



Introduction

The following pertussis surveillance report aims to provide an overview of surveillance systems and selected epidemiological characteristics of pertussis at European level for 2008.

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 2009. 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 mid-year population estimates from Eurostat.¹

Surveillance systems and reporting

Twenty-eight EUVAC.NET-participating countries conducted surveillance for pertussis based on a mandatory notification system covering the total population.² In 2008, Denmark introduced a mandatory reporting of laboratory-confirmed cases in addition to the clinical surveillance of children below the age of two.³ All 28 countries provided pertussis data (Table 1).

The mandatory surveillance system in Belgium only operates in one of its three regions, while in Germany pertussis is a notifiable disease in five of the 16 federal states.⁴ Switzerland and France have sentinel surveillance system for pertussis.

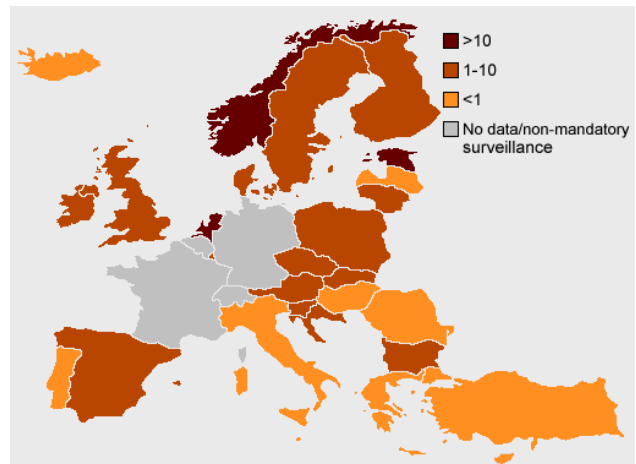
Results

Number of cases and incidence

A total of 20,208 pertussis cases was reported from the 28 countries that provided epidemiological data based on mandatory notification systems covering total country population for 2008 (Table 1). This corresponds to an overall incidence of 4.9 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 the Netherlands, with 82.2 and 50.3 cases per 100,000 inhabitants, respectively. Most cases (71%; n=14,302) were reported the Netherlands (n=8,246), Norway (n=3,892), and Poland (n=2,164), contributing to 40%, 19% and 11% respectively of all cases reported for 2008.

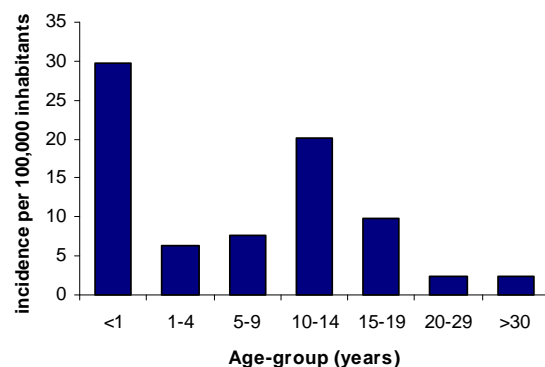
Figure 1. Incidence category of reported pertussis cases per 100,000 inhabitants, 2008



Age distribution

Data on the specified age-groups was known in 19,695 cases (97%). These were distributed between age-groups with 1,410 (7.2%) aged <1 year, 1,204 (6.1%) aged 1-4 years, 1,836 (9.3%) aged 5-9 years, 4,979 (25.3%) aged 10-14 years, 2,639 (13.4%) aged 15-19 years, 834 (4.2%) aged 20-24 years, 621 (3.2%) aged 25-29 years, and 6,172 (31.3%) older than 30 years. The incidence was highest among infants, (29.7 cases per 100,000) and among those aged 10-14 years (20.1 cases per 100,000 inhabitants), Figure 2.

Figure 2. Incidence of reported pertussis cases by age-group, 2008

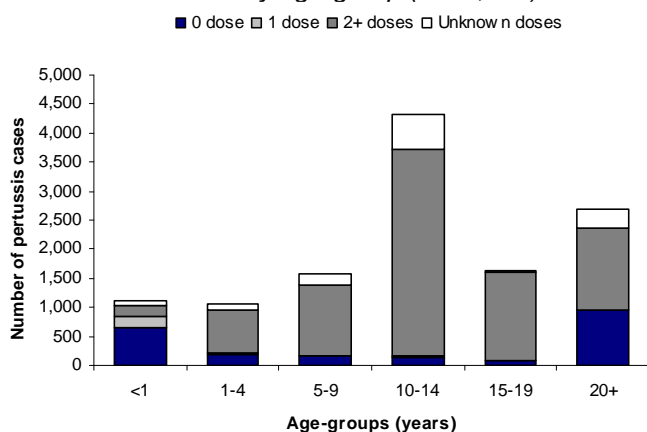


The vaccination status was known in 12,429 (62%) of all reported pertussis cases (Table 2). Of these, 2,156 (17%) were unvaccinated, 283 (2%) were vaccinated with one dose, 8,622 (69%) were vaccinated with at least two doses, and 410 (11%) were vaccinated with an unspecified number of doses.

Of those unvaccinated, a large number were infants (n=647), with the majority of these cases reported by UK (n=162), the Netherlands (n=74) and Italy (n= 42). Case-based data for UK showed that 60% of these cases were too young to have received any doses of vaccine. Case based data with age in weeks was not available for the Italian and Dutch cases.

Of those aged 5-19 years with at least two doses of vaccine (n=6,295), the majority were reported from The Netherlands (57%, n=3,572), Poland (21, n=1,353) and Norway (9%, n=593).

Figure 2. Number of pertussis cases with a known vaccination status by age-group (n=12,427)



Two cases with unknown age-group not shown

Hospitalisation and mortality

There were 1,915 reported hospitalised cases (100 per 1000 pertussis cases). Most were infants (38%) and those aged 10-14 years (22%). There were 11 deaths related to pertussis corresponding to a case fatality rate of 1.0 per 1000 cases (Table 3), Most deaths occurred in infants (n=10). Case-based data was available for eight of the infants who died. Seven cases were laboratory-confirmed. Four infants were unvaccinated and younger than two months when the first dose of the primary pertussis vaccination course is recommended. One case was aged two months and had not been immunised. Another infant, aged 11 weeks, had received one dose according to the recommended schedule. In the two remaining cases the vaccination status was unknown.

Comments

The burden of pertussis across Europe remains comparable to that of previous years. In 2008, we observed varied incidence of disease between countries, and different age distributions of the cases in respect to different countries, as observed also in 2003-07. Despite the high number of cases, few outbreaks have been documented for 2008 across Europe.^{5,6}

Comparisons between countries need to be interpreted with caution due to different reporting procedures and health systems, and the case definitions in use. Overall comparisons with estimates from previous years must also be interpreted with caution, due to the variation in the number of countries reporting. 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. Moreover, ascertainment of deaths due to pertussis is known to be poor.

Comparing the rates of laboratory-confirmed cases between countries is also challenging. The aggregated data used for the present analysis does not allow a description of the type of laboratory test used. Culture, PCR and serology have different sensitivities and specificities, may be used preferentially in certain age-groups and their results may be affected by a number of factors.⁴ Moreover, even in countries using the same tests, variations still exist due to different diagnostic tools. Standardization of serology has been encouraged across Europe⁷, and it remains a pivotal aspect in the next years in order to support high quality collection of epidemiological data.

However, despite these limitations, the overall picture for pertussis in Europe remains unchanged: the reported incidence of disease is high in infants, many of whom are too young to be vaccinated, and in adolescents, in whom waning immunity might be responsible for disease. It is also possible that surveillance in adolescents has improved or that these adolescent cases might not have had a full course of vaccination. Infants are the most represented group in terms of hospitalisation and deaths.

Nonetheless, it is important not to underestimate that pertussis may be under-diagnosed in the adolescents and adults, due to its atypical presentation or lack of clinical suspicion in these groups, even when the presentation is typical.⁸ Therefore, the epidemiological picture that we observe in infants may reflect a more frequent

circulation of the bacteria in the adolescents and adults than that captured by surveillance systems.

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Table 1. Number, incidence, and proportion of laboratory-confirmed pertussis cases, 2008

	Number of cases	Incidence per 100,000	Laboratory-confirmed cases (%)	
Austria	188	2.3	n/a	-
Bulgaria	193	2.5	130	67%
Croatia	102	2.3	n/a	-
Cyprus	3	0.4	2	67%
Czech Republic	767	7.4	765	100%
Denmark	505	9.2	505	100%
Estonia	485	36.2	482	99%
Finland	511	9.6	511	100%
Greece	22	0.2	10	45%
Hungary	33	0.3	33	100%
Iceland	2	0.6	1	50%
Ireland	104	2.4	71	68%
Italy	336	0.6	49	15%
Latvia	13	0.6	0	0%
Lithuania	51	1.5	41	80%
Luxemburg	11	2.3	11	100%
Malta	1	0.2	0	-
the Netherlands	8,246	50.3	8,246	100%
Norway	3,892	82.2	3,890	100%
Poland	2,164	5.7	n/a	-
Portugal	72	0.7	68	94%
Romania	50	0.2	31	62%
Slovakia	105	1.9	98	93%
Slovenia	181	8.9	161	89%
Spain	663	1.5	196	30%
Sweden	459	5.0	372	81%
Turkey	17	0.02	17	100%
UK	1,032	1.7	1,032	100%
Total	20,208	4.9	16,722	77%

Table 2. Pertussis cases by country and by vaccination status, 2008

	Unvaccinated		1 dose		≥ 2 doses		Unspecified number of doses		Unknown vaccination status	
	n	%	n	%	n	%	n	%	n	%
Austria	0	-	0	-	0	-	0	-	188	100%
Bulgaria	51	26%	22	11%	103	53%	15	8%	2	1%
Croatia	0	-	0	-	0	-	0	-	102	100%
Cyprus	2	67%	0	-	0	-	1	33%	0	-
Czech Republic	68	9%	2	-	668	87%	23	3%	6	1%
Denmark	60	12%	17	3%	23	5%	6	1%	399	79%
Estonia	29	6%	3	1%	330	68%	1	-	122	25%
Finland	36	7%	3	1%	9	2%	0	-	463	91%
Greece	13	59%	3	14%	3	14%	0	-	3	14%
Hungary	8	24%	2	6%	23	70%	0	-	0	-
Iceland	1	50%	0	-	0	-	1	50%	0	-
Ireland	33	32%	5	5%	11	11%	11	11%	44	42%
Italy	137	41%	0	-	0	-	112	33%	87	26%
Latvia	5	38%	0	-	6	46%	0	-	2	15%
Lithuania	12	24%	3	6%	31	61%	0	-	5	10%
Luxemburg	0	-	0	-	0	-	11	100%	0	-
Malta	0	-	0	-	0	-	0	-	1	100%
the Netherlands	896	11%	60	1%	5085	62%	280	3%	1925	23%
Norway	50	1%	0	-	679	17%	0	-	3163	81%
Poland	104	5%	34	2%	1674	77%	0	-	352	16%
Portugal	46	64%	11	15%	11	15%	4	6%	0	-
Romania	15	29%	3	6%	32	65%	0	-	0	-
Slovakia	18	17%	6	6%	70	67%	11	10%	0	-
Slovenia	23	13%	0	-	29	16%	104	57%	25	14%
Spain	82	12%	32	5%	69	10%	42	6%	438	66%
Sweden	109	24%	12	3%	142	31%	26	6%	170	37%
Turkey	6	35%	5	29%	5	29%	0	-	1	6%
UK	352	34%	60	6%	297	29%	42	4%	281	27%
Total	2,156	11%	283	1%	9,300	46%	690	3%	7,779	38%

Table 3. Pertussis-related hospitalisations, deaths and rates per 1,000 cases, 2008

	Hospitalised		Deaths	
	Number	Rate per 1000	Number	Rate per 1000
Austria	n/a	-	n/a	-
Bulgaria	102	528	0	0
Croatia	0	-	1	10
Cyprus	2	667	0	0
Czech Republic	75	98	0	0
Denmark*	43	-	0	0
Estonia	19	39	0	0
Finland	n/a	-	n/a	0
Greece	15	682	0	0
Hungary	9	273	0	0
Iceland	1	500	0	0
Ireland**	24	-	0	0
Italy	98	292	0	0
Latvia	7	538	0	0
Lithuania	19	373	0	0
Luxemburg	0	-	0	0
Malta	0	-	0	0
the Netherlands	146	18	0	0
Norway	49	13	0	0
Poland	871	402	1	1
Portugal	67	931	1	14
Romania	50	1,000	0	0
Slovakia	24	229	0	0
Slovenia	41	227	0	0
Spain	n/a	-	n/a	0
Sweden***	25	-	1	2
Turkey	n/a	-	n/a	-
UK	228	221	7	7
Total	1,915	100†	11	0.6 ††

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 80/104 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 21 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=17,761)

†† Death rate is for the 23 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=18,988)

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