

Diphtheria

Reporting on 2014 data retrieved from TESSy* on 7 July 2016

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Key facts

- In 2014, 38 cases of diphtheria were reported to TESSy, 35 of which were laboratory confirmed as due to *C. diphtheriae* or *C. ulcerans*.
- Adults and elderly were the most affected.
- The majority of the cases were not vaccinated or the vaccination status was reported as unknown.
- Latvia was the only country in the EU to report indigenous cases.
- High vaccination coverage must be sustained to prevent diphtheria cases.

Methods

[Click here for a detailed description of the methods used to produce this annual report](#)

ECDC has coordinated the surveillance of diphtheria at the EU level since the transfer of DIPNET, the Diphtheria Surveillance Network, to ECDC in 2010. DIPNET used to be hosted at the UK Health Protection Agency.

- In 2014, 30 EU/EEA Member States reported data. Nine countries reported cases due to *C. diphtheriae* or *C. ulcerans*, and 21 countries reported zero cases.
- The majority of Member States reported data on diphtheria according to the 2008 (n=13) or 2012 (n=11) EU case definition. Five 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 causation by, toxigenic strains are reported at the EU level (Commission Implementing Decision 2012/506/EU of 8 August 2012 of the European Parliament and of the Council).

• All reporting countries have a surveillance system for diphtheria and reported case-based data. Clinical and laboratory-notified cases were linked at the national level and submitted to TESSy with a single record identifier. The majority of the countries reported data based on a comprehensive (n=30) and compulsory (n=29) surveillance system. For a summary of national surveillance systems characteristics by country, please refer to the Annex.

Epidemiology

Thirty-eight cases of diphtheria were reported in 2014 (Table 1, Figure 1), 35 of which were laboratory confirmed as due to *C. diphtheriae* (n=22) or *C. ulcerans*, (n=13). The overall notification rate was <0.01 per 100 000 population. Additionally, Latvia reported three cases as possible *C. diphtheriae* respiratory infections. Of the 22 confirmed *C. diphtheriae* cases, Latvia reported the highest number (n=10) and was the only EU Member State with continued indigenous transmission. Diphtheria caused by *C. ulcerans* accounted for 13 cases and was reported by Germany (n=5), France (n=5), Italy (n=1), Sweden (n=1) and the United Kingdom (n=1).

From 2010 to 2014, 131 cases of diphtheria were reported in the EU/EEA; 76 of these cases were laboratory-confirmed *C. diphtheriae* infections. The number of *C. diphtheriae* cases reported over the last four years increased, especially in Latvia (n=42, 38 of these cases were laboratory confirmed).

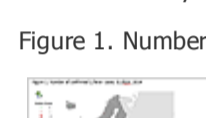
Table 1. Reported diphtheria cases: number and rate per 100 000 population, EU/EEA, 2010–2014

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Country	2010		2011		2012		2013		2014					
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	National data	Report type	Reported cases	Rate	ASR	Confirmed cases
Austria	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	2	0.0	0.0	2
Belgium	0	0.0	0	0.0	1	0.0	1	0.0	Y	C	0	0.0	0.0	0
Bulgaria	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Croatia	-	-	-	-	-	-	0	0.0	Y	C	0	0.0	0.0	0
Cyprus	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Czech Republic	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Denmark	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Estonia	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Finland	0	0.0	0	0.0	1	0.0	0	0.0	Y	C	0	0.0	0.0	0
France	2	0.0	5	0.0	4	0.0	6	0.0	Y	C	6	0.0	0.0	6
Germany	8	0.0	4	0.0	9	0.0	4	0.0	Y	C	8	0.0	0.0	8
Greece	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Hungary	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Iceland	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Ireland	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Italy	0	0.0	0	0.0	0	0.0	1	0.0	Y	C	1	0.0	0.0	1
Latvia	2	0.1	6	0.3	8	0.4	14	0.7	Y	C	13	0.6	0.6	10
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	0	0.0	1	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Luxembourg	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Malta	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Netherlands	0	0.0	0	0.0	1	0.0	0	0.0	Y	C	1	0.0	0.0	1
Norway	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	2	0.0	0.0	2
Poland	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Portugal	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Romania	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Slovakia	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Slovenia	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	0	0.0	0.0	0
Spain	0	0.0	0	0.0	0	0.0	0	0.0	Y	C	1	0.0	0.0	1
Sweden	0	0.0	2	0.0	2	0.0	2	0.0	Y	C	3	0.0	0.0	3
United Kingdom	2	0.0	2	0.0	1	0.0	4	0.0	Y	C	1	0.0	0.0	1
EU/EEA	14	0.0	20	0.0	27	0.0	32	0.0	.	C	38	0.0	0.0	35

Source: Country reports. Legend: Y = yes, N = no, C = case based, ' = no report, ASR: age-standardised rate

Figure 1. Number of reported diphtheria cases, EU/EEA, 2014



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

Age and gender distribution

In 2014, all age groups were affected, with a preponderance in adults and the elderly. Regarding *C. diphtheriae*, 13 of the 22 confirmed cases were aged 25 years and over: five were aged 45–64 years and four 65 years and over). Fifteen of the 22 cases were male. For *C. ulcerans*, all cases (n=13) were reported in adults 45 years or over, except one case reported in a 13-year-old female. The cases were almost equally distributed between males (n=7) and females (n=6).

Figure 2. Reported diphtheria cases, by age and gender, EU/EEA, 2014



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

Seasonality

The low number of reported cases does not allow analysis of seasonal variation. In 2014, cases were reported throughout the year.

Clinical presentation and origin of infection

Ten of the confirmed *C. diphtheriae* cases were reported as respiratory diphtheria and ten as cutaneous infections. For two confirmed *C. diphtheriae* cases, the clinical presentation was not reported.

Eleven cases were reported as imported. The probable countries of infection of nine of the imported cases were Afghanistan, Angola, Ethiopia, Mozambique, Madagascar, Sri Lanka, Somalia and Thailand (2). For one case, the probable country of infection was reported as Cambodia, Laos, Malaysia or Thailand. All 10 cases of confirmed *C. diphtheriae* reported by Latvia were reported as not imported. One confirmed *C. diphtheriae* case had an unknown importation status. The clinical presentation of cases due to *C. ulcerans* was not reported, except one case reported as cutaneous diphtheria.

Outcome

Among the 37 cases for which information on outcome was available, one death was reported due to *C. ulcerans* in an 88-year-old woman.

Vaccination status

Vaccination status was reported for 16 cases of confirmed *C. diphtheriae*. Eight cases were reported as not vaccinated, one as vaccinated with three doses, one with four doses and four with five doses; two cases were vaccinated with an unknown number of doses. In Latvia, among the 10 laboratory-confirmed cases due to *C. diphtheriae*, six cases were reported as not vaccinated, two cases had an unknown vaccination status, one 34-year old case was vaccinated with three doses, and one 37-year-old case was vaccinated with five doses.

Of all the cases reported in the EU due to *C. ulcerans*, one was not vaccinated, one was vaccinated with three doses (aged 65 years), three were vaccinated with an unknown number of doses (aged 13, 58 and 63 years), and eight had an unknown vaccination status.

Discussion

Diphtheria is a transmissible bacterial disease primarily infecting the pharynx, larynx, tonsils and nose. Occasionally, the bacteria affects skin or mucous membranes including conjunctivae and the vagina.

The causative agent of diphtheria is *Corynebacterium diphtheriae* transmitted through droplets during close contact. The bacterium produces a toxin that can cause severe complications. Systemic toxicity occurs in 8.1% of diphtheria patients, which may lead to severe complications such myocarditis, neuropathies, renal failure and eventually death.

Other corynebacteria, *C. ulcerans* and very rarely *C. pseudotuberculosis*, may produce the diphtheria toxin, although the strains appear to belong to distinct species and have different routes of transmission [1].

Diphtheria case detection is strongly influenced by the availability of laboratory resources (techniques and supplies), clinical expertise and surveillance systems. As ECDC surveillance data and EQA reports have shown, the availability of these resources seems to be unevenly distributed in Europe, and very few countries perform toxigenicity testing [2].

It is likely that countries that reported cases in consecutive years (Austria, France, Germany, Latvia, Lithuania, Norway, Spain, Sweden and United Kingdom) have acquired stronger expertise and laboratory capacity for detecting and confirming diphtheria cases than countries that did not detect and report cases. *C. ulcerans* infections were reported by Germany, France, Italy, Sweden and the United Kingdom, perhaps suggesting a higher level of awareness of this pathogen in these countries [3].

While in 2010 only three *C. diphtheriae* cases were reported, ECDC received information on 22 confirmed cases in 2014.

Latvia is the only EU Member State with continued indigenous transmission, probably due to decreasing adult booster coverage [4]. Though the clinical presentation was not always reported, a notable increase of cases was reported with cutaneous manifestation, mainly among adult travellers.

Because the risks of transmission from cases with respiratory or cutaneous forms continue, particularly in countries outside the EU, high vaccination coverage must be maintained [5,6].

European travellers may become infected and develop cutaneous diphtheria while travelling or working in endemic countries. ECDC data show that most of the imported cases had not received booster vaccinations before travelling. If travellers are not vaccinated and are exposed to overcrowding and poor hygienic conditions, they are at potential risk for acquiring diphtheria and of transmitting the infection on their return [6].

The diphtheria toxoid vaccine effectively protects against the effects of the exotoxin produced by *C. diphtheriae*, and immunisation is the only effective method of preventing the toxin-mediated disease. Since the reported vaccination coverage is high in Europe, the threat of a widespread outbreak is unlikely, but sporadic cases may continue to occur in unvaccinated or partially vaccinated individuals [5,7,8].

Public health conclusions

Enhanced diphtheria surveillance with high data completeness must be maintained. Also, early medical diagnosis (clinical recognition and laboratory confirmation) and treatment should be in place. As early administration of diphtheria antitoxin (DAT) is essential for survival, countries must maintain the capacity for rapid investigation and management of close contacts of cases. Not all EU countries have their own stocks of DAT, thus timely transfer of available stocks to affected countries is essential; arrangements need to be in place to ensure that the transfer of DAT stocks is possible on short notice [5,8].

Maintaining high vaccination coverage in the population is critical, and measures should be taken to improve vaccination coverage rates in under-vaccinated populations and certain risk groups (e.g. travellers planning to go to endemic areas and contacts of unvaccinated travellers returning from endemic areas, overcrowded closed groups of people under poor hygienic conditions, unvaccinated clusters and the elderly [6]. Particular attention should also be given to revaccination of healthcare and social workers due to waning immunity, revaccination of adult population against diphtheria every 10 years might be considered [9].

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Additional information

ECDC Surveillance Atlas of Infectious Diseases

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Peer-reviewed literature:

- <http://www.ncbi.nlm.nih.gov/pubmed/6422492>
- <http://www.ncbi.nlm.nih.gov/pubmed/9122631>
- http://wwwnc.cdc.gov/eid/article/18/2/11-0987_article
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Annex

Table. Diphtheria, surveillance systems overview, 2014

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* The European Surveillance System (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.