Pertussis

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

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Key facts

- In 2014, 40 727 cases of pertussis were reported to TESSy by 29 EU/EEA countries.
- The notification rate was 9.1 cases per 100 000 population, higher than in 2013, but lower than in the epidemic year of 2012.
- Germany provided data for the first time in 2014 and reported 12 339 cases (15.3 cases per 100 000 population).
- Age-specific rates were highest in <1-year-olds (51.6 cases per 100 000 population), followed by 10–14- (24.4 per 100 000) and 15–19-year-olds (19.7 per 100 000).
- Eighty-two percent of cases under one year of age were older than six months.
- The clinical presentation of pertussis in adolescents and adults can be mild and is often not recognised. This poses a transmission risk to infants who are too young to have completed the primary pertussis vaccination series.
- Vaccination strategies should be revisited in order to ensure the protection of infants; possible approaches include vaccination of pregnant women and adolescent and adult boosters.

Methods

Click here for a detailed description of the methods used to produce this annual report

ECDC has coordinated the surveillance of pertussis at the European level since the transfer of EUVAC.NET (European surveillance network for selected vaccine-preventable diseases, hosted by Statens Serum Institute, Denmark) to ECDC in 2011.

• In 2014, 29 EU/EEA Member States routinely reported pertussis data to TESSy.

• The majority of Member States reported data on pertussis in accordance with the EU case definition (Commission Implementing Decision 2012/506/EU of 8 August 2012 of the European Parliament and of the Council).

• The majority of Member States reported data from comprehensive, passive surveillance systems with national coverage. For a summary of the surveillance system characteristics in each Member State, please refer to the Annex.

Epidemiology

In 2014, 40 727 (38 044 confirmed) cases were reported by 29 EU/EEA countries, 28 of which have national surveillance systems. Iceland and Liechtenstein did not report data (Table 1, Figures 1 and 2). France reported data from a hospital-based sentinel surveillance network reporting only on cases aged <6 months [1]; France was therefore not included in the analysis of notification rates. The notification rate in 2014 was 9.1 per 100 000 population, higher than in 2013, but lower than in the epidemic year of 2012 (Table 1).

Norway reported the highest notification rate, with 59.4 cases per 100 000 population (Table 1 and Figure 2). The Netherlands, the Czech Republic and Slovakia followed with 47.9, 24.0 and 20.7 cases per 100 000 population, respectively. Norway has consistently reported the highest notification rate since 2011. Germany provided data on pertussis for the first time in 2014, reporting 12 339 cases (15.3 cases per 100 000 population). If data from Germany are excluded for 2014, the overall notification rate in 2014 is 7.7 cases per 100 000.

Since 2013, notable increases in the notification rate were observed in the Netherlands (from 17.8 cases per 100 000 population in 2013 to 47.9 cases per 100 000 population in 2014), the Czech Republic (11.7 in 2013 to 24.0 in 2014), Slovenia (8.2 in 2013 to 19.4 in 2014), Denmark (8.6 in 2013 to 13.5 in 2014), Belgium (7.2 in 2013 to 12.5 in 2014), Sweden (2.5 in 2013 to 7.3 in 2014) and Lithuania (2.2 in 2013 to 4.9 in 2014). Belgium has reported a consistently increasing annual notification rate since 2010. Substantial decreases in the notification rate were reported by Latvia (9.9 in 2013 to 4.0 in 2014) and Luxembourg (5.4 in 2013 to 1.1 in 2014). Estonia has reported a consistently decreasing annual notification rate since 2010 (Table 1).

Table 1. Reported pertussis 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	435	5.2	288	3.4	571	6.8	580	6.9	Y	C	370	4.3	4.4	286
Belgium	100	0.9	233	2.1	500	4.5	799	7.2	Y	C	1395	12.5	12.4	1395
Bulgaria	54	0.7	46	0.6	102	1.4	89	1.2	Y	A	52	0.7	0.8	48
Croatia	45	1.0	-	-	0	0.0	109	2.6	Y	C	131	3.1	3.3	92
Cyprus	0	0.0	2	0.2	16	1.9	9	1.0	Y	C	7	0.8	-	5
Czech Republic	661	6.3	324	3.1	737	7.0	1233	11.7	Y	C	2521	24.0	25.7	2303
Denmark	372	6.7	373	6.7	980	17.6	484	8.6	Y	C	762	13.5	13.5	762
Estonia	1295	97.1	478	35.9	149	11.2	55	4.2	Y	C	43	3.3	3.3	43
Finland	343	6.4	555	10.3	541	10.0	192	3.5	Y	C	206	3.8	3.8	206
France*	49	-	92	-	196	-	166	-	N	C	83	-	-	83
Germany	-	-	-	-	-	-	-	-	Y	C	12339	15.3	16.0	11969
Greece	64	0.6	3	0.0	56	0.5	40	0.4	Y	C	15	0.1	0.1	13
Hungary	25	0.2	9	0.1	5	0.1	20	0.2	Y	C	20	0.2	0.2	20
Iceland	0	0.0	0	0.0	36	11.3	31	9.6	-	-	-	-	-	-
Ireland	114	2.5	229	5.0	458	10.0	174	3.8	Y	C	73	1.6	1.2	63
Italy	463	0.8	516	0.9	489	0.8	466	0.8	Y	C	172	0.3	-	172
Latvia	9	0.4	10	0.5	257	12.6	201	9.9	Y	C	81	4.0	4.3	65
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	19	0.6	30	1.0	154	5.1	65	2.2	Y	C	143	4.9	5.1	81
Luxembourg	0	0.0	4	0.8	11	2.1	29	5.4	Y	C	6	1.1	1.1	6
Malta	0	0.0	20	4.8	3	0.7	3	0.7	Y	C	1	0.2	0.2	1
Netherlands	3733	22.5	5447	32.7	12853	76.8	2982	17.8	Y	C	8067	47.9	47.6	8067
Norway	3560	73.3	4405	89.5	4247	85.2	2608	51.6	Y	C	3032	59.4	58.0	3032
Poland	1266	3.3	1669	4.4	4684	12.3	2182	5.7	Y	C	2100	5.5	5.7	731
Portugal	14	0.1	32	0.3	237	2.2	106	1.0	Y	C	74	0.7	0.8	73
Romania	29	0.1	86	0.4	83	0.4	57	0.3	Y	C	87	0.4	0.5	80
Slovakia	1378	25.6	936	17.4	950	17.6	907	16.8	Y	C	1123	20.7	20.7	1112
Slovenia	611	29.8	284	13.9	178	8.7	169	8.2	Y	C	399	19.4	22.3	216
Spain	714	1.5	2325	5.0	1804	3.9	1678	3.6	Y	C	2679	5.8	6.0	2379
Sweden	263	2.8	177	1.9	289	3.0	237	2.5	Y	C	703	7.3	7.2	698
United Kingdom	517	0.8	1256	2.0	11986	18.9	6077	9.5	Y	C	4043	6.3	6.3	4043
EU/EEA	**16133**	**4.4**	**19829**	**5.5**	**42572**	**11.6**	**21748**	**5.9**	**-**	**C**	**40727**	**9.1**	**9.3**	**38044**

Source: Country reports. Legend: Y = yes, N = no, C = case based, A = aggregated, - = no data reported, ASR: age-standardised rate, - = no notification rate calculated
* France reports data from a sentinel surveillance system focusing only on cases <6 months of age

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

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

Figure 2. Number of reported pertussis cases per 100 000 population, EU/EEA, 2014

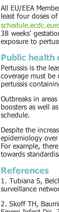
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United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

Age and gender distribution

Information on age was available for all but 39 cases. In 2014, 46% of cases were aged 30 years or older, and an additional 20% were in the age group 15–29 years. The most affected age group was infants below the age of one, with a notification rate of 51.6 cases per 100 000 population (Figure 3). This was the most affected age group in the majority of Member States, particularly Spain (177.9 cases per 100 000 population). Lithuania, the Netherlands, Slovenia and Sweden also reported a notification rate >100 cases per 100 000 population in this age group. Among infants <1 year old, 93% of cases (n=2 123/2 288) had known month of age. Of these cases, 82% were <6 months of age.

The second highest notification rate was observed among 10–14-year-olds (24.4 cases per 100 000 population), followed by 15–19-year-olds (19.7), 1–4-year-olds (15.0) and 5–9-year-olds (14.3). One-to-four-year-olds were the most affected age group in Estonia, Malta and Luxembourg, 10–14-year-olds were the most affected age group in Denmark, the Netherlands and Slovenia, and 15–19-year-olds were the most affected age group in the Czech Republic, Norway and Slovakia. Females (10.5 cases per 100 000 population) were more often affected than males (8.2 cases per 100 000 population) in all age groups, with a male-to-female ratio of 0.8:1.

Figure 3. Reported pertussis cases, by age and gender, EU/EEA, 2014



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

Seasonality

Typically, pertussis activity has no distinct seasonal pattern, but the number of cases may increase in the summer and autumn (Figures 4 and 5). In 2014, the lowest number of cases was reported in January–February; numbers then gradually increased, reaching a high in July.

Figure 4. Seasonal distribution of reported pertussis cases, EU/EEA, 2014 compared with 2010–2013

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

Figure 5: Trend and number of reported pertussis cases, EU/EEA, 2010–2014

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

Vaccination status

Data on vaccination status were available for 28 044 cases (69%). Of these cases, 10 298 (37%) were unvaccinated, 1 832 (7%) were vaccinated with one or two doses, 2 293 (8%) with three doses, and 11 243 (41%) with four or more doses. For 2 378 cases (8%), the number of doses was unknown.

Outcome

Outcome was known for 31 815 cases, 78% of all cases. Fifteen deaths were reported: 14 in children and one year of age, and one in a 75-year-old person.

Hospitalisation status

Of 29 949 cases with known hospitalisation status, 2 249 (8%) were hospitalised. The majority of those hospitalised were under one year of age.

Discussion

In the majority of Member States, the 2014 notification rate for pertussis was lower than in the epidemic year 2012, but remained higher than in 2010 and 2011. The majority of Member States reported a decrease in the number of cases following the epidemic year of 2012; however, some Member States, e.g. Belgium and the Czech Republic, have reported consistent increases in their annual notification rates over the last few years.

Germany reported data on pertussis to TESSy for the first time in 2014 because the country only recently introduced mandatory nation-wide reporting for pertussis (29 March 2013). Reporting has been mandatory in the five eastern states since 2002, thus under-ascertainment in the western part of the country is higher.

It is important to note that surveillance systems as well as the proportion of laboratory-confirmed cases in EU/EEA Member States are heterogeneous, and direct comparisons between countries should be made with caution.

After a dramatic decline in the reported incidence of pertussis following the introduction of pertussis vaccines into national immunisation programmes some 50 years ago, reported pertussis incidence has increased markedly in recent years in almost all EU/EEA Member States, as well as in other parts of the world [2,3]. This increase has occurred despite sustained high vaccination coverage, highlighting the impact of waning vaccine immunity, while changes in circulating strains may also play a role [3,4]. Improved surveillance is another important factor, such as the increased awareness of the disease among clinicians, improved case ascertainment and improvements in laboratory techniques, for example the use of serology in some countries, which has contributed to the improved diagnosis of the disease in adults and adolescents.

The most affected age group in the majority of countries was infants under one year of age; 83% of these cases are under six months of age, an age group too young to have completed the primary vaccination series. The most severe symptoms of pertussis occur in infants and young children, and death mostly occurs in infants under six months of age [5]. However, in some Member States, adolescents were the most affected age group, with the majority of cases aged 15 years or over, highlighting that pertussis is no longer solely a paediatric disease. The increasing incidence in adolescents and adults is a reason for concern because these age groups are a source of transmission to infants [6,7], especially because mild and asymptomatic cases in adolescents and adults are often not recognised as pertussis [3].

All EU/EEA Member States have added pertussis vaccination to their routine childhood immunisation schedules. These schedules are heterogeneous, but all Member States have at least four doses of pertussis-containing vaccine (primary vaccination with three doses plus at least one booster dose; see http://vaccine-schedule.ecdc.europa.eu/Pages/Schedules.aspx). The United Kingdom started a maternal vaccination programme in October 2012, vaccinating pregnant women between 28 and 38 weeks' gestation. The programme was found to be effective in protecting infants against pertussis infection through both transfer of maternal antibodies and reduced maternal exposure to pertussis [8,9]. Belgium, Ireland, the UK and some regions in Spain have maternal vaccination programmes for pertussis.

Public health conclusions

Pertussis is the least controlled of the vaccine-preventable diseases, and significant challenges remain to curb the recent resurgence of the disease in Europe. A high vaccination coverage must be maintained to ensure direct protection of infants and young children, the two groups which tend to show the most severe symptoms. The recent shortage of pertussis containing vaccines in Europe presents a considerable challenge to maintaining this coverage [10].

Outbreaks in areas of high vaccination coverage highlight that vaccination strategies may need to be revisited and that consideration should be given to adolescent and adult boosters as well as to vaccinations for healthcare workers and pregnant women. Some Member States already have included some of these policies in their national immunisation schedule.

Despite the increasing number of cases reported, it is likely that the burden in Europe is still considerably underestimated [3]. In order to accurately assess changes in the epidemiology over time and optimise disease control, it is important that we continue to improve the surveillance of pertussis, from clinical recognition to laboratory diagnosis. For example, there is a need for further dissemination and implementation of standard approaches to diagnostic confirmation of pertussis across European laboratories [11]. Steps towards standardisation have been taken by the European EuPertStrain and EUPert-LabNet groups, but need to be further promoted in all countries.

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Additional information

ECDC Surveillance Atlas of Infectious Diseases

Annual Epidemiological Report 2014 – vaccine-preventable diseases: http://www.ecdc.europa.eu/en/publications/Publications/AER-2014-VPD-FINAL.pdf

Expert consultation on pertussis. Published on 12 May 2014: http://www.ecdc.europa.eu/en/publications/_layouts/forms/Publication_DispForm.aspx?List=4f55ad51-4aed-4d32-b960-af70113dbb90&ID=1093

Guidance and protocol for the use of real-time PCR in laboratory diagnosis of human infection with Bordetella pertussis or Bordetella parapertussis: http://ecdc.europa.eu/en/publications/_layouts/forms/Publication_DispForm.aspx?List=4f55ad51-4aed-4d32-b960-af70113dbb90&ID=703

Guidance and protocol for the serological diagnosis of human infection with Bordetella pertussis: http://ecdc.europa.eu/en/publications/_layouts/forms/Publication_DispForm.aspx?List=4f55ad51-4aed-4d32-b960-af70113dbb90&ID=704

Annex

Table. Pertussis, 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.