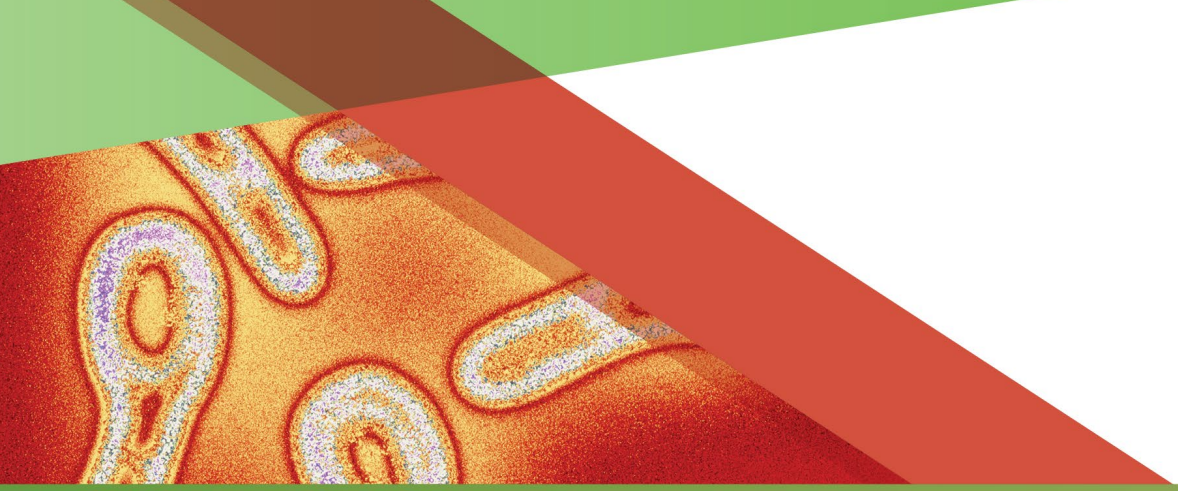


SURVEILLANCE REPORT

Diphtheria

Annual Epidemiological Report for 2017

Key facts

- For 2017, 39 cases of diphtheria due to toxigenic *Corynebacterium diphtheriae* or *C. ulcerans* were reported to ECDC.
- The highest proportion of *C. ulcerans* cases was among adults 45 years of age and above, whereas *C. diphtheriae* cases were more common in younger age groups.
- Among *C. diphtheriae* cases, 50% were reported as imported.
- Latvia was the only country in the EU to report continued indigenous transmission of *C. diphtheriae*.
- High vaccination coverage is crucial to prevent diphtheria.

Methods

This report is based on data for 2017 retrieved from The European Surveillance System (TESSy) on 31 January 2019. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases. EU Member States and EEA countries contribute to the system by uploading their infectious disease surveillance data at regular intervals [1].

An overview of the national surveillance systems is available online [2].

A subset of the data used for this report is available through the interactive *Surveillance atlas of infectious diseases* [3].

In 2017, 29 EU/EEA Member States reported data on diphtheria and related toxigenic pathogens. Of these, nine countries reported cases of *Corynebacterium diphtheriae or C. ulcerans.* Two countries did not report data.

The majority of Member States reported data on diphtheria according to the 2008 (n=11) or 2012 (n=12) EU case definition. Six countries used an alternative or unspecified case definition. Regardless of the case definition used, only cases caused by or with a clinical syndrome consistent with toxigenic strains are reported at the EU level [4].

The majority of countries reported data from a comprehensive and compulsory case-based surveillance system [2].

Suggested citation: European Centre for Disease Prevention and Control. Diphtheria. In: ECDC. Annual epidemiological report for 2017. Stockholm: ECDC; 2019.

Stockholm, June 2019

Epidemiology

Thirty-nine cases of laboratory-confirmed diphtheria and related toxigenic pathogens were reported in 2017 (Table 1, Figure 1). Eighteen cases were reported as *C. diphtheriae* and 21 cases as *C. ulcerans* (Table 2). The overall notification rate was below 0.01 per 100 000 population.

Diphtheria caused by *C. diphtheriae* was reported by nine countries (Table 2). Among these countries, Latvia reported the highest number of indigenous cases (n=3) and remains the only EU Member State with continued indigenous transmission.

Diphtheria caused by *C. ulcerans* was reported by five countries. More than half of these cases were reported in France and Germany.

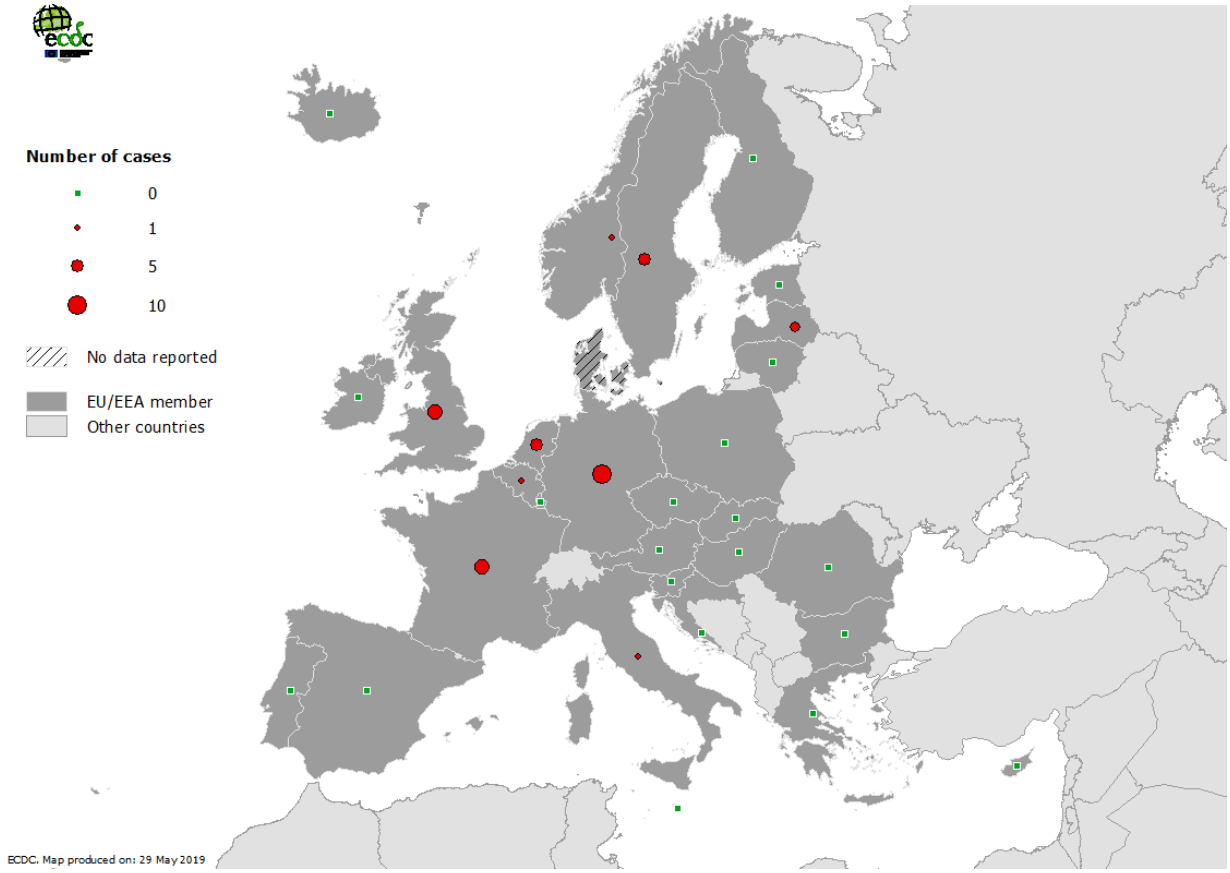
Between 2013 and 2017, 223 cases of diphtheria were reported in the EU/EEA, of which 131 cases were due to *C. diphtheriae*.

Table 1. Number of diphtheria cases by country and year, EU/EEA, 2013–2017

Country	2013	2014	2015	2016	2017
Austria	0	2	0	2	0
Belgium	1	0	3	6	1
Bulgaria	0	0	0	0	0
Croatia	0	0	0	0	0
Cyprus	0	0	0	0	0
Czech Republic	0	0	0	0	0
Denmark	0	0	.	.	.
Estonia	0	0	0	0	0
Finland	0	0	1	0	0
France	6	6	14	8	7
Germany	4	8	14	11	11
Greece	0	0	0	0	0
Hungary	0	0	0	0	0
Iceland	0	0	0	0	0
Ireland	0	0	1	1	0
Italy	1	1	0	1	1
Latvia	14	13	10	6	3
Liechtenstein	.	.	.	.	.
Lithuania	0	0	0	0	0
Luxembourg	0	0	0	0	0
Malta	0	0	0	0	0
Netherlands	0	1	5	2	4
Norway	0	2	2	1	1
Poland	0	0	0	0	0
Portugal	0	0	0	0	0
Romania	0	0	0	0	0
Slovakia	0	0	0	0	0
Slovenia	0	0	0	0	0
Spain	0	1	1	1	0
Sweden	2	3	8	4	4
United Kingdom	4	1	6	6	7
EU/EEA	**32**	**38**	**65**	**49**	**39**

Source: country reports.
.: no data reported.

Figure 1. Number of reported cases of diphtheria in EU/EEA by country, 2017



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

Table 2. Number of reported cases of diphtheria by country and species, EU/EEA, 2017

Country	*C. diphtheriae*	*C. ulcerans*
Austria	0	0
Belgium	1	0
Bulgaria	0	0
Croatia	0	0
Cyprus	0	0
Czech Republic	0	0
Denmark	.	.
Estonia	0	0
Finland	0	0
France	1	6
Germany	3	8
Greece	0	0
Hungary	0	0
Iceland	0	0
Ireland	0	0
Italy	1	0
Latvia	3	0
Liechtenstein	.	.
Lithuania	0	0
Luxembourg	0	0
Malta	0	0
Netherlands	2	2
Norway	1	0
Poland	0	0
Portugal	0	0
Romania	0	0
Slovakia	0	0
Slovenia	0	0
Spain	0	0
Sweden	2	2
United Kingdom	4	3
EU/EEA	**18**	**21**

Source: country reports.
.: no data reported.

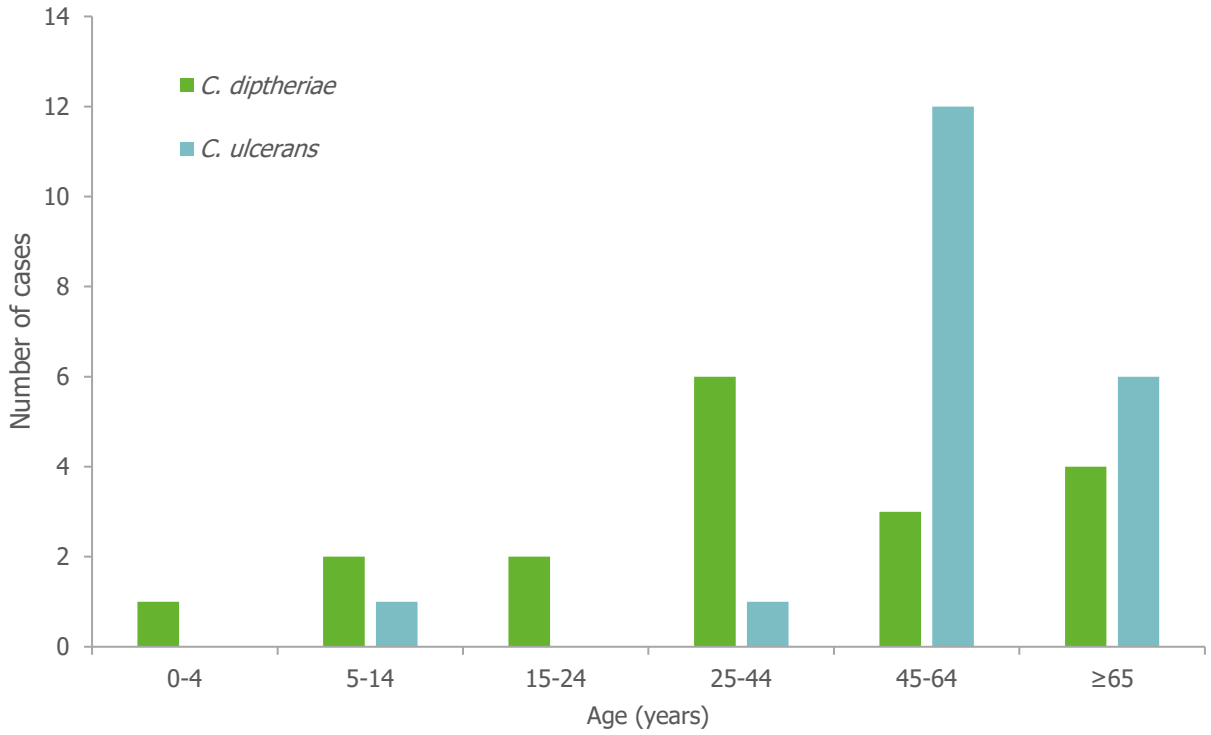
Age and gender distribution

In 2017, cases were reported among all age groups, with a preponderance among those aged 45–64 years (39%) and 65 years or older (26%; Figure 2). Twenty-three (59%) of the 39 cases were reported in males.

Of the 18 *C. diphtheriae* cases with known age, three were below 15 years, two were reported in teenagers and young adults from 15–24 years and 13 were reported in adults 25 years and over. Ten (56%) of the 18 cases with known gender were reported in males.

Of the 20 *C. ulcerans* cases with known age, 16 (80%) were reported in adults over 46 years of age and 13 (62%) of the 21 cases with known gender were reported in males.

Figure 2: Age distribution of diphtheria cases by species, EU/EEA, 2017



Seasonality

The low number of cases reported does not allow for analysis of seasonal variation. Similar to previous years, cases in 2017 were reported throughout the year, peaking during the first and last quarters.

Clinical presentation and outcome

Seventeen *C. diphtheriae* cases were reported with known clinical presentation. Four of them were reported as classical respiratory diphtheria: two indigenous cases from Latvia and two from the UK. Eleven confirmed *C. diphtheriae* cases were reported with cutaneous infections. One case from Norway and one from Latvia were reported with 'other' clinical presentation.

Of the reported *C. ulcerans* cases, 11 had cutaneous infection and three had additional respiratory manifestations. For seven cases, clinical presentation was reported as 'unknown'.

Information on outcome was available for only 32 cases. One death was reported due to *C. diphtheriae* in a 34-year-old man in Latvia.

Vaccination status

Eight cases were reported to have been vaccinated with a known number of doses: six *C. diphtheriae* cases received two to seven doses and two *C. ulcerans* cases received four and five doses respectively. Twelve cases were reported as vaccinated with an unknown number of doses.

Six cases were reported as not vaccinated at all. Twelve additional cases had unknown vaccination status.

Importation status

In 2017, 10 cases were imported from diphtheria-endemic countries, nine of which were reported as confirmed and cutaneous infections. The country of origin was known for seven of them: Comoros (1), Madagascar (1), the Philippines (2), Sri Lanka (1) Thailand (1) and Tunisia (1).

Eight confirmed *C. diphtheriae* and 17 confirmed *C. ulcerans* cases were reported as indigenous and five were due to biotype var. *gravis*.

Discussion

C. diphtheriae is transmitted via droplets during close contact. The bacterium produces a toxin that can cause severe complications. Systemic toxicity occurs in 8% of all diphtheria patients, which may lead to severe complications such as myocarditis, neuropathies, renal failure and eventually death. Other corynebacteria, *C. ulcerans* and very rarely *C. pseudotuberculosis* may produce diphtheria toxin, although the toxigenic strains appear to belong to distinct species and have different routes of transmission [5].

This report includes cases due to *C. diphtheriae* and *C. ulcerans*. While most Member States had surveillance in place for *C. diphtheriae* (n=29), few countries reported cases to ECDC from 2013–2017. It is likely that countries with reported cases of all species causing diphtheria in consecutive years have a higher awareness of these pathogens [6].

Diphtheria case detection is strongly influenced by the availability of laboratory resources, expertise and surveillance systems [7,8]. This varies across Europe and few countries perform toxigenicity testing [7–9]. As a consequence, under-ascertainment and under-reporting are highly likely.

Latvia is the only country in the EU/EEA reporting cases resulting from continued indigenous transmission since 2012. This could be explained as an epidemic tail following a regional epidemic in the 1990s.

The majority of *C. diphtheriae* cases with known clinical presentation were reported as cutaneous and imported from endemic geographical areas. The increased number of susceptible travellers is likely to have contributed to distribution [10]. European travellers may become infected and develop cutaneous diphtheria while travelling or working in endemic countries. ECDC data show that most cutaneous cases were unvaccinated or had an uncertain vaccination status. Unvaccinated travellers exposed to overcrowding and poor hygienic conditions are at risk for acquiring diphtheria and transmitting the infection upon their return. Therefore, the vaccination status of travellers to diphtheria-endemic areas should be checked and catch-up vaccinations should be offered at any opportunity, especially in adult migrants [11–14], along the lines of national recommendations.

Since reported diphtheria vaccination coverage is high in Europe, the threat of widespread outbreaks is low. As reported data show, sporadic cases may continue to occur in unvaccinated and partially vaccinated individuals, especially in travellers to and from endemic countries. The few cases reported in vaccinated adults and the elderly are most probably due to waning immunity [12,13].

Communication with the Member States experiencing diphtheria cases suggested that a significant effort was required for the clinical and public health management of cases for a disease rarely seen in Europe. Member States should consider close monitoring of their diphtheria antitoxin (DAT) stock and take appropriate and timely actions to replace it [15]. This is particularly important given the increasing number of outbreaks due to *C. diphtheriae* in endemic geographical areas (Bangladesh, Indonesia, Venezuela and Yemen) among people facing humanitarian crises and most likely due to disrupted immunisation programmes.

Public health conclusions

Immunisation with the diphtheria toxoid vaccine is the only effective method of preventing the toxin-mediated disease. Achieving and sustaining high vaccination coverage in the population is critical for preventing toxigenic diphtheria from causing serious or fatal illness. In addition, special attention should be given to travellers, health care 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. If there is a strong suspicion of toxigenic *C. diphtheria* disease, regardless of clinical manifestation, early administration of DAT is essential for survival. Thus, timely mobilisation of available stocks in individual countries should be ensured. This may require support from other countries if domestic DAT stocks are depleted.

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