Introduction

The following preliminary pertussis surveillance report covers the 5-year period 2003-07 and aims to provide an overview of the basic epidemiological features of pertussis at a European level.

Methods

Case-based pertussis surveillance data were requested from all 32 EUVAC.NET-participating countries for the years 2003-07. If case-based data could not be supplied we requested aggregated data consisting of the number of cases in specified age-groups categorised by vaccination, laboratory confirmation status, and hospitalisation variables. The number of cases with death was also requested. Countries with data obtained through mandatory notification systems covering the national population for the whole 5-year period 2003-07 were included in the analyses. Cases meeting the requirements for national surveillance, including clinical, laboratory-confirmed, and epidemiologically linked cases, were analysed. We converted case-based data to aggregated data by specified age-groups for analyses.

Cases with disease onset dates for each consecutive year from 2003 to 2007 were analysed. Cases with absent or unknown disease onset dates were included in the analyses because the date of notification or the date of collection of the laboratory sample was during each year of the study period.

Incidence was calculated with the number of cases of reported pertussis as the numerator and the country population obtained from Eurostat[1] as the denominator. Age-specific incidence was calculated for countries that provided data by the specified age-group requested and that had a known status. We expressed incidence of disease as pertussis cases per 100,000 inhabitants per year, and that of death as the total per 1000 pertussis cases per year.

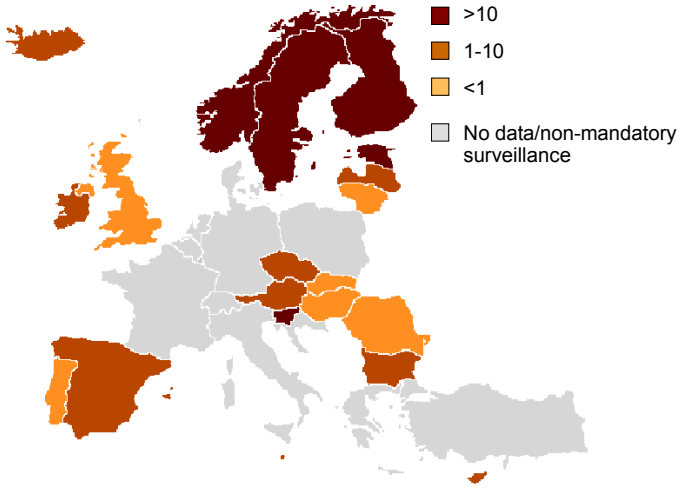
Results

Twenty countries provided data for the whole 5-year period 2003-07. Two countries submitted data covering shorter periods: Turkey for 2004-07, and Poland for 2005.

Incidence

A total of 43,482 pertussis cases was reported from 20 countries giving a crude incidence of 4.1 per 100,000 inhabitants. The distribution of reported pertussis cases varied considerably among the participating countries (table 1). The highest number of pertussis cases was reported from Norway followed by Sweden contributing to 48% and 12% of all cases reported for the study period, respectively. Cumulative crude incidences greater than 10 per 100,000 inhabitants were reported by Norway, Estonia, Finland, Slovenia and Sweden as shown in figure 1.

Figure 1. Geographical cumulative crude incidence of pertussis in 20 European countries, 2003-07



Data show incidence per 100,000 inhabitants.

Age distribution

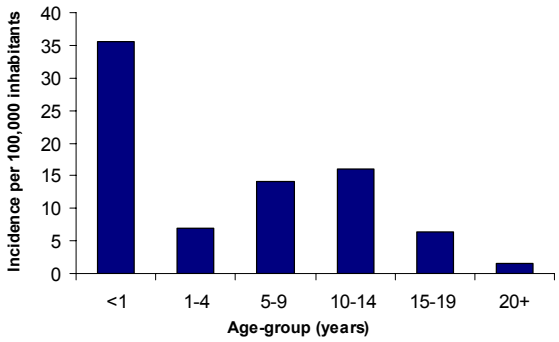
Data on the specified age-groups analysed was known in 41,515 cases (95%). Infants had the highest incidence (35.5 per 100,000) with 3,995 cases contributing to 10% of all cases with a known age-group. The remaining cases were distributed between age-groups with 2,938 (7%) aged 1-4 years, 7,631 (18%) aged 5-9 years, 9,577 (23%) aged 10-14 years, 4,338 (11%) aged 15-19 years and 13,036 (31%) older than 20 years.

Vaccination status

Information on known vaccination status was provided in 18,284 (42%) of all reported pertussis cases (table 2). Of these, 3,850 (21%) were unvaccinated, 627 (3%) were vaccinated with one dose, 10,207 (56%) were vaccinated with at least two doses, and 3,600 (20%) were vaccinated with an unspecified number of doses.

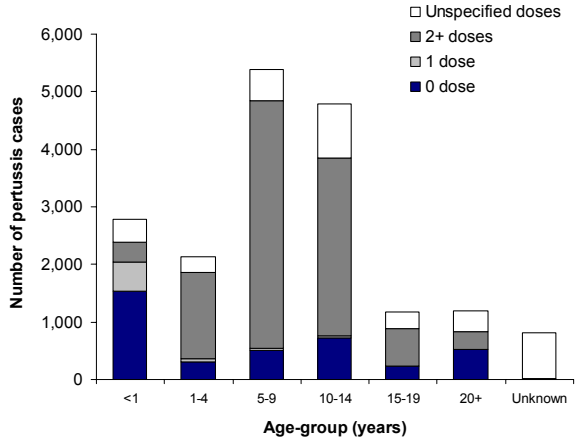
Of those vaccinated with at least two doses of pertussis vaccine the largest number were aged 5-9 years (n= 4,294) followed by those aged 10-14 years (n=3,085) corresponding to 80% and 64% respectively, of those with a known vaccination status in these age-groups (figure 3). Norway contributed to 50% of those aged 5-14 years with at least two doses of pertussis vaccine.

Figure 2. Incidence of reported pertussis cases by age-group, 2003-07



Excluded from this figure are incidence rates for 214 cases aged 1-14 years from Bulgaria as these were reported by age-groups other than those specified.

Figure 3. Pertussis cases with a known vaccination status by age-group, 2003-07 (n=18,284)



Hospitalisation and mortality

There were 2,777 reported hospitalised cases (82 per 1000 pertussis cases). For Sweden, the number of hospitalised cases was reported for those <15 years old and with laboratory confirmation only. The number of deaths in connection with pertussis was 30 corresponding to a death rate per 1000 pertussis cases of 0.8 (table 3). Most deaths occurred in infants (n=26; 87%). The remaining were distributed between age-groups with two (7%) aged 1-4 years, and two (7%) older than 30 years.

Comments

Our findings show widely varied incidence of pertussis in many European countries. While this may reflect a real variation, comparisons between countries should be made with caution because of different reporting procedures—some countries reported only laboratory-confirmed cases whereas others reported clinical cases without laboratory confirmation. One other limitation in the accuracy of the data source is the use of passive routine surveillance systems. Such systems are notorious for under-reporting and delayed reporting despite the statutory obligation to notify pertussis.

Conversely, countries whose surveillance relies entirely on laboratory notifications based on serological test results may be overestimating their incidence as commercially available diagnostic kits vary in sensitivity and specificity.[2]

We aggregated case-based data by specified age-groups to allow more comparisons on variables between different countries. However, data on laboratory confirmation, hospitalisation and deaths have to be interpreted cautiously as cases with unknown status on these variables could not be analysed fully using aggregated data.

We did not examine trends during the study period or make comparisons in the age-groups mostly affected in different countries. However, pooled data have shown the highest incidence of pertussis in infants. A corresponding high-case fatality in infants has been observed in an earlier study on pertussis in Europe.[3]

The high proportion (50%) of cases aged 5-14 years with at least two doses of pertussis vaccine reported from Norway may be explained by waning immunity in this age-group following the primary three-dose course completed by the first year of life. However, a booster dose was introduced in the Norwegian childhood vaccination programme in January 2006 for children aged 7 years and born after 1998.[4]

For a more accurate epidemiological assessment of pertussis a complete set of surveillance data in case-based format from all participating countries is required. Moreover, improved quality of data on all basic variables is necessary.

References

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[2] Mattoo S, Cherry JD. Molecular pathogenesis, epidemiology, and clinical manifestations of respiratory infections due to Bordetella pertussis and other Bordetella subspecies. Clin Microbiol Rev. 2005,18(2):326-82.

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Table 1. Number of reported pertussis and laboratory-confirmed cases, 2003-07 (n=43,482)

	2003			2004			2005			2006			2007			Total		
	Number of cases	Laboratory-confirmed cases		Number of cases	Laboratory-confirmed cases		Number of cases	Laboratory-confirmed cases		Number of cases	Laboratory-confirmed cases		Number of cases	Laboratory-confirmed cases		Number of cases	Laboratory-confirmed cases	
Austria *	170	170	100%	130	130	100%	135	135	100%	72	72	100%	133	133	100%	640	640	100%
Bulgaria *	180	0	0%	222	0	0%	313	313	100%	335	335	100%	269	238	88%	1,319	886	67%
Cyprus	58	20	34%	15	12	80%	6	6	100%	8	3	38%	9	8	89%	96	49	51%
Czech Republic	342	340	99%	373	373	100%	412	412	100%	234	234	100%	186	144	77%	1,547	1,503	97%
Estonia †	623	489	78%	455	451	99%	63	62	98%	153	148	97%	409	399	98%	1,703	1,549	91%
Finland *	1,264	1,264	100%	1,631	1,631	100%	552	552	100%	536	536	100%	480	480	100%	4,463	4,463	100%
Hungary *	29	26	90%	31	30	97%	22	21	95%	17	17	100%	48	48	100%	147	142	97%
Iceland	4	3	75%	0	..	..	6	6	100%	6	3	50%	4	2	50%	20	14	70%
Ireland	40	n/a	..	92	41	45%	83	33	40%	62	38	61%	78	47	60%	355	159	45%
Latvia †	99	55	56%	41	26	63%	25	15	60%	29	10	34%	27	15	56%	221	121	55%
Lithuania †	5	0	0%	49	18	37%	64	41	64%	6	4	67%	17	14	82%	141	77	55%
Malta	7	2	29%	6	0	0%	5	0	0%	2	0	0%	0	..	..	20	2	10%
Norway †	2,768	2,768	100%	1,547	1,542	99.7%	4,504	4,492	99.7%	6,587	6,585	99.97%	5,374	5,367	99.87%	20,780	20,754	99.87%
Portugal	4	0	0%	38	35	92%	78	73	94%	22	0	0%	21	0	0%	163	108	66%
Romania †	94	0	0%	231	0	0%	52	18	35%	37	4	11%	35	26	74%	449	48	11%
Slovakia *	47	47	100%	21	21	100%	17	17	100%	21	21	100%	21	21	100%	127	127	100%
Slovenia *	182	148	81%	113	94	83%	85	76	89%	551	446	81%	708	529	75%	1,639	1,293	79%
Spain	551	53	10%	530	102	19%	304	115	38%	383	101	26%	554	146	26%	2,322	517	22%
Sweden*	664	574	86%	1,567	1,394	89%	1,360	1,072	79%	794	615	77%	690	554	80%	5,075	4,209	83%
UK	270	270	100%	370	312	84%	456	397	87%	476	476	100%	683	683	100%	2,255	2,138	95%
Total	7,401	6,229	84%	7,462	6,212	83%	8,542	7,856	92%	10,331	9,648	93%	9,746	8,854	91%	43,482	38,799	89%

* reported aggregated data for 2003-07; † reported partially aggregated data for 2003-07; n/a = not available

Table 2. Pertussis cases with number of vaccines received, 2003-07

	Unvaccinated		1 dose		≥2 doses		Unspecified		Unknown status	
Austria	0	..	0	..	0	..	0	..	640	100%
Bulgaria	201	15%	34	3%	276	21%	367	28%	441	33%
Cyprus	11	11%	0	0%	1	1%	70	73%	14	15%
Czech Republic	153	10%	15	1%	1,317	85%	43	3%	19	1%
Estonia	42	2%	13	1%	825	48%	540	32%	283	17%
Finland	0	..	0	..	0	..	0	..	4,463	100%
Hungary	0	..	0	..	0	..	0	..	147	100%
Iceland	1	5%	0	0%	0	0%	16	80%	3	15%
Ireland	53	15%	9	3%	20	6%	17	5%	256	72%
Latvia	59	27%	3	1%	154	70%	5	2%	0	0%
Lithuania	62	44%	23	16%	46	33%	3	2%	7	5%
Malta	6	30%	2	10%	2	10%	6	30%	4	20%
Norway	461	2%	21	0.1%	4,522	22%	69	0%	15,707	76%
Portugal	85	52%	35	21%	11	7%	3	2%	29	18%
Romania	29	6%	16	4%	69	15%	5	1%	330	73%
Slovakia	7	6%	1	1%	99	78%	1	1%	19	15%
Slovenia	209	13%	0	..	609	37%	657	40%	164	10%
Spain	179	8%	118	5%	384	17%	1,242	53%	399	17%
Sweden	1,631	32%	198	4%	1,290	25%	494	10%	1,462	29%
United Kingdom	661	29%	139	6%	582	26%	62	3%	811	36%
Total	3,850	9%	627	1%	10,207	23%	3,600	8%	25,198	58%

Table 3. Pertussis-related hospitalised and death cases and rates per 1000 cases, 2003-07

	Hospitalised		Deaths	
	Number	Rate per 1000	Number	Rate per 1000
Austria	n/a	..	0	0
Bulgaria	43	33	1	0.8
Cyprus	18	188	0	0
Czech Republic	184	119	2	1.3
Estonia	241	142	0	0
Finland	n/a	..	n/a	..
Hungary	83	565	0	0
Iceland	n/a	..	0	0
Ireland	55	155	1	2.8
Latvia	153	692	0	0
Lithuania	n/a	..	1	7.1
Malta	2	100	0	0
Norway	422	20	2	0.1
Portugal	153	939	0	0
Romania	120	267	0	0
Slovakia	n/a	..	0	0
Slovenia	355	217	1	0.6
Spain	n/a	..	4	1.7
Sweden *	327	102	n/a	..
United Kingdom	621	275	15	6.7
Total	2,777	82 **	27	0.8 †

n/a= not available

* For Sweden, the number of hospitalised cases is for those <15 years old and with laboratory confirmation only . Denominator used is therefore number of laboratory-confirmed cases <15 years (n= 3,219)

** Hospitalisation rate is for the 14 countries with available data on hospitalisation and is based on total number of pertussis cases from these countries (for Sweden, total number of laboratory-confirmed cases <15 years only) as denominator (n=33,913).

† Death rate is for the 19 countries with available data on deaths and is based on total number of pertussis cases from these countries as denominator (n=39,019)

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