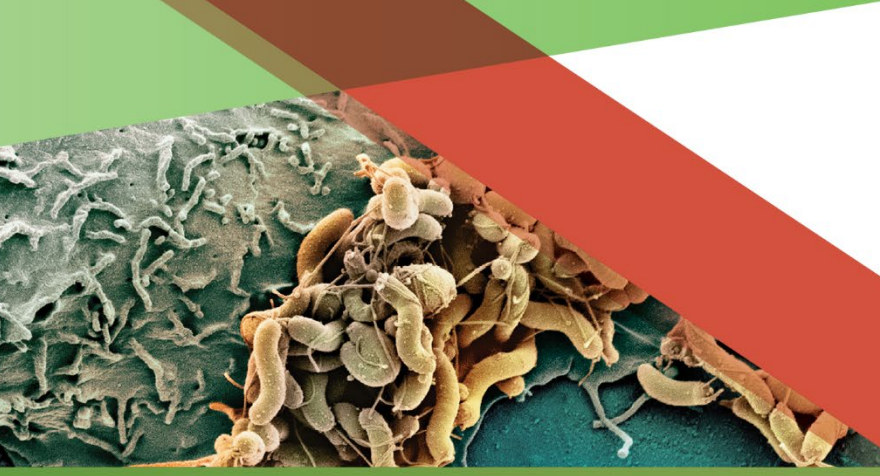

SURVEILLANCE REPORT

Campylobacteriosis

Annual Epidemiological Report for 2022

Key facts

- Campylobacteriosis is the most commonly reported gastrointestinal disease in the EU/EEA.
- In 2022, 30 EU/EEA countries reported 140 241 confirmed cases of campylobacteriosis.
- The overall EU/EEA notification rate was 46.9 cases per 100 000 population.
- The campylobacteriosis notification rate was highest in children under five years at 146.2 cases per 100 000 population.
- During the period 2018–2019 before the COVID-19 pandemic, campylobacteriosis notification rates were gradually declining. After a significant drop in the number of cases in 2020, probably as a consequence of the pandemic, case numbers increased slightly in 2021 and remained stable in 2022.
- Campylobacteriosis shows clear seasonality, with a peak of cases in the summer months.
- While resistance to fluoroquinolones remains high in *Campylobacter* isolates from human infections, statistically significant decreasing trends in resistance to macrolides and tetracyclines were observed in several countries during the period 2018–2022.

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 two to five days. The symptoms start with abdominal cramps followed by watery diarrhoea, which is often accompanied by fever, headaches and muscle aches. In about one-third of cases blood may appear in stools. The infection is usually self-limiting, lasting around a week, but may require hospital care in about 5–10% of cases. If the infection is severe or prolonged, antimicrobial treatment may be needed. The acute infection may lead to rare late-onset complications, such as reactive arthritis or Guillain-Barré syndrome (GBS), which is an acute neuromuscular paralysis. *Campylobacter* bacteria are common in animals (e.g. poultry, cattle, pigs and wild birds) which can serve as reservoirs without clinical symptoms. Human infection usually occurs via consumption of contaminated food (e.g. poultry meat) or drinking water from private wells. Swimming in natural waters has also been shown to be a risk factor for infection.

Methods

This report is based on data for 2022 retrieved from The European Surveillance System (TESSy) on 11 October 2023. 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 see 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, February 2024

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 was mandatory in 26 EU/EEA countries. In four EU Member States (Belgium, France, Italy and the Netherlands) notification was voluntary. The surveillance systems for campylobacteriosis had full national coverage in all but four EU Member States (France, Italy, the Netherlands and Spain). The coverage of the surveillance system in 2022 was estimated to be 20% in France, 64% in the Netherlands and 73% in Spain. These proportions were used when calculating the national notification rates for the EU Member States in question. No estimate of population coverage in Italy was provided, so a notification rate was not calculated. In Belgium, full national coverage was established in 2015 and rates before this date are not displayed. The drop in cases in Luxembourg for 2019 was a surveillance artefact caused by a change to non-culture-based methods (PCR) in private laboratories, resulting in a reduced number of isolates being 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, resulted in an increase in *Campylobacter* notifications. Greece reported data on laboratory-confirmed cases collected from public hospitals from 2018 onwards. For 2020, Spain did not receive data from all regions normally reporting and the case numbers were therefore lower than expected. No estimate of population coverage in Spain was provided prior to 2021, so notification rates were not calculated for that period. All countries reported case-based data except Belgium and Bulgaria which reported aggregated data. Both reporting formats were included to calculate numbers of cases, notification rates, disease trends and age and gender distributions.

The completeness of some variables, such as outcome or travel history, varies among countries and years; some countries were able to collect and integrate this type of information from different sources, other countries were not.

Twenty-four EU/EEA countries reported antimicrobial resistance data for *Campylobacter* for 2022. Twenty-two countries reported phenotypic resistance data (17 as disk zones or MIC values and five as interpretation with clinical breakpoints). Two countries reported resistance predicted from whole genome sequencing.

Epidemiology

For 2022, 30 EU/EEA countries reported 140 241 confirmed cases of campylobacteriosis, representing a stable trend compared to 2021, but still lower than before the pandemic (Table 1). The overall EU/EEA notification rate in 2022 was 46.9 cases per 100 000 population (range by countries 1.4–141.3) (Table 1). The countries with the highest notification rates in 2022 were Czechia and Luxembourg with 137.0 and 141.3 cases per 100 000 population, respectively. Luxembourg reported a notable increase in cases by 54.8% compared to cases reported in 2021, whereas case reports in Czechia decreased by 11.6% (Table 1, Figure 1). The lowest rates were reported in Bulgaria, Greece, Poland and Romania. In 2022, Czechia, Germany and Spain accounted for 10.3%, 31.0%, and 14.8%, respectively, of all confirmed cases in the EU/EEA. During the period 2018−2022, the most notable increases (≥ 50%) in notification rates were reported in Cyprus and Latvia, while Finland saw a reduction of ≥ 50%.

Thirty-five deaths from campylobacteriosis were reported in 2022, resulting in an EU/EEA case fatality rate of 0.04%. The average percentage of fatal outcomes observed has remained unchanged over the past five years (range 0.03−0.05%). Information on hospitalisation status was provided for 33.9% of all campylobacteriosis cases by 17 EU/EEA countries with a total of 11 382 (23.9%) hospitalisations.

Information on travel history was available for 84 244 (60.1%) cases. Among these, the proportion of domestically acquired infections was 80−100% (no travel reported) in all reporting countries except for five, which reported the highest proportion of travel-associated cases: Denmark (29.6%), Finland (69.0%), Iceland (65.1%), Norway (41.9%), and Sweden (40.6%). Of the 7 981 travel-associated cases reported with a known probable country of infection, 4 472 cases (56.0%) were linked to travel within the EU/EEA, with most of the infections acquired in Spain, Greece and Italy (33.4%, 12.3% and 8.1%, respectively). Türkiye, Thailand and Indonesia were the most frequently reported probable countries of infection outside the EU/EEA (23.7%, 11.0% and 6.6%, respectively).

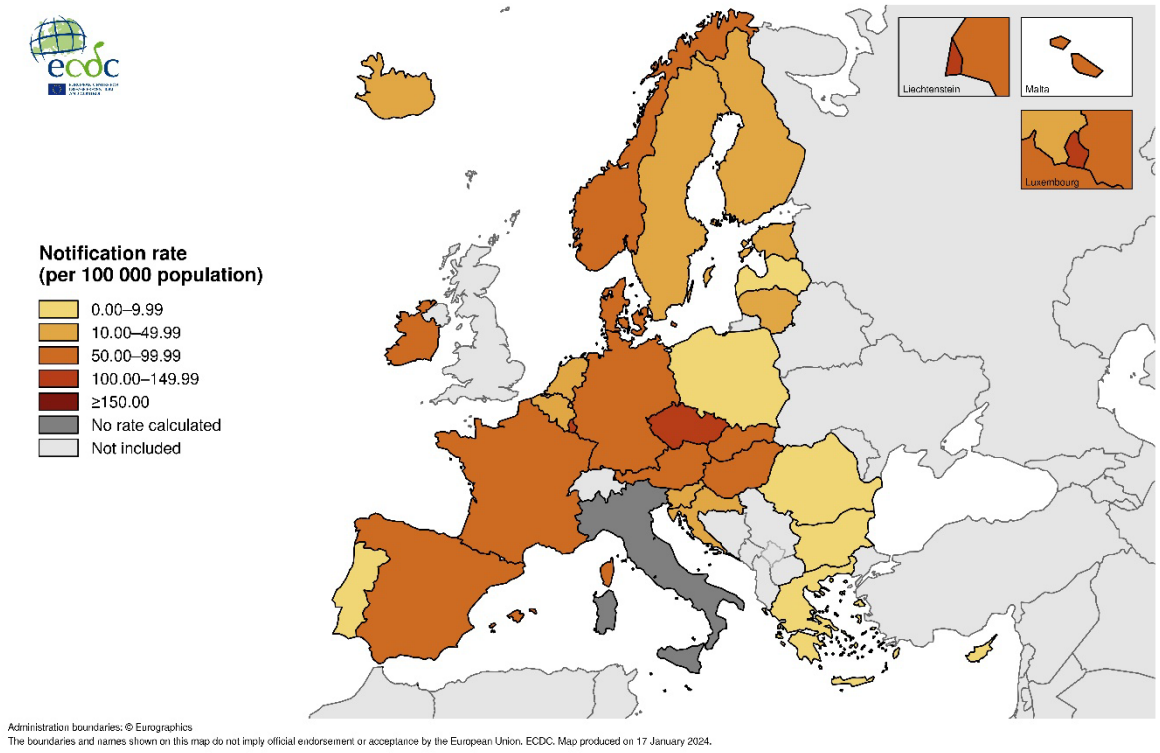
Information about transmission mode was reported for 14 216 cases (10.1%) and 91.8% had acquired the infection by consuming contaminated food. A suspected vehicle of infection was reported for 10 150 cases (7.2%) with broiler meat, pig meat and mixed meals reported for 62.7%, 10.7% and 5.4%, respectively.

Table 1. Confirmed campylobacteriosis cases and rates per 100 000 population by country and year, EU/EEA, 2018–2022

Country	2018		2019		2020		2021		2022	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Austria	7 999	90.7	6 572	74.2	5 406	60.7	6 019	67.4	6 294	70.1
Belgium	8 086	70.9	7 337	64.0	5 693	49.4	3 273	28.3	5 255	45.2
Bulgaria	191	2.7	229	3.3	127	1.8	130	1.9	107	1.6
Croatia	1 965	47.9	1 722	42.2	1 054	26.0	1 148	28.4	1 467	38.0
Cyprus	26	3.0	21	2.4	18	2.0	24	2.7	82	9.1
Czechia	22 895	215.8	22 894	215	17 517	163.8	16 305	152.4	14 412	137.0
Denmark	4 559	78.9	5 402	93.0	3 742	64.3	3 740	64.0	5 143	87.6
Estonia	411	31.2	347	26.2	265	19.9	185	13.9	211	15.8
Finland	5 099	92.5	4 382	79.4	2 074	37.5	1 798	32.5	2 462	44.4
France	7 491	55.9	7 712	57.4	7 920	58.8	8 875	65.6	9 095	67.0
Germany	67 585	81.6	61 277	73.8	46 377	55.8	47 911	57.6	43 471	52.2
Greece	357	3.3	366	3.4	218	2.0	260	2.4	302	2.9
Hungary	7 117	72.8	6 400	65.5	4 461	45.7	5 088	52.3	5 050	52.1
Iceland	145	41.6	136	38.1	95	26.1	58	15.7	104	27.6
Ireland	3 044	63.0	2 776	56.6	2 419	48.7	3 147	62.9	3 617	71.5
Italy	1 356	NRC	1 633	NRC	1 418	NRC	1 541	NRC	1 539	NRC
Latvia	87	4.5	133	6.9	104	5.5	158	8.3	172	9.2
Liechtenstein	NDR	NRC	NDR	NRC	NDR	NRC	38	97.3	50	127.2
Lithuania	919	32.7	1 221	43.7	684	24.5	357	12.8	497	17.7
Luxembourg	625	103.8	271	44.1	729	116.4	589	92.8	912	141.3
Malta	333	70.0	278	56.3	206	40.0	378	73.2	372	71.4
Netherlands	3 091	34.6	3 415	34.1	2 549	25.2	2 692	24.1	3 030	26.9
Norway	3 668	69.3	4 154	78	2 422	45.1	2 049	38.0	2 980	54.9
Poland	719	1.9	715	1.9	414	1.1	616	1.6	528	1.4
Portugal	610	5.9	887	8.6	790	7.7	973	9.4	868	8.4
Romania	573	2.9	805	4.1	300	1.6	348	1.8	525	2.8
Slovakia	8 339	153.2	7 690	141.1	4 921	90.2	6 099	111.7	4 777	87.9
Slovenia	1 305	63.1	1 085	52.1	811	38.7	856	40.6	938	44.5
Spain	18 410	NRC	9 658	NRC	6 891	NRC	20 748	60.0	20 816	60.1
Sweden	8 132	80.4	6 693	65.4	3 435	33.3	4 059	39.1	5 165	49.4
EU/EEA (30 countries)	**185 137**	**57.5**	**166 211**	**54.5**	**123 060**	**42.8**	**139 462**	**46.4**	**140 241**	**46.9**
United Kingdom	65 246	98.4	58 718	88.1	NDR	NRC	NA	NA	NA	NA
EU/EEA (31 countries)	**250 383**	**64.1**	**224 929**	**59.9**	**123 060**	**42.8**	**NA**	**NA**	**NA**	**NA**

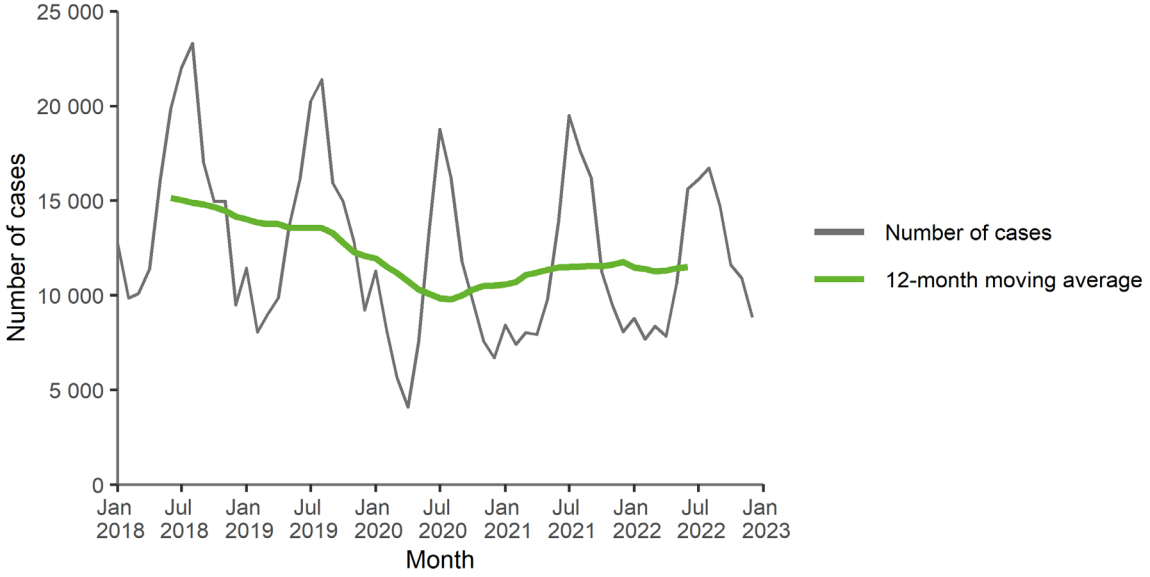
Source: Country reports.
NDR: No data reported.
NRC: No rate calculated.
NA: Not applicable.
No data were reported by the United Kingdom for 2020–2022 due to its withdrawal from the EU on 31 January 2020.

Figure 1. Confirmed campylobacteriosis cases per 100 000 population by country, EU/EEA, 2022



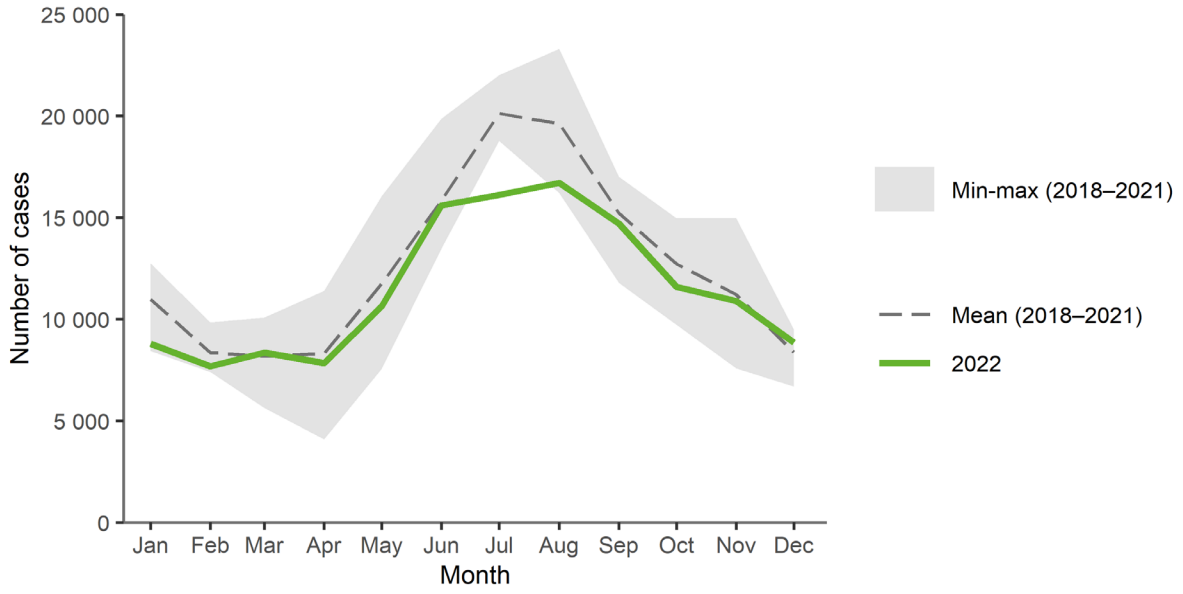
The overall campylobacteriosis trend in 2018–2022 showed no statistically significant increase or decrease at EU/EEA level (Figure 2). During this period Belgium, Finland, Hungary and Slovakia reported significantly decreasing trends ($p < 0.05$) 2018–2022, whereas Cyprus, Luxemburg and Portugal reported a significantly increasing trend [4]. An annual peak of cases was noted in the summer months, but with lower case counts in July–August than the average for the previous four years (Figure 3).

Figure 2. Confirmed campylobacteriosis cases by month, EU/EEA, 2018–2022



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 and Sweden.

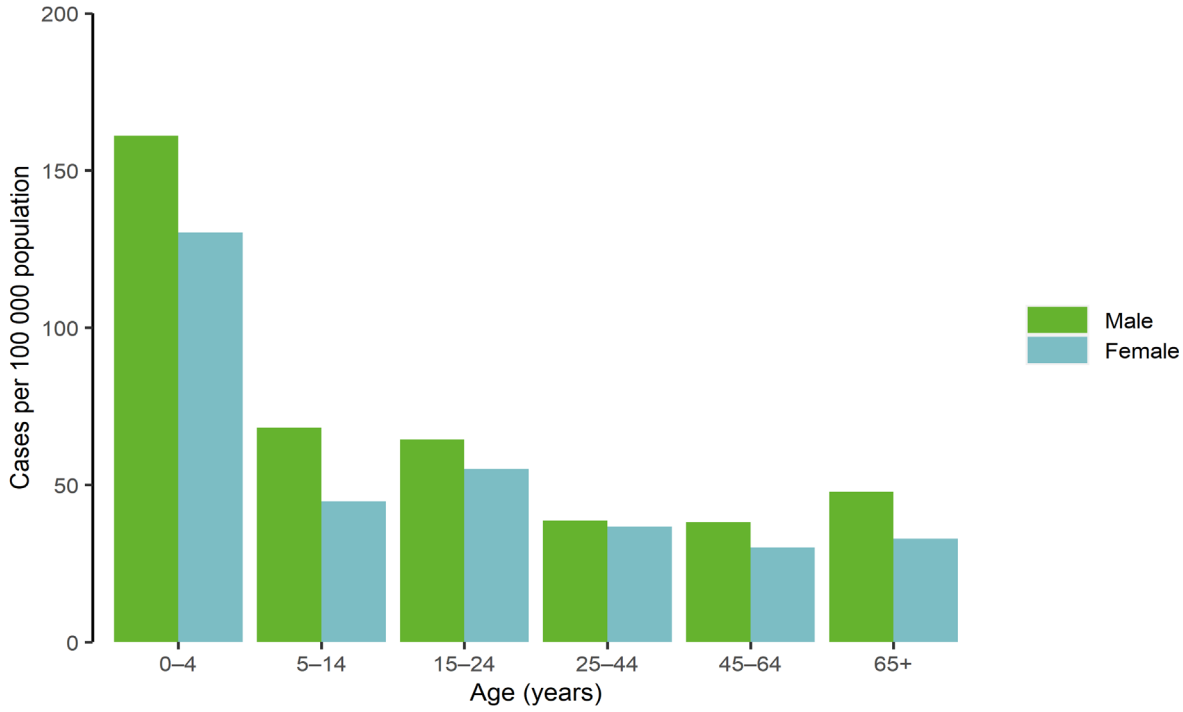
Figure 3. Confirmed campylobacteriosis cases by month, EU/EEA, 2018–2021 and 2022



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 and Sweden.

In 2022, adults over 25 years accounted for 60% of the 139 574 confirmed cases with age reported. The notification rate was highest, 146.2 cases per 100 000 population, in children under five years (ranging by country from 12.2 to 657.3). 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. Confirmed campylobacteriosis cases per 100 000 population, by age and gender, EU/EEA, 2022



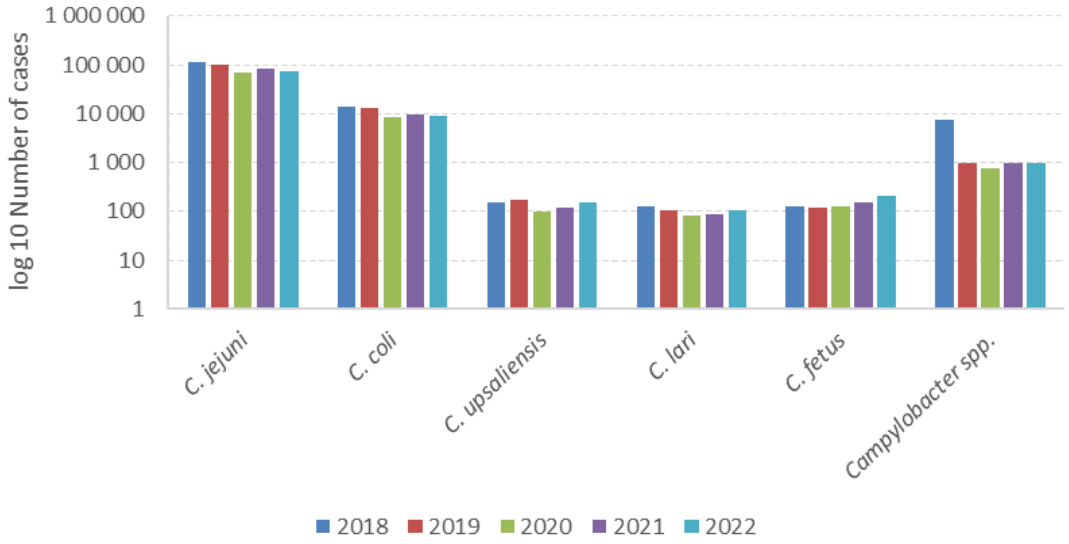
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and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

Microbial surveillance

Species

Campylobacter species information was provided by 28 Member States for 60.1% of confirmed cases reported in the EU/EEA, representing a slight decrease compared to 66.8% in 2022. Of these cases, 87.7% were *Campylobacter jejuni*, 10.6% *C. coli*, 0.26% *C. fetus*, 0.17% *C. upsaliensis*, and 0.12% *C. lari*. 'Other' *Campylobacter* species accounted for 1.1% of cases, but most of these were reported at the national level as '*C. jejuni* / *C. coli* / *C. lari* not differentiated'.

Figure 5. Number of confirmed campylobacteriosis cases by species, EU/EEA, 2018–2022



Source: Country reports from Austria, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Antimicrobial resistance

Antimicrobial resistance data collection for *Campylobacter* spp. at EU level focuses on antimicrobials of relevance for clinical treatment (fluoroquinolones, macrolides, aminoglycosides and tetracyclines) [5]. In 2022, resistance to fluoroquinolones and tetracyclines was observed in *Campylobacter jejuni* and *C. coli* at very high levels: 69.1% and 46.6%, respectively, for *C. jejuni* and 70.6% and 71.2%, respectively, for *C. coli*. The increasing trends in resistance previously observed for these agents seemed to have stabilised somewhat. In the five- year period 2018–2022, there were only two more countries with a statistically significant increasing trend in fluoroquinolone resistance than those with a decreasing trend (six versus four) in *C. jejuni*. During the same period, for tetracyclines, there were more countries observing a decreasing trend in resistance than an increasing trend (six versus three). No consistent change in resistance was observed during the pandemic, with a few exceptions (e.g. Finland, Iceland, Slovakia) where resistance decreased in 2020–2021, but then increased again in 2022. 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 0.9% of *C. jejuni,* but in 7.8% of *C. coli*, with the highest proportions of resistance in *C. coli* in Greece (38.5%, although few isolates were tested), Portugal (26.9%) and Spain (19.3%). Decreasing trends in macrolide resistance were observed in six of 18 countries for *C. jejuni* and in four of 13 for *C. coli*. The proportion of isolates resistant to both of the antimicrobial classes used as first line treatment, fluoroquinolones and macrolides, was similar to resistance 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 [6]. Gentamicin (an aminoglycoside) resistance was very low, <1%, in most countries for both *C. jejuni* and *C. coli*, but higher in a small number of Member States, with Spain reporting the highest resistance in *C. jejuni* (3.6%) and Greece in *C. coli* (23.1%). Carbapenems are not yet in the priority panel of antimicrobials recommended for testing and reporting at EU level [5] and no interpretive criteria have been defined by EUCAST.

It should be noted that the analysis above was carried out using epidemiological cut-off values (ECOFFs) and therefore describes microbiological/acquired resistance which does not take into account the dose of the antimicrobial. However, for Campylobacter the clinical breakpoints are identical to the ECOFFs, with few exceptions, and therefore the clinical resistance is considered very similar.

Outbreaks and other threats

No threats or outbreaks of *Campylobacter* were reported to ECDC in 2022.

Discussion

Since 2005, *Campylobacter* has been the most commonly reported gastrointestinal bacterial pathogen in humans in Europe [4]. With 140 241 confirmed cases in 2022 (notification rate 46.9 cases per 100 000), campylobacteriosis causes a considerable disease burden in EU/EEA countries. While surveillance mainly captures symptomatic infections, a large proportion of the population may have asymptomatic or mild infection, reflecting a high infection pressure and frequent exposure to *Campylobacter* [7,8].

The gradually declining trend seen between 2017 and 2019 came to a halt in 2020, before increasing slightly and then remaining stable during the period 2021–2022. However, the number of cases reported in 2021 and 2022 did not reach the level of reporting of the pre-pandemic period (2017–2019). During the period 2018–2022, Belgium, Finland, Hungary and Slovakia reported significantly decreasing trends ($p < 0.05$) while Cyprus, Luxemburg and Portugal reported a significantly increasing trend [4]. The COVID-19 pandemic was probably responsible for the decreasing trends. Some of the factors mentioned by countries resulting in lower case numbers during the pandemic were people not seeking medical care for mild symptoms due to the risk of exposure to COVID-19 at healthcare facilities; limited laboratory capacity due to reallocation of resources to SARS-CoV-2; fewer restaurant visits; increased hand washing, and less travel due to restrictions. In most countries, infection is domestically acquired, with 80–100% of cases having no travel history during the incubation period, except for the five Nordic countries, where high proportions of travel-associated cases were reported, ranging from 29.6% to 69.0% in Denmark and Finland, respectively. In 2022, the geographical distribution remained similar to previous years, with the majority of cases reported by Germany (31.0%), Spain (14.8%) and Czechia (10.3%), and these three countries accounting for 56.1% of all confirmed cases.

In the majority of the EU/EEA countries, children under five years were the age group most affected by campylobacteriosis, with an overall notification rate of 146.2 cases per 100 000 population in 2022. However, there was a large difference in the rate for this age group among countries: the lowest rate being 12.2 cases per 100 000 and the highest 657.3, possibly reflecting differences in diagnostic and reporting practices. A sustainable phenomenon in the epidemiology of campylobacteriosis, observed every year, is the systematically higher rates in males than females across all age groups. This could indicate higher exposure to environmental sources among males due to outdoor activities.

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 warm temperatures during the year [9].

In 2022, 255 foodborne outbreaks caused by *Campylobacter* were reported to EFSA by 17 EU countries, involving 1 097 cases, 83 hospitalisations and no deaths. Of nine outbreaks with strong evidence in Denmark (6), France (2), and Spain (1), all were caused by broiler meat or broiler products [4].

In most countries, poultry meat is considered 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 [10]. A study in Canada concluded that abattoirs were the primary *C. jejuni*, contamination point for poultry, although only a subset of subtypes was a high risk to humans [11]. To control this processing stage in the EU, process hygiene is monitored at slaughterhouses for broilers [12,13]. In 2022, over one-third of the official control samples taken from broiler carcasses to monitor process hygiene (38.9%) were positive for *Campylobacter* and 19.4% exceeded the limit of 1 000 cfu/g [4]. Cattle have also been identified as the second most predominant source of *C. jejuni* infections in humans [14]. 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 found to be an important source and ruminants, pets and environment/surface water were identified as important non-livestock sources [15,16]. In Estonia, a genomic comparison of *Campylobacter* isolates from humans and poultry meat suggested that imported fresh broiler meat was a probable cause of human campylobacteriosis [17]. This highlights the potential risk for cross-border foodborne *Campylobacter* outbreaks through the poultry meat trade.

Antimicrobial resistance to fluoroquinolones and tetracyclines was very common in *Campylobacter* bacteria from human infections, while macrolide resistance was less frequent. During the period 2018–2022, there was a positive development in terms of resistance to tetracycline and macrolides, with decreasing trends observed in several countries. One explanation is that sales of tetracyclines and macrolides used in food-producing animals decreased by 70.7% and 48.0%, respectively, during the period 2011–2022, based on sales data reported by 25 EU/EEA countries to the European Medicines Agency [18].

Public health implications

Campylobacteriosis is still an important diarrhoeal disease, carrying high morbidity and a risk, albeit low, of fatal outcomes in the EU/EEA. The handling, preparation and consumption of broiler meat is estimated to account for 20–30% of all human campylobacteriosis cases [10]. 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 [19]. In addition, knives and cutting boards should be properly cleaned after preparing chicken meat [19].

The reduction/elimination of *Campylobacter* in poultry is challenging, requiring a combination of different strategies throughout the food chain to reduce the risk of infection in humans [20].

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