Introduction

The following pertussis surveillance report aims to provide an overview of surveillance systems and selected epidemiological characteristics of pertussis at European level for 2010.

Methods

We requested data for pertussis, to be provided in a case-based format. If case-based data could not be supplied, we requested aggregated data, consisting of the number of cases in specified age-groups. Standardized forms were used to collect information on vaccination status, laboratory confirmation, hospitalisation and deaths. Data was collected retrospectively in 2011. The following report provides an overview of the variables available for aggregated dataset, and for the countries with epidemiological data obtained through mandatory notifications systems covering national populations. Cases meeting the requirements for national surveillance, including clinical, laboratory-confirmed, and epidemiologically linked cases, were analyzed. Country and age-specific incidence were calculated using the population estimates from Eurostat.[1]

For the countries reporting case-based data, an analysis of additional variables regarding case classification and type of laboratory diagnosis was also performed.

Surveillance systems and reporting

Of the 32 EUVAC.NET-participating countries, 28 conducted surveillance for pertussis based on a mandatory notification system covering the total population. Case-based data was provided by 13 countries, aggregated data by 12 countries; three countries reported zero cases (Table 1).

The mandatory surveillance system in Belgium only operates in one of its three regions, while in Germany pertussis was a notifiable disease in five of the 16 federal states. Switzerland and France had sentinel surveillance system for pertussis.

Table 1. Countries reporting surveillance pertussis data to EUVAC.NET, by format of data reporting, 2010 (table is ok for 2010

Case-based (n=13)
Austria, Croatia, Estonia, Finland, Greece, Ireland, Latvia, Lithuania, Norway, Romania, Slovakia, Slovenia, United Kindgdom
Aggregated (n=12)
Bulgaria, Czech Republic, Denmark, Italy, Hungary, Malta, Mumps, Netherlands, Poland, Spain, Sweden, Turkey

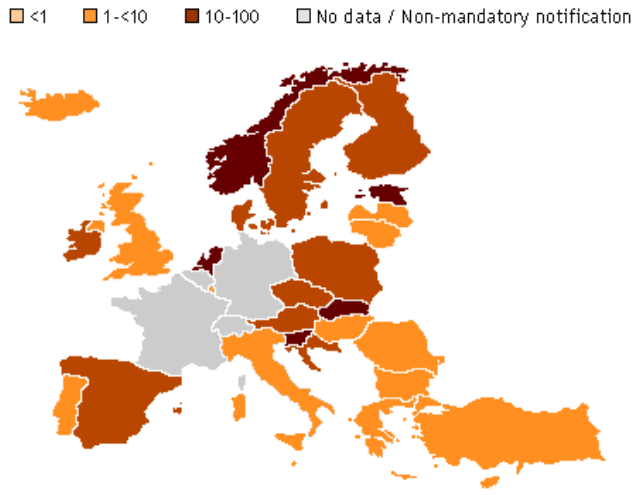
Cyprus, Iceland and Luxemburg reported zero cases.

Results

Number of cases and incidence

A total of 15,749 pertussis cases was reported from the 28 countries that provided epidemiological data based on mandatory notification systems covering total country population for 2010 (Table 2). This corresponds to an overall incidence of 3.7 per 100,000 inhabitants. The incidence category of reported pertussis per 100,000 is shown in figure 1. The highest incidences were reported from Norway and Estonia, with 73.4 and 96.6 cases per 100,000 inhabitants, respectively. Most cases (55%; n=8,593) were reported from the Netherlands (n=3,649), Norway (n=3,565), Slovakia (n=1,379), contributing to 23%, 23% and 9% respectively of all cases reported for 2010.

Figure 1. Incidence category of reported pertussis cases per 100,000 inhabitants, 2010

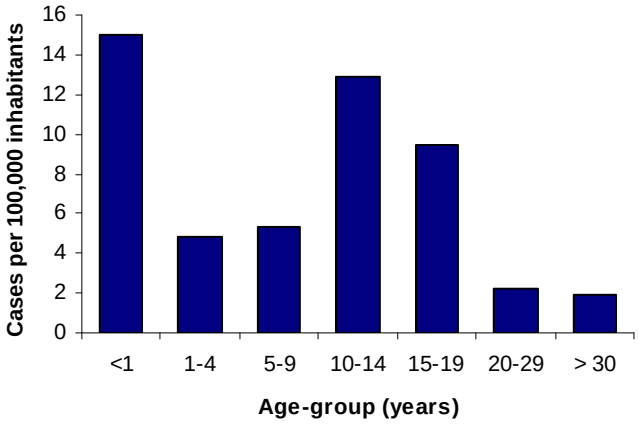


Age distribution

Data on the specified age-groups was known in 14,997 cases (95%). These were distributed between age-groups with 757 (5%) aged <1 year, 968 (7%) aged 1-4 years, 1277 (9%) aged 5-9 years, 3180 (21%) aged 10-14 years, 2535 (17%) aged 15-19 years, 781 (5%) aged 20-24 years, 559 (4%) aged 25-29 years, and 4940 (33%) older than 30 years. The incidence was highest among infants, (15 cases per 100,000) and among those aged 10-14 years (13 cases per 100,000 inhabitants), Figure 2.

Spain did not report data aggregated by age groups.

Figure 2. Incidence of reported pertussis cases by age-group, 2010



Vaccination status

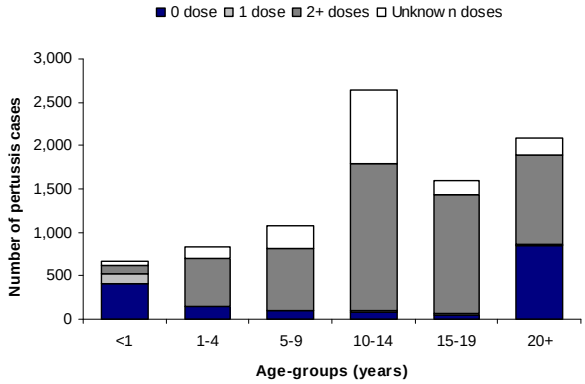
The vaccination status was known in 8,913 (57%) of all reported pertussis cases (Table 3). Of these, 1,648 (18%) were unvaccinated, 171 (2%) were vaccinated with one dose, 5,463 (61%) were vaccinated with at least two doses, and 1,631 (18%) were vaccinated with an unspecified number of doses. Of those unvaccinated (n=1,645), 25% were infants (n=413) and 51% adults over 20 (n=847).

Hospitalisation and mortality

Data with hospitalisation status was provided by 22 countries (table 4). There were 1,278 reported hospitalised cases in connection with pertussis (87 per 1000 pertussis cases). Most were infants (35%) and those aged 10-14 years (18%).

Data on deaths was provided by 22 countries (table 4). Two deaths in infants were reported: one from Denmark and one from UK. Both infants were too young to have received the first dose of vaccine (4 and 6 weeks respectively) One death was reported from Austria in an individual of 30 or more years of age.

Figure 2. Number of pertussis cases with a known vaccination status by age-group, 2010 (n=8,903)



Ten cases with unknown age-group not shown

Case-based notifications

Information at an individual level was available for 8,391 cases (53%), reported by 13 countries (Table 1). The male: female ratio was 0.8.

Case classification

Of these 8,391 cases, 7,678 (92%) were classified as confirmed, 26 (0.3%) as probable (cases with an epidemiological link) and 686 (8%) as possible (clinical cases). For one case the classification was unknown.

Laboratory diagnosis

Of the 7,678 laboratory confirmed cases, 90 were diagnosed with culture, 1,261 with PCR, and 5,738 with serology. Twenty-seven cases were confirmed with more than one test For 993 cases which were classified as confirmed, information on which test was used for laboratory confirmation was not available.

Comments

The overall number of pertussis reported cases has decreased by ~30% in 2010 as compared to 2009 or 2008, years when all 28 countries with mandatory surveillance systems covering all country population submitted surveillance data. Such change could be attributed to a real decrease in the number of cases occurring in Europe, or to the fact that this report is being issued earlier as compared to previous years. Indeed, for some countries the data reported are preliminary and will be subject to changes during 2011.

Additionally some countries which at present reported aggregated data, at a later time during the year might be able to report case based data. Similarly, Spain could have been able to submit data aggregated by age groups and vaccination status and not only overall number of cases if data

would have been collected later, as it was during 2003-09.

Besides these issues related to data collection, comparisons between countries need to be interpreted with caution due to different reporting procedures and health systems, the case definitions in use, and the different extent of use of laboratory confirmation. Data on hospitalisations and deaths are also particularly influenced by the type of surveillance system in place, and this is reflected by a large variation in the estimates observed in the present analysis.

In 2010 some countries were assigned to a different incidence category as compared to the previous years; however for most countries, except Slovakia and Lithuania, the change was insignificant (in the range of 1 unit)

In Slovakia, an increase of 200% in the crude incidence was observed. Since 2008 Slovakia has been reporting cases that are all laboratory confirmed, and in all years the majority were confirmed by serology.
In 2010 in Lithuania a 10 fold decrease in the incidence was noted as compared to 2009. This could be attributed to the fluctuation of the epidemiology of disease since the incidence in 2010 was similar to the incidence of 2008. Moreover, in 2008 a pre-school DTpa booster was added to the vaccination programme.

Most epidemiological characteristics - age of disease and vaccination status - have remained similar in 2010 as compared to 2008-09. The pooled data from 28 countries showed that infants and adolescents are the most affected. Fewer deaths were reported in 2010 as compared to 2008-09, however this can be mostly attributed to the decreased number of deaths reported by the UK, which reported the majority of deaths in 2003-09. The UK complements the information on laboratory confirmed cases of pertussis with an enhanced surveillance system aimed at collection clinical features.

Information on which type of test was used for laboratory confirmation was missing for about 13% of the cases. This situation underlines the importance of the current European strategy to integrate microbiological and epidemiological surveillance.[6] The proportion of laboratory confirmed cases was 93% for the countries which reported case based data, while the average from all 28 countries was 84%, possibly suggesting that countries who had a laboratory based surveillance system or that had access to laboratory information had also a more complete set of data variables available.
Few outbreaks continue to be reported yearly from European countries.[2-5] The literature is abundant with outbreaks description from the United States, Australia and Japan. It is possible that pertussis outbreaks are not investigated or they are not considered a priority for scientific dissemination. However they often provide insight into the disease dynamics and vaccine effectiveness and are a unique opportunity to reinforce the public health importance of the disease. Therefore descriptions of outbreaks occurring in European settings should be promoted.

Recently, the Global Pertussis Initiative (GPI) and the COPE Group (Consensus on Pertussis Booster Vaccine in Europe) have advocated for changes in the pertussis strategy for vaccination and surveillance.[7-8]
The COPE has emphasised the need for pertussis vaccinations beyond childhood and proposed implementation of a cocooning strategy to protect non-immune infants and replacement of dT boosters with dTpa for adolescents and adults in vaccination schedules across Europe.[7]
The GPI has advocated, among other things, for improved surveillance of pertussis in adults and for an update of a clinical definition which does not focus only on detecting the disease in children. [8]
It is important to remember that policy recommendation rely, among other things, on surveillance data. This is why all countries must strive to collect surveillance data of the highest possible standard.

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Reporters

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Table 2. Number, incidence, and proportion of laboratory-confirmed pertussis cases, 2010

	Number of cases (incidence per 100,000)				Laboratory-confirmed cases (%)	
	2009		2010		2010	
Austria	183	2.2	414	4.9	70	17%
Bulgaria	251	3.3	54	0.7	22	41%
Croatia	102	2.3	45	1	30	67%
Cyprus	8	1.0	0	0	0	-
Czech Republic	955	9.1	662	6.3	645	97%
Denmark	541	9.8	371	6.7	370	100%
Estonia	629	46.9	1,295	96.6	1279	99%
Finland	267	5.0	343	6.4	343	100%
Greece	45	0.4	64	0.6	55	86%
Hungary	33	0.3	25	0.2	25	100%
Iceland	0	0	0	0	0	-
Ireland	78	1.8	107	2.4	41	38%
Italy	638	1.1	262	0.4	0	0%
Latvia	10	0.4	7	0.3	4	57%
Lithuania	233	7.0	19	0.6	16	84%
Luxemburg	1	0.2	0	0	0	-
Malta	0	0	2	0.5	2	100%
Netherlands	6,468	39.2	3,649	22	3649	100%
Norway	5,487	114.3	3,565	73.4	3548	100%
Poland	2,390	6.3	1,266	3.3	573	45%
Portugal	64	0.6	14	0.1	13	93%
Romania	9	0.0	29	0.1	29	100%
Slovakia	288	5.3	1,379	25.4	1379	100%
Slovenia	442	21.7	611	29.8	371	61%
Spain	538	1.2	739	1.6	n/a	0%
Sweden	281	3.0	266	2.8	251	94%
Turkey	11	0.01	48	0.1	48	100%
UK	839	1.4	513	0.8	513	100%
Total	**20,758**	**4.9**	**15,749**	**3.7**	**13,276**	**84%**

Table 3. Pertussis cases by country and by vaccination status, 2010

	Unvaccinated		1 dose		≥ 2 doses		Unspecified number of doses		Unknown vaccination status	
	n	%	n	%	n	%	n	%	n	%
Austria	125	30%	21	5%	73	18%	0	0%	195	47%
Bulgaria	26	48%	3	6%	14	26%	0	0%	11	20%
Croatia	22	49%	0	0%	2	4%	20	44%	1	2%
Cyprus	0	-	0	-	0	-	0	.	0	.
Czech Republic	43	6%	2	0%	564	85%	42	6%	11	2%
Denmark	41	11%	16	4%	16	4%	0	0%	298	80%
Estonia	153	12%	14	1%	624	48%	119	9%	385	30%
Finland	8	2%	4	1%	1	0%	0	0%	330	96%
Greece	31	48%	6	9%	11	17%	0	0%	16	25%
Hungary	4	16%	1	4%	6	24%	5	20%	9	36%
Iceland	0	-	0	-	0	-	0	-	0	-
Ireland	13	12%	3	3%	4	4%	15	14%	72	67%
Italy	93	35%	0	0%	0	0%	125	48%	44	17%
Latvia	1	14%	0	0%	5	71%	0	0%	1	14%
Lithuania	2	11%	1	5%	14	74%	2	11%	0	0%
Luxemburg	0	-	0	-	0	-	0	-	0	-
Malta	2	100%	0	0%	0	0%	0	0%	0	0%
Netherlands	509	14%	30	1%	2068	57%	105	3%	937	26%
Norway	24	1%	0	0%	0	0%	670	19%	2871	81%
Poland	211	17%	13	1%	863	68%	0	0%	179	14%
Portugal	6	43%	7	50%	1	7%	0	0%	0	0%
Romania	16	55%	5	17%	3	10%	5	17%	0	0%
Slovakia	44	3%	2	0%	1032	75%	0	0%	301	22%
Slovenia	55	9%	0	0%	0	0%	502	82%	54	9%
Spain	0	0%	0	0%	0	0%	0	0%	739	100%
Sweden	106	40%	15	6%	58	22%	8	3%	79	30%
Turkey	19	40%	13	27%	4	8%	3	6%	9	19%
UK	94	18%	15	3%	100	19%	10	2%	294	57%
Total	**1,648**	**10%**	**171**	**1%**	**5,463**	**35%**	**1,631**	**10%**	**6,836**	**43%**

Table 4. Pertussis-related hospitalisations, deaths and rates per 1,000 cases, 2010

	Hospitalised		Deaths	
	Number	**Rate per 1000**	**Number**	**Rate per 1000**
Austria	68	164	1	2.4
Bulgaria	41	759	0	-
Croatia	17	378	n/a	-
Cyprus	-	-	0	-
Czech Republic	34	51	0	-
Denmark*	49	-	1	2.7
Estonia	83	64	n/a	-
Finland	n/a	0	n/a	-
Greece	44	688	0	-
Hungary	4	160	0	-
Iceland	-	-	0	-
Ireland**	23	-	0	-
Italy	24	92	n/a	-
Latvia	1	143	0	-
Lithuania	2	0	0	-
Luxemburg	-	-	n/a	-
Malta	0	0	0	-
Netherlands	83	23	0	-
Norway	32	9	0	-
Poland	525	415	0	-
Portugal	14	1000	0	-
Romania	29	1000	0	-
Slovakia	7	5	0	-
Slovenia	112	183	0	-
Spain	n/a	0	n/a	-
Sweden***	26	-	0	-
Turkey	n/a	-	0	-
UK	60	117	1	1.9
Total	**1,278**	**87**[†]	**3**	**0.02**

n/a = not available
* For Denmark, the number of hospitalised cases and deaths is for those < 2 years old
** Ireland, hospitalisation rate was not calculated because the hospitalisation status was unknown for a number of cases
***Sweden, hospitalisation data is only available for children born since 1996 and for some children born 1992-1994 who have participated in pertussis vaccine trials.
† Hospitalisation rate is for the 22 countries with available data on hospitalisation for all age-groups and is based on total number of pertussis cases from these countries as denominator (n=14,619)
†† Death rate if for the 22 countries with available data on deaths on all age groups and is based on total number of pertussis cases from these countries as denominator (n=13,065)