

SURVEILLANCE REPORT

Diphtheria

Annual Epidemiological Report for 2024

Key facts

- In 2024, 151 cases of diphtheria were reported to ECDC: 83 cases due to toxigenic *Corynebacterium diphtheriae* and 65 cases due to *Corynebacterium ulcerans*.
- The increase in cases of diphtheria among migrants, reported in several EU/EEA countries during the second half of 2022, is continuing to decline.
- *C. diphtheriae* cases were reported among all age groups, with 74% of cases in males. *C. ulcerans* cases were more common in adults aged 65 years and above, with 58% of cases in males.
- Among the *C. diphtheriae* cases with importation status available, 21% were reported as imported (having been outside the country of notification during the incubation period, with no links to local transmission), and 57% of the imported cases presented with a cutaneous infection.
- Vaccination status was available for 43% of all cases. Sixty-two percent of the cases with known vaccination status were unvaccinated, or vaccinated with an unknown number of doses.
- Vaccination with the diphtheria toxoid vaccine is the only effective method for preventing this toxin-mediated disease. Achieving and sustaining high vaccination coverage in the population is critical to prevent toxigenic diphtheria from causing serious or fatal illness.

Introduction

Diphtheria is a bacterial infectious disease, which can be prevented by vaccination. Humans are the only known significant reservoir for *C. diphtheriae* [1]. Transmission occurs via airborne respiratory droplets, direct contact with respiratory secretions, or indirect contact with exudate from infected cutaneous lesions or contaminated surfaces [2]. The incubation period ranges from two to five days, but can be as long as 10 days [1].

Following an infection, unvaccinated individuals may present with skin infections (cutaneous diphtheria), classic respiratory diphtheria and, in rare cases, systemic diphtheria [3]. Case fatality of respiratory diphtheria can be as high as 5–10% [4]. In highly-vaccinated populations, most infections are asymptomatic or have a mild clinical course. Such cases are rarely diagnosed and reported unless detected during active case finding or contact tracing. The most common sites from which bacteria are isolated in symptomatic and asymptomatic infections are the pharynx, larynx, tonsils, nose, and skin. Other rare sites include the mucous membranes of the conjunctiva and vulvovaginal area, as well as the external auditory canal [1]. The critical diphtheria virulence factor is the production of an exotoxin (called diphtheria toxin). The toxin kills tissue cells at the site of infection and produces systemic effects including myocarditis, nephritis, polyneuropathy, and paralysis when disseminated via the bloodstream.

The other two potentially toxigenic *Corynebacteria* species, *C. ulcerans* and (very rarely) *C. pseudotuberculosis*, may also cause diphtheria disease. The vast majority of these infections are zoonotic, with human-to-human transmission almost never reported [2]. The diphtheria toxin secreted by the two species is 95% homologous to that of *C. diphtheriae* and the biological effect and clinical presentation of *C. ulcerans* and *C. pseudotuberculosis* are similar to that caused by the diphtheria toxin produced by *C. diphtheriae* [2,5].

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Methods

This report is based on data reported to ECDC for the year 2024 and extracted from the European surveillance portal for infectious diseases (EpiPulseCases) on 1 June 2026.

An overview of the national surveillance systems is available online [6].

Following an increase in the number of diphtheria cases in 2022, ECDC updated its surveillance protocol for diphtheria, increasing the frequency reporting from annual to monthly, to better monitor any ongoing outbreaks. Data are published in the interactive 'Surveillance atlas of infectious diseases' on a monthly basis [7]. In addition, an annual data call, including zero reporting, is carried out to collect more comprehensive information that is not available monthly. These data are included in the Annual Epidemiological Report.

In 2024, 30 European Union/European Economic Area (EU/EEA) countries reported data on diphtheria and related toxigenic pathogens. Of these, 14 countries reported cases of *Corynebacterium diphtheriae* or *C. ulcerans*.

Most countries reported data on diphtheria according to the 2008 (n=6), 2012 (n=5) or 2018 (n=10) EU case definition. One country used an alternative case definition. Regardless of the case definition used, only cases caused by or with a clinical syndrome consistent with toxigenic strains are reported to ECDC [8].

All countries reported data from a comprehensive and compulsory case-based surveillance system [6].

Epidemiology

In 2024, 146 cases of laboratory-confirmed diphtheria and related toxigenic pathogens, four possible cases and one probable case diphtheria were reported (Table 1, Figure 1). Some 80 confirmed cases and three possible cases were reported as *C. diphtheriae* and 65 confirmed cases were reported as *C. ulcerans*. For one confirmed, one probable and one possible case the pathogen was unknown (Table 2). The overall notification rate was 0.01 per 100 000 population.

Diphtheria caused by *C. diphtheriae* was reported by 11 countries (Table 2). Among these countries, Germany (n=31) and France (n=18) reported the highest number of cases, followed by Czechia (n=8).

Diphtheria caused by *C. ulcerans* was reported by nine countries. More than 65% of these cases were reported in Germany (n=24) and France (n=19).

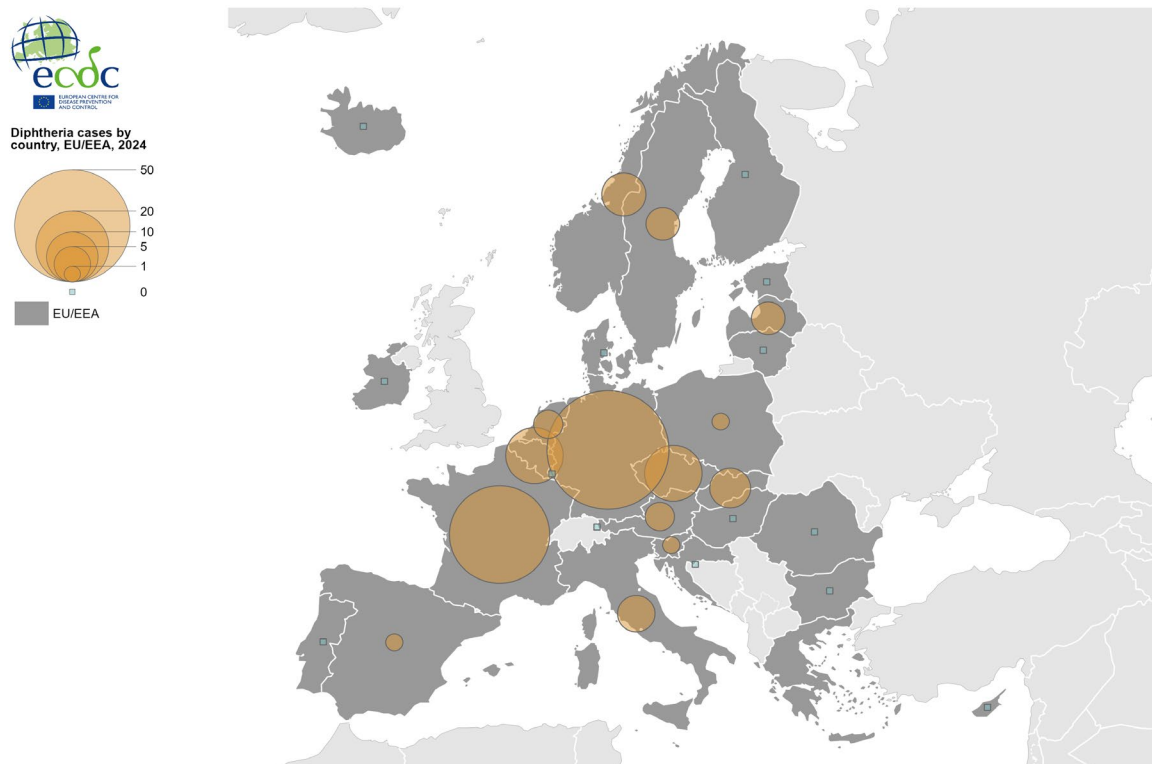
Between 2020 and 2024, 862 cases of diphtheria were reported in the EU/EEA (Table 1), 618 of which were due to *C. diphtheriae*.

Table 1. Number of diphtheria cases by country and year

Country	2020	2021	2022	2023	2024
Austria	2	2	62	4	3
Belgium	3	4	31	14	12
Bulgaria	0	0	0	0	0
Croatia	0	0	0	0	0
Cyprus	0	0	0	0	0
Czechia	0	0	5	7	12
Denmark	0	1	0	0	0
Estonia	0	0	0	0	0
Finland	0	0	0	0	0
France	18	22	60	37	37
Germany	24	22	172	137	55
Greece	0	0	0	0	0
Hungary	0	0	0	0	0
Iceland	0	0	0	0	0
Ireland	0	0	0	0	0
Italy	0	0	3	3	5
Latvia	0	0	0	3	4
Liechtenstein	NDR	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	0	1	0	2	0
Malta	0	0	0	0	0
Netherlands	3	0	8	14	3
Norway	0	0	8	4	7
Poland	0	0	0	1	1
Portugal	0	0	0	0	0
Romania	0	0	0	0	0
Slovakia	0	4	8	2	6
Slovenia	0	0	0	4	1
Spain	1	1	1	2	1
Sweden	0	4	4	3	4
EU/EEA (30 countries)	51	61	362	237	151

Source: country reports; ASR: age-standardised rate; NDR: no data reported; NRC: no rate calculated; NA: not applicable.

Due to its withdrawal from the EU on 31 January 2020, no data were reported by the United Kingdom from 2020 onwards.

Figure 1. Diphtheria cases by country, 2024**Table 2. Number of reported cases of diphtheria by country and species, 2024**

	<i>C. diphtheriae</i>	<i>C. ulcerans</i>
Austria	0	3
Belgium	6	6
Bulgaria	0	0
Croatia	0	0
Cyprus	0	0
Czechia	8	3
Denmark	0	0
Estonia	0	0
Finland	0	0
France	18	19
Germany	31	24
Greece	0	0
Hungary	0	0
Iceland	0	0
Ireland	0	0
Italy	2	1
Latvia	4	0
Liechtenstein	0	0
Lithuania	0	0
Luxembourg	0	0
Malta	0	0
Netherlands	3	0
Norway	3	4
Poland	1	0
Portugal	0	0
Romania	0	0
Slovakia	6	0
Slovenia	0	1
Spain	1	0
Sweden	0	4
Total	83	65

Source: Country reports from Austria, Belgium, Czechia, France, Germany, Italy, Latvia, the Netherlands, Norway, Poland, Slovakia, Slovenia, Spain and Sweden. One additional case with an unknown pathogen was reported from Italy.

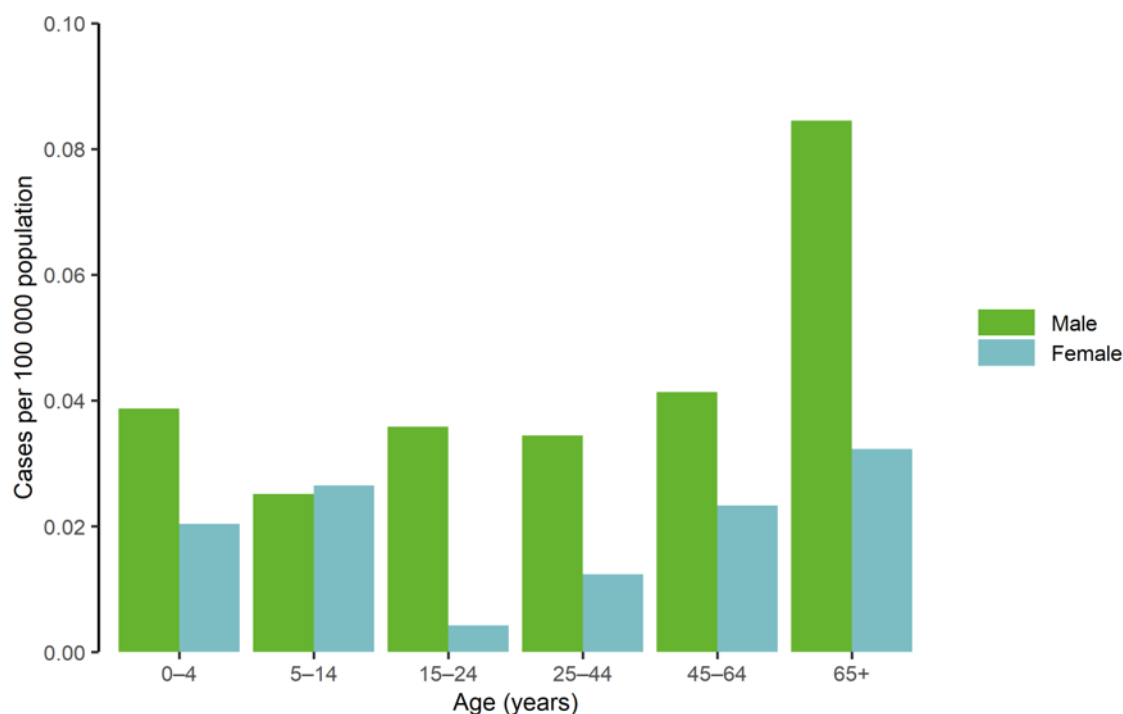
Age and gender distribution

In 2024, cases were reported in all age groups, with a preponderance among those aged 65 years and above (36%) (Figure 2). Of all cases reported, 101 (67%) were males.

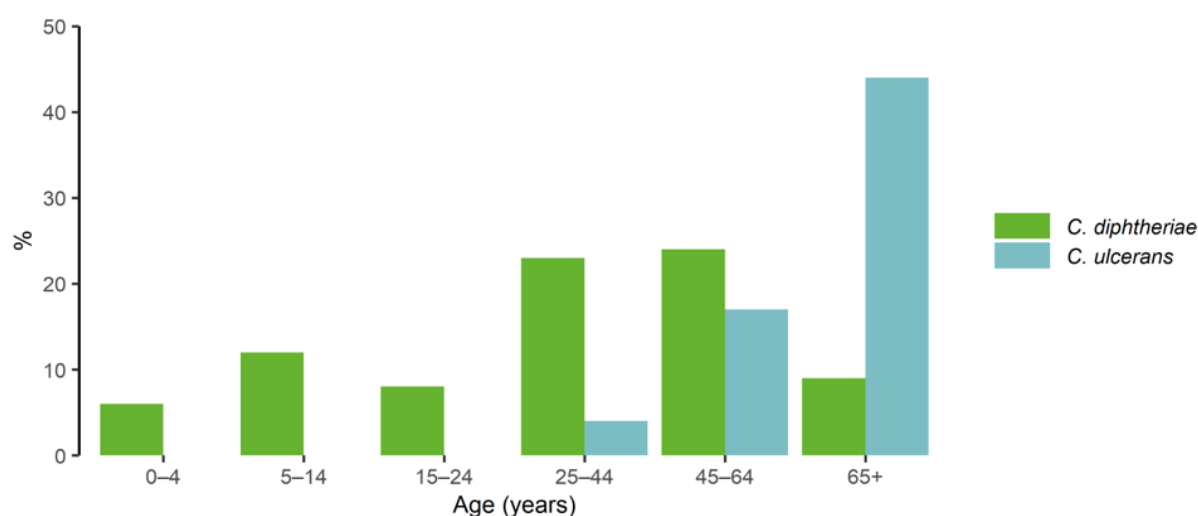
Of the 81 *C. diphtheriae* cases with known age, 18 (22%) were under 15 years, eight (10%) were teenagers and young adults aged 15–24 years, 23 (28%) were aged 25–44 years, 24 (30%) were aged 45–64 years and nine (11%) were 65 years and above (Figure 3). Of the 82 cases with known gender, 61 (74%) were reported in males.

Of the 65 *C. ulcerans* cases, four (6%) were individuals aged 25–44 years, 17 (26%) were aged 45–64 years, and 44 (68%) were aged 65 years and above (Figure 3). Thirty-eight (58%) of the *C. ulcerans* cases were reported in males.

Figure 2. Diphtheria cases per 100 000 population, by age and gender, EU/EEA, 2024



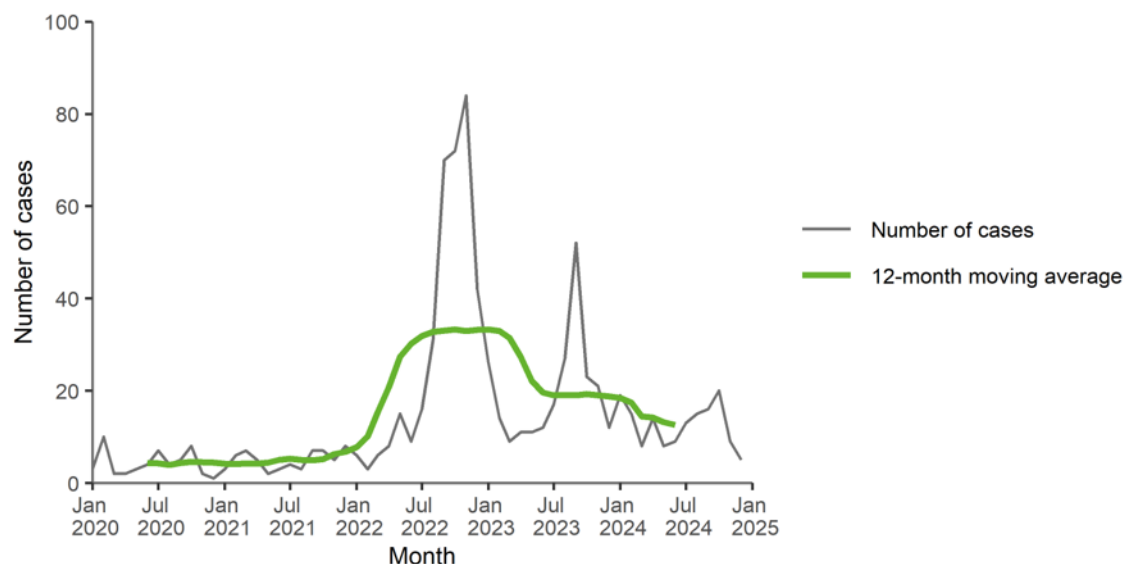
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and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

Figure 3. Age distribution of diphtheria cases by species, EU/EEA, 2024

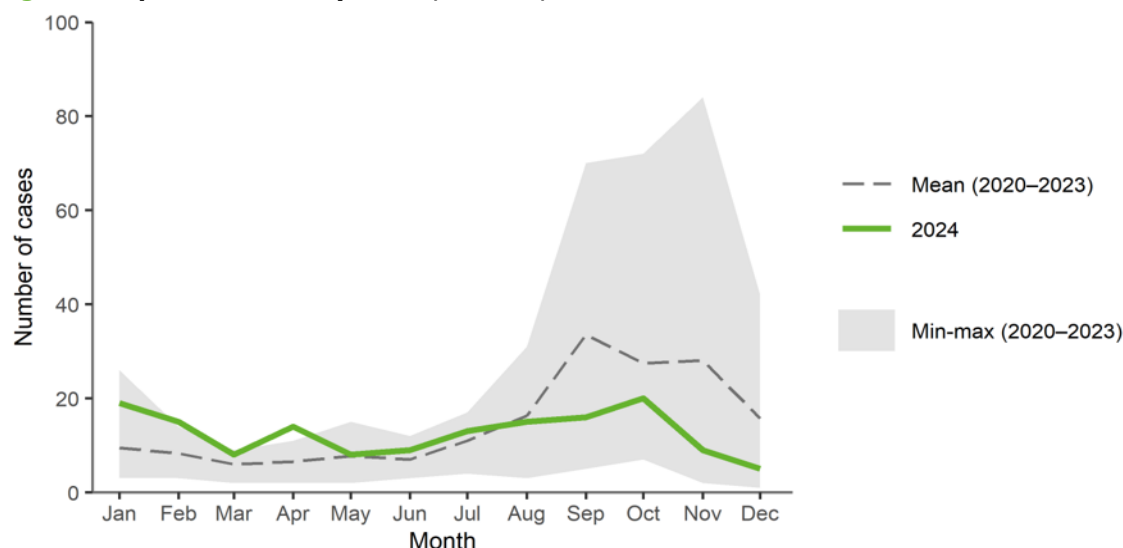
Source: Country reports from Austria, Belgium, Czechia, France, Germany, Italy, Latvia, the Netherlands, Norway, Poland, Slovakia, Slovenia, Spain and Sweden.

Seasonality

The low number of cases reported does not allow for analysis of seasonal variation (Figure 4). While in the years before 2022 cases were reported throughout the year and peaked during the last quarter of the year, in 2022 and an increase in cases was reported from the summer onwards. This led to a major increase in cases during the second half of the year, with case numbers peaking in the period September to December (Figure 5). A similar pattern, with a peak in the second half of the year, was reported in 2023, although with lower case numbers than in 2022. In 2024, a peak was reported in April and in October, respectively, with case numbers declining in November and December.

Figure 4. Diphtheria cases by month, EU/EEA, 2020–2024

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

Figure 5. Diphtheria cases by month, EU/EEA, 2024 and 2020–2023

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

Clinical presentation, biotype and outcome

Some 64 *C. diphtheriae* cases were reported with known clinical presentation. Three of these cases (4.7%) were reported as classical respiratory diphtheria by Belgium (1), Germany (1) and Latvia (1). Six (9.4%) were reported as respiratory infection without membrane by Germany (3) and Latvia (3). Italy reported one case (1.6%) with a respiratory and cutaneous infection. Germany (26), Czechia (8), Belgium (5), Slovakia (5), the Netherlands (3), Norway (3), Italy (1), Poland (1) and Spain (1) reported 53 *C. diphtheriae* cases (83%) with cutaneous infections. Slovakia reported one case (1.6%) with a clinical presentation classified as 'other'. France (18) and Germany (1) reported 19 cases with unknown clinical presentation.

For 46 of the *C. ulcerans* cases, clinical presentation was reported as known. Four cases (8.7%) were reported with classical respiratory infection by Austria (1), Belgium (1), Italy (1) and Norway (1). Three cases (6.5%) were reported as respiratory infection without membrane by Germany (2) and Belgium (1). Thirty-eight of these cases (83%) had cutaneous infection. These were reported by Germany (22), Belgium (4), Sweden (4), Czechia (3), Austria (2), Norway (2) and Slovenia (1). Norway reported one case (2.2%) with a clinical presentation classified as 'other'. Nineteen cases with an unknown clinical presentation were reported from Germany.

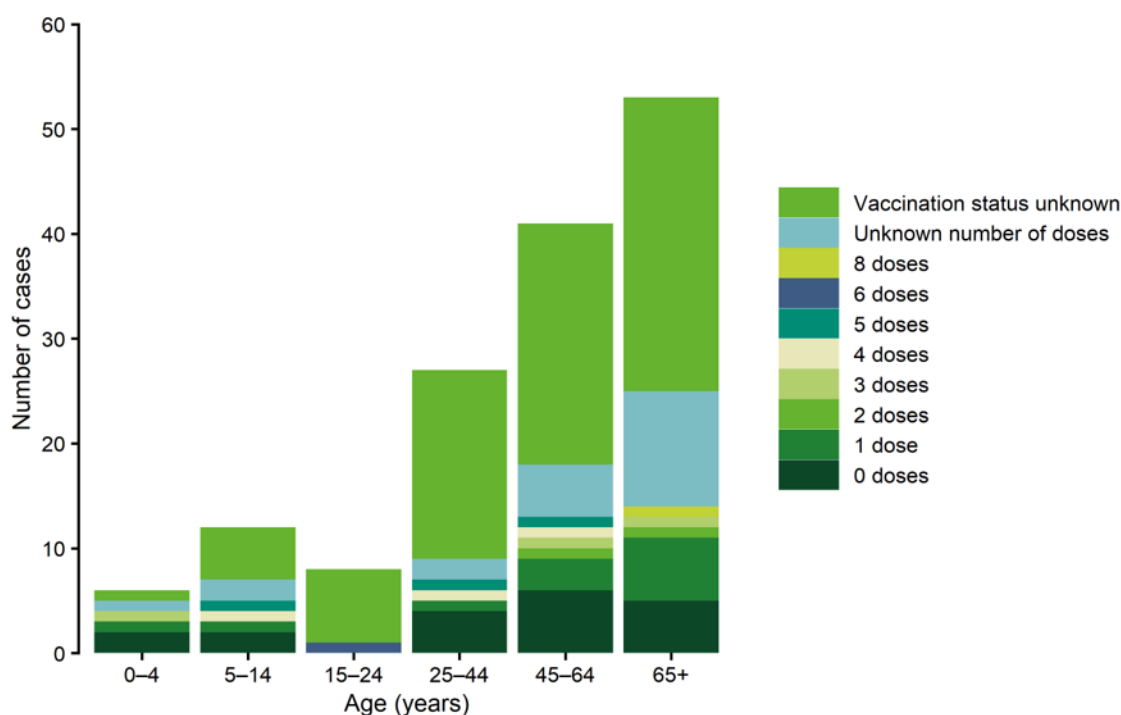
The biotype was reported for 26 *C. diphtheriae* cases. Fourteen cases were due to Var mitis, seven cases due to Var gravis and three cases due to Var intermedius. For 59 *C. diphtheriae* cases, the biotype was unknown. The biotype was not available for all 65 *C. ulcerans* cases.

Information on eventual outcome was available for 112 cases. Four deaths were reported: three deaths due to *C. diphtheriae* in Germany (2) and Latvia (1) and one death due to *C. ulcerans* in Austria. Clinical presentation of the three deaths due to *C. diphtheriae* was reported as classic respiratory diphtheria for two cases and as respiratory infection without membrane for one case. The death due to *C. ulcerans* presented with cutaneous infection. The vaccination status for the three deaths due to *C. diphtheriae* was unknown for one case, while the other two cases were unvaccinated. For the death due to *C. ulcerans*, the case had been vaccinated with an unknown number of doses.

Vaccination status

Vaccination status was available for 31 *C. diphtheriae* cases. Thirteen of these (42%) were reported to have been vaccinated with a known number of doses: five (16%) had received one dose, two (6.5%) had received three doses, one (3.2%) had received four doses, three (9.7%) had received five doses, one (3.2%) had received six doses and one (3.2%) had received eight doses (Figure 6). Six *C. diphtheriae* cases (19%) were vaccinated with an unknown number of doses and 12 cases (39%) were unvaccinated.

Vaccination status was available for 34 *C. ulcerans* cases. Twelve *C. ulcerans* cases (35%) were reported to have been vaccinated with a known number of doses: seven (21%) had received one dose, two (5.9%) had received two doses, one (2.9%) had received three doses and two (5.9%) had received four doses. Fifteen *C. ulcerans* cases (44%) were reported as vaccinated with an unknown number of doses and seven *C. ulcerans* cases (21%) were reported as unvaccinated. The vaccination status was unknown for 52 *C. diphtheriae* and 31 *C. ulcerans* cases.

Figure 6. Number of diphtheria cases by vaccination status and age group, 2024

Source: Country reports from Austria, Belgium, Czechia, France, Germany, Italy, Latvia, the Netherlands, Norway, Poland, Slovakia, Slovenia, Spain and Sweden.

Importation status

Importation status was available for 110 cases and 23 of these (21%) were imported. An imported case is defined as a case having been outside the country of notification during the incubation period of disease, without links to local transmission chains in the EU. All 23 imported cases were caused by *C. diphtheriae*. Thirteen (57%) of the imported cases caused by *C. diphtheriae* presented with cutaneous disease, while one case (4.4%) presented with respiratory infection without membrane, and clinical presentation was unknown for nine cases (39%).

The probable country of origin was known for six cases (26%). One case was reported from each Eritrea, Mali, Philippines, Senegal, Somalia, and Sri Lanka, respectively.

Cluster-relatedness, whole genome sequencing and antibiotic susceptibility testing

Following the increase in diphtheria cases in 2022 and the updated reporting mechanism, ECDC introduced new metadata for diphtheria, including variables to identify whether a case is part of an outbreak or a cluster, information on whole genome sequencing and information on antibiotic susceptibility testing.

In 2024, information on cluster-relatedness was available for 29 cases. Six cases (21%) were reported as being related to a cluster, while 23 cases (79%) were not related to a cluster. Further details, including information on cluster setting (setting where a cluster-related case has been identified), whole genome sequencing and antibiotic susceptibility testing results, cannot be described due to limited reporting of these variables.

Discussion

This report includes cases due to *C. diphtheriae* and *C. ulcerans*. Although all countries had surveillance in place for *C. diphtheriae*, not all of them reported cases to ECDC during the period 2020–2024. It is likely that countries with reported cases of all species causing diphtheria in consecutive years have a higher awareness of these pathogens [9].

Diphtheria case detection is strongly influenced by the availability of laboratory resources, expertise and surveillance systems [10,11]. This varies across Europe, and only a few countries perform toxigenicity testing [10–12]. Therefore, under-ascertainment and under-reporting probably affect these data.

In 2024, most *C. diphtheriae* cases with known clinical presentation were reported as cutaneous infections, with unknown vaccination status, unvaccinated or having only received one dose of vaccination. The fatalities reported were in individuals with a respiratory presentation and their vaccination status was either unknown or they were unvaccinated. Most imported *C. diphtheriae* cases with known probable country of infection were imported from endemic areas. The number of susceptible individuals in the EU, which is probably higher among travellers and migrant populations, could have contributed to the continued occurrence of imported and locally detected cases in recent years [13–15]. European travellers may become infected and develop cutaneous diphtheria while travelling or working in endemic countries. ECDC data presented in this report show that most cutaneous cases had an uncertain vaccination status or were unvaccinated. Unvaccinated individuals exposed to overcrowding and poor hygiene conditions are at risk of acquiring diphtheria and transmitting the infection. The vaccination status of travellers to diphtheria-endemic areas should be checked, and catch-up or booster doses should be offered and made accessible at every relevant opportunity. Furthermore, ensuring equitable access to vaccination for migrants is essential, considering the specific challenges faced by such populations in accessing healthcare systems. Vaccination of individuals in the EU should be kept up-to-date, including necessary boosters in adult and older age groups, on the basis of national vaccine recommendations [3,14,16–18].

The substantial increase in cutaneous diphtheria among migrants in EU/EEA countries which began in the second half of 2022, prompting an ECDC risk assessment and increased monitoring through event based and indicator-based surveillance, decreased to lower levels in 2023 and further in 2024 [14,19]. Nevertheless, as of June 2025, additional cases of sequence types detected in 2022 have continued to circulate in different populations, prompting ECDC to update the 2022 risk assessment [20,21].

Communication with countries experiencing diphtheria cases suggests that significant efforts are required for the clinical and public health management of cases for a disease rarely seen in Europe.

The European Commission has appointed a European Reference Laboratory to support the control and monitoring of pertussis and diphtheria in the EU/EEA countries – the European Reference Laboratory for Public Health in Diphtheria and Pertussis (EURL-PH-DIPE) [23]. The EURL-PH-DIPE aims to maintain and increase the EU/EEA's capacity to respond to the health threats posed by diphtheria and pertussis. This will be accomplished by developing and harmonising laboratory capacity in EU/EEA countries; improving surveillance; harmonising methods; providing expertise to ECDC and a network of national reference centres; training in diagnostics, antimicrobial susceptibility testing and genomic sequence data analysis, and ensuring a rapid response to local and larger-scale outbreaks. [24]

Public health implications

Vaccination with the diphtheria toxoid vaccine is the only effective method for preventing the toxin-mediated disease. Achieving and sustaining high vaccination coverage in the population is critical to prevent toxigenic diphtheria from causing serious or fatal illness. In addition, special attention should be given to travellers and migrants arriving from endemic countries, as well as healthcare and social workers.

If cases occur, prompt clinical recognition, laboratory confirmation and treatment are essential, including rapid investigation and management of close contacts of cases. The rapid administration of diphtheria antitoxin (DAT), according to national or local guidelines, is required for the successful treatment of respiratory diphtheria, in combination with antibiotic treatment, and may also be required for other forms of diphtheria. WHO guidance published in 2024 provides updated recommendations on the clinical management of diphtheria, including DAT preparation, administration, safety and patient monitoring [24,25]. When used, DAT should be administered if there is clinical suspicion of diphtheria, irrespective of whether there are symptoms of systemic toxicity. The timely mobilisation of available DAT stocks in individual countries should therefore be ensured.

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