notification rates were reported in Belgium, Finland, Iceland, Lithuania, and Sweden.

The outcome was reported for 71.3% of confirmed campylobacteriosis cases by 16 EU/EEA countries. The number of reported deaths attributed to campylobacteriosis was 26 in 2021, resulting in a stable case fatality rate of 0.03% (range 0.03%-0.05% in the previous five years) in the EU/EEA. Of the cases with available data (n= 47 112), 23.9% were hospitalised in 2021.

Of the 3,138 travel-associated cases reported by MSs with a known country of infection, 2,063 cases (65.7%) were linked to travel within the EU. The travel-associated cases within the EU increased by 17.3% in 2021 compared with 2020 (n=2 676) but were still about 10% lower compared with pre-pandemic period 2017-2019.

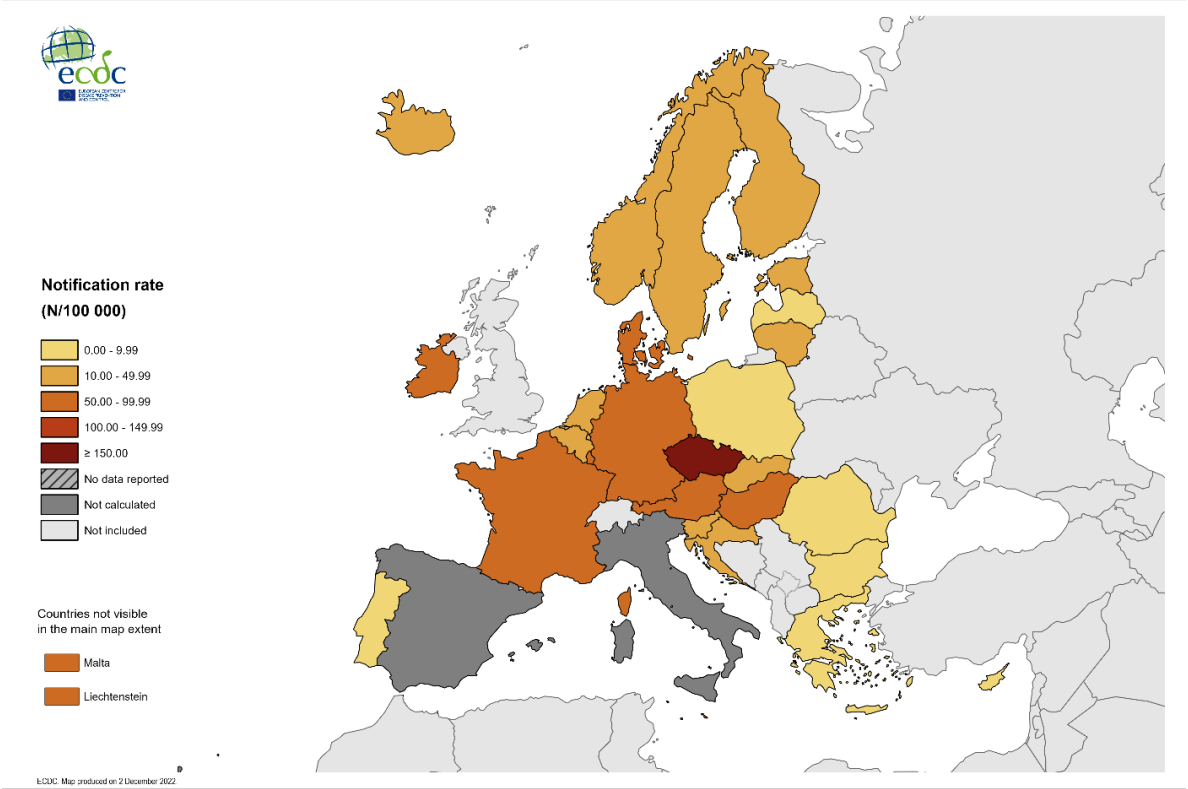
Table 1. Distribution of confirmed campylobacteriosis cases and rates per 100 000 population by country and year, EU/EEA, 2017–2021

Country	2017		2018		2019		2020		2021		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	7 204	82.1	7 999	90.7	6 572	74.2	5 406	60.7	6 019	67.4	69.5
Belgium	8 649	76.2	8 086	70.9	7 337	64.0	5 693	49.4	3 273	28.3	27.9
Bulgaria	195	2.7	191	2.7	229	3.3	127	1.8	130	1.9	2.1
Croatia	1 686	40.6	1 965	47.9	1 722	42.2	1 054	26.0	1 148	28.4	30.8
Cyprus	20	2.3	26	3.0	21	2.4	18	2.0	24	2.7	2.8
Czechia	24 326	230.0	22 895	215.8	22 894	215.0	17 517	163.8	16 305	152.4	158.8
Denmark	4 255	74.0	4 559	78.9	5 402	93.0	3 742	64.3	3 740	64.0	63.7
Estonia	285	21.7	411	31.2	347	26.2	265	19.9	185	13.9	14.5
Finland	4 289	77.9	5 099	92.5	4 382	79.4	2 074	37.5	1 798	32.5	32.6
France	6 579	49.2	7 491	55.9	7 712	57.4	7 920	58.8	8 875	65.6	65.4
Germany	69 251	83.9	67 585	81.6	61 277	73.8	46 378	55.8	47 912	57.6	57.7
Greece	344	3.2	357	3.3	366	3.4	218	2.0	260	2.4	-

Country	2017		2018		2019		2020		2021		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Hungary	7 807	79.7	7 117	72.8	6 400	65.5	4 461	45.7	5 088	52.3	55.5
Iceland	119	35.2	145	41.6	136	38.1	95	26.1	58	15.7	16.2
Ireland	2 779	58.1	3 044	63.0	2 776	56.6	2 419	48.7	3 147	62.9	61.7
Italy	1 060	NR	1 356	NR	1 633	NR	1 418	NR	1 542	NR	NR
Latvia	59	3.0	87	4.5	133	6.9	104	5.5	158	8.3	8.5
Liechtenstein	ND	NR	ND	NR	ND	NR	ND	NR	38	97.3	96.5
Lithuania	990	34.8	919	32.7	1221	43.7	684	24.5	357	12.8	13.3
Luxembourg	613	103.8	625	103.8	271	44.1	729	116.4	589	92.8	95.3
Malta	231	50.2	333	70.0	278	56.3	206	40.0	378	73.2	74.2
Netherlands	2 890	32.5	3 091	34.6	3 415	34.1	2 549	25.2	2 692	24.1	23.9
Norway	3 883	73.8	3 668	69.3	4 154	78.0	2 422	45.1	2 049	38.0	38.0
Poland	874	2.3	719	1.9	715	1.9	414	1.1	616	1.6	1.7
Portugal	596	5.8	610	5.9	887	8.6	790	7.7	973	9.4	11.3
Romania	467	2.4	573	2.9	805	4.1	300	1.6	348	1.8	1.8
Slovakia	6 946	127.8	8 339	153.2	7 690	141.1	4 921	90.2	6 099	111.7	113.5
Slovenia	1 408	68.2	1 305	63.1	1 085	52.1	811	38.7	856	40.6	43.4
Spain	18 860	NR	18 410	NR	9 658	NR	6 891	NR	11 244	NR	NR
Sweden	10 608	106.1	8 132	80.4	6 693	65.4	3 435	33.3	4 059	39.1	39.3
United Kingdom	63 267	96.1	65 246	98.4	58 718	88.1	ND	NR	ND	NR	NR
EU-EEA	**250 540**	**63.3**	**250 383**	**64.1**	**224 929**	**59.9**	**123 061**	**42.8**	**129 960**	**44.5**	**44.9**

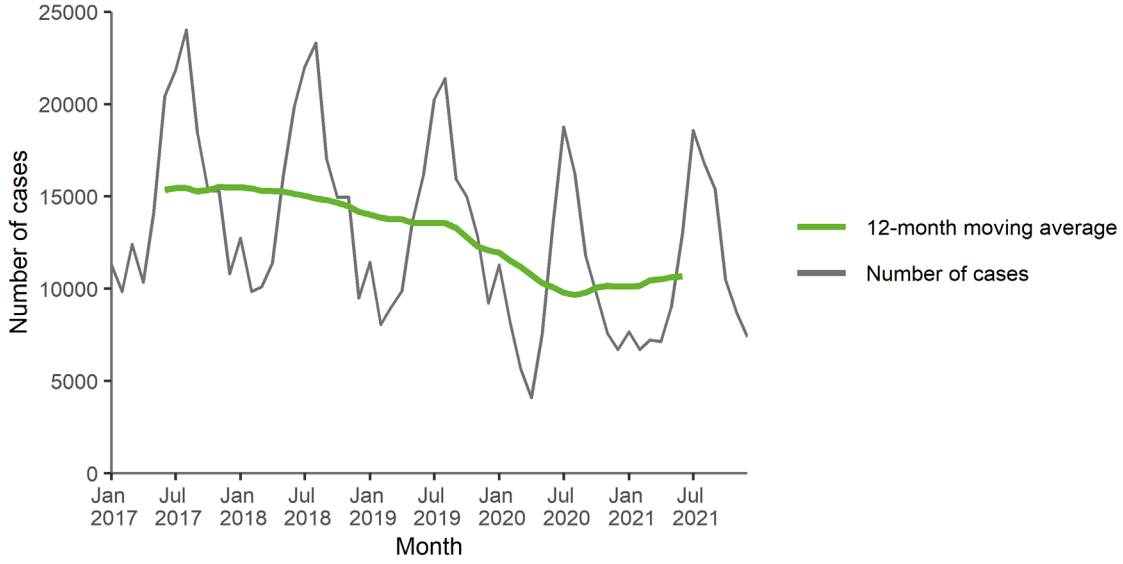
Source: Country reports.
ASR: age-standardised rate.
ND: no data reported. Data have not been collected from the UK since 2020, as the country left the EU on 31 January 2020.
NR: no rate calculated.

Figure 1. Distribution of confirmed campylobacteriosis cases per 100 000 population by country, EU/EEA, 2021



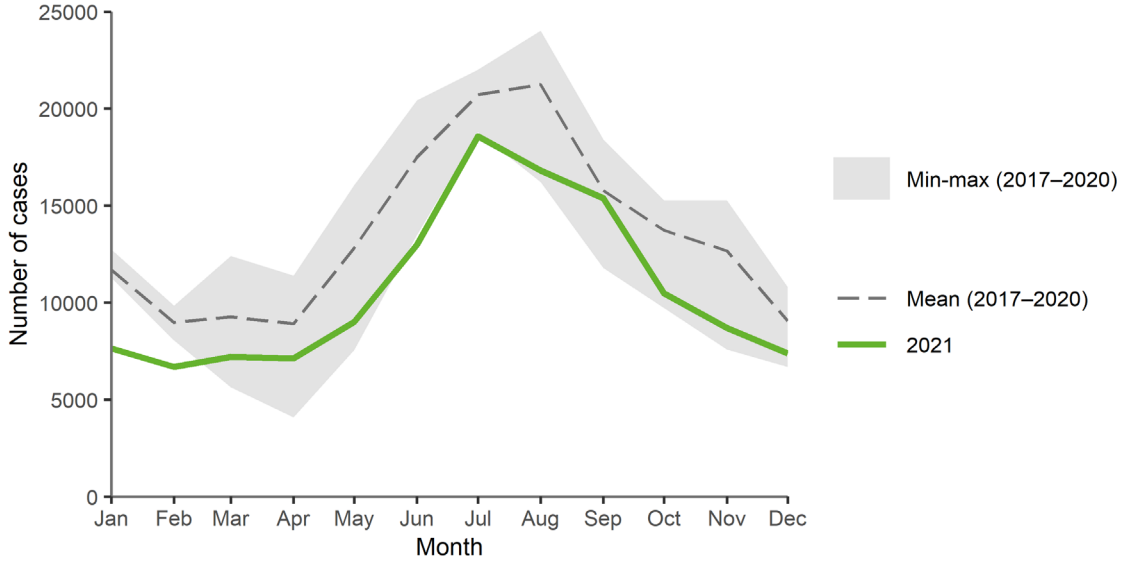
Human cases of reported campylobacteriosis followed a clear seasonality consistent with previous years, with most cases being reported from June to September in 2021 (Figures 2,3). Small January peaks were observed in 2017–2020 but not this was not so pronounced in 2021. In 2021, the reported cases by month were below the mean of 2017–2021 (Figure 3).

Figure 2. Distribution of confirmed campylobacteriosis cases by month, EU/EEA, 2017–2021



Source: Country reports from Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

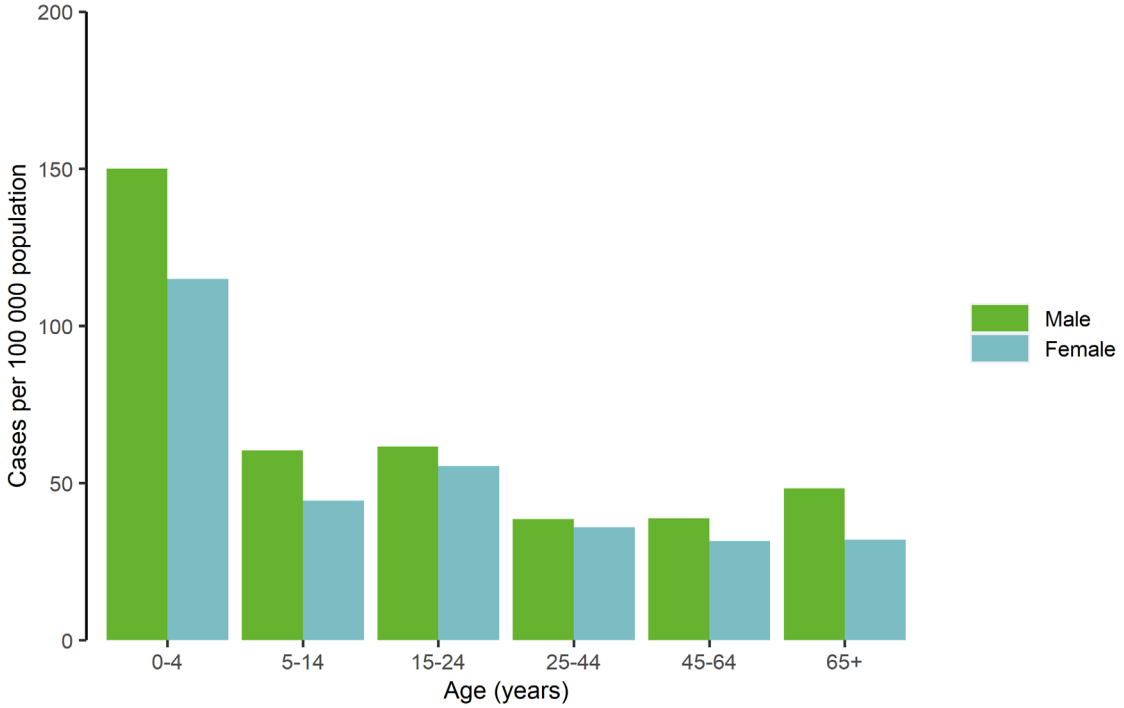
Figure 3. Distribution of confirmed campylobacteriosis cases by month, EU/EEA, 2021 and 2017–2020



Source: Country reports from Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

In 2021, adults aged between 25 and 64 years accounted for 41.7% of the 129 624 confirmed cases with known age. The notification rate was highest, 133.0 cases per 100 000, in children aged below 5 years (ranging by country from 4.2 to 859.4). Higher rates in males than females were observed in all six age groups (Figure 4). The overall male-to-female ratio was 1.2:1, as in previous years.

Figure 4. Distribution of confirmed campylobacteriosis cases per 100 000 population, by age and gender, EU/EEA, 2021

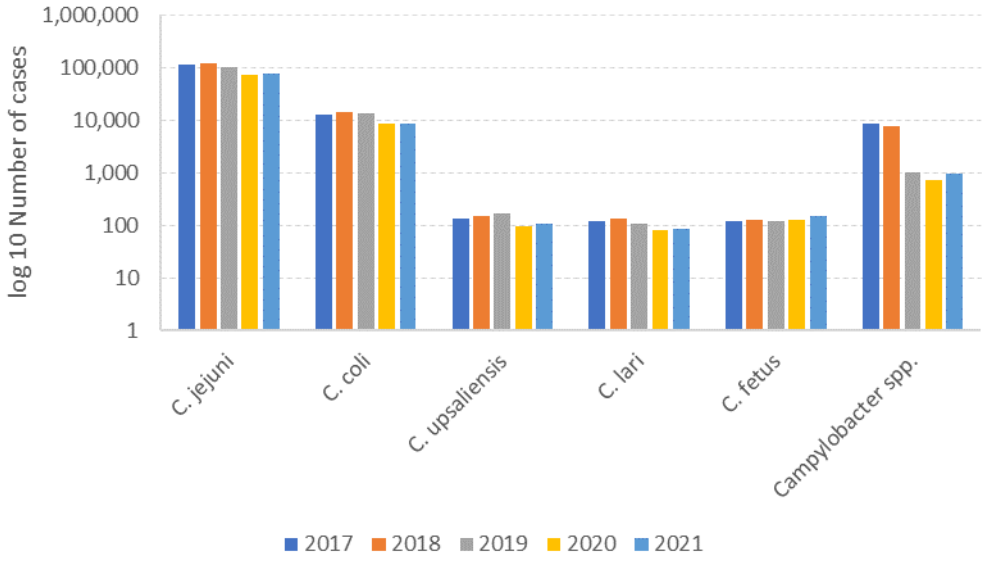


Microbial surveillance

Species

In 2021, speciation was reported for 84 985 cases (65.4% of all confirmed cases). Among these, 88.4% of infections were caused by *C. jejuni* followed by *C. coli* with 10.1%. The ratio between these two species has stayed about the same over the years. In the period 2017–2021, the number of cases by species were stable compared with 2020 and the only slight increase during pandemic was seen for *C. fetus*, with 148 cases reported in 2021 compared with 122 and 130 reported in 2019 and 2020, respectively (Figure 5).

Figure 5. Number of confirmed campylobacteriosis cases by species, EU/EEA, 2017-2021



Antimicrobial resistance

Note that the below analysis has been carried out using epidemiological cut-off values (ECOFFs) and thus describe microbiological/acquired resistance that is not taking dosing into account. For Campylobacter, however, the clinical breakpoints are identical to the ECOFFs with a few exceptions, and thus the clinical resistance is very similar.

Antimicrobial resistance data collection for *Campylobacter* spp. at the EU level focuses on antimicrobials of relevance for clinical treatment (fluoroquinolones, macrolides, aminoglycosides, and tetracyclines) [4]. Resistance to fluoroquinolones and tetracyclines was observed in *Campylobacter jejuni* and *C. coli* from humans in 2021 at very high levels: 65% and 70%, respectively, for *C. jejuni* and for *C. coli* 70% for both classes. For fluoroquinolones, the resistance ranged from 8% to 100% and for tetracyclines from 12% to 91% by country. The increasing trends in resistance observed for these agents in earlier years seemed to have stabilised somewhat as in the last five years, 2017–2021, fewer countries were observing increasing trends than earlier and a few countries also reported decreasing trends. For macrolides, which is the class of agents used to treat children with severe *Campylobacter* infection, or adults if the bacteria are resistant to fluoroquinolones, resistance was only detected in 1% of *C. jejuni* but in 9% of *C. coli*, with the highest proportion, 55%, observed in Portugal. Combined resistance to both fluoroquinolones and macrolides was similar to macrolides alone as most isolates resistant to macrolides were also resistant to fluoroquinolones. For invasive *Campylobacter* infections, aminoglycosides or carbapenems are the recommended treatment [5]. Gentamicin (an aminoglycoside) resistance was very low – <1%, in most countries for both *C. jejuni* and *C. coli* – but higher in a couple of Member States, with Spain reporting the highest resistance (in 10% and 12% of *C. jejuni* and *C. coli* isolates, respectively). Carbapenems are not yet in the priority panel for testing but Malta reported results on ertapenem for a few isolates, all being susceptible.

Discussion

Since 2005, *Campylobacter* has been the most commonly reported gastrointestinal bacterial pathogen in humans in the EU/EEA up to and including 2021 [6]. All Member States except four (Belgium, Greece, Italy, and the Netherlands) had a comprehensive surveillance system. Despite this, reported cases only represent a small proportion of *Campylobacter* infections occurring in the EU/EEA. With 129 960 confirmed cases in 2021 (notification rate 44.5/100 000), campylobacteriosis causes a major disease burden in EU/EEA countries.

The gradually declining trend between 2017 and 2019 dropped clearly in 2020 but increased again slightly in 2021, although not reaching the level of reporting in the pre-pandemic period 2017–2019. Belgium, Finland, Hungary, Poland, Slovenia, and Sweden reported significantly decreasing trends ($p < 0.05$) during the period 2017–2021, whereas Latvia and Portugal reported a significantly increasing trend over the same period [7]. The increase observed in these two countries during the pandemic years could be due to improved laboratory testing and reporting, as the low notification rates in these countries indicate an underreporting of the disease. This was also confirmed by Latvia, which is now focusing on improving the laboratory testing of patients and reporting of cases to the national statistics (A. Bormane, SPKC – Centre for Disease Prevention and Control of Latvia, personal communication, 16 July 2020). The COVID-19 pandemic has likely had an influence on decreasing trends. Factors mentioned by countries resulting in lower case numbers included people avoiding seeking medical care for mild symptoms due to a risk of exposure to COVID-19 in healthcare facilities, limited laboratory capacity due to the reallocation of resources to SARS-CoV-2, fewer restaurant visits, increased hand-washing, and less travel due to travel restrictions. While cases with a travel history within the EU increased by 17.3% in 2021 compared with 2020, travelling was still at much lower level in 2021 than in pre-pandemic period. The geographical distribution remained consistent with previous years, with the majority of cases reported by Czechia, Germany, and Spain.

In the majority of EU/EEA countries, children younger than five years are the most affected by campylobacteriosis, with an overall notification rate of 133.0 cases per 100 000 population in 2021. However, the difference in the rate in this age group was large between countries, with the lowest rate being 4.2 cases per 100 000 and the highest 859.4, possibly reflecting the differences in diagnostic and reporting practices in countries.

Campylobacter has a characteristic seasonality, with a sharp increase in the number of cases from late spring to early autumn. The timing and intensity of the summer peak varies across European countries, with human *Campylobacter* cases associated with higher temperatures [8].

In 2021, 249 foodborne outbreaks caused by Campylobacter were reported in the EU, involving 1 051 cases, 134 hospitalisations, and six deaths. Of 20 outbreaks with strong evidence, seven were caused by broiler meat or broiler products and three by bovine meat or meat products [7].

In most countries, poultry meat is a major source of human campylobacteriosis. The poultry reservoir as a whole, including environmental transmission, direct animal contact, consumption and preparation of poultry meat, is estimated to account for 50%–80% of campylobacteriosis cases [9]. A study in Canada concluded that the abattoir was the primary contamination point of poultry by *C. Jejuni* , but only a subset of subtypes was a high risk to humans [10]. To control this production stage in the EU, process hygiene is monitored at slaughterhouses. In 2021, almost half of the official control samples monitoring process hygiene (42.1%) were positive for *Campylobacter*, and 18.4% exceeded the limit 1 000 cfu/g [7]. In addition, cattle has been identified as a second

most predominant source of *C. jejuni* infections in humans [11]. Additional identified sources are drinking water that has not been disinfected, wild birds, pets, and the environment [9]. Several studies have used multilocus sequence typing and whole genome sequence-based typing methods to attribute the sources of human *Campylobacter* infections. For example, in France and the Netherlands, chicken was an important source as well as ruminants, but pets and environment/surface water were important non-livestock sources [12,13]. In Estonia, a genomic comparison of *Campylobacter* isolates from humans and poultry meat suggested that imported fresh broiler meat was a likely cause of human campylobacteriosis [14]. This highlights the potential risk for cross-border foodborne *Campylobacter* outbreaks through the poultry meat trade.

Antimicrobial resistance of *Campylobacter* bacteria in humans to antibiotics used for treatment of human infections was very high in 2021, particularly for fluoroquinolones and tetracyclines. However, combined resistance to both of the critically important antimicrobial classes, fluoroquinolones and macrolides, was low, with some exceptions by country. Similar results were observed in *Campylobacter jejuni* from poultry [9].

Public health implications

Handling, preparing, and consuming broiler meat is estimated to account for 20–30% of all human campylobacteriosis cases [5]. Proper kitchen hygiene is required to avoid cross-contamination. Raw chicken meat should never be washed as this practice spreads droplets to the environment contaminating kitchen surfaces and other food around [15]. In addition, the proper cleaning of knives and cutting boards is needed after preparing chicken meat [15].

The elimination of *Campylobacter* in poultry is challenging, requiring a combination of different strategies in the food chain to reduce the risk of infection in humans [16].

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