Invasive pneumococcal disease

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Key facts

- In 2014, 17 528 confirmed cases of invasive pneumococcal disease were reported to TESSy.
- The notification rate was 4.8 cases per 100 000 population, lower than in the previous four years.
- Age-specific rates were highest in those aged 65 years and over (13.8 cases per 100 000 population), followed by infants under one year of age (11.3 cases per 100 000 population).
- The 10 most common serotypes were 3, 8, 22F, 19A, 7F, 12F, 1, 9N, 15A and 24F (in order of frequency), accounting for 56% of typed isolates.
- Of all cases <5 years of age, 68% were caused by a serotype not included in any PCV vaccine.
- Among cases aged 65 years and over, 67% were caused by a PPV23 serotype, and 33% were caused by a PCV13 serotype.
- It is essential to continue to monitor circulating serotypes and antimicrobial resistance in Europe in order to assess interventions such as treatment options and the development of new vaccines.

Methods

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

In 2010, enhanced surveillance of invasive pneumococcal disease (IPD) was implemented at the European level.

• In 2014, 28 Member States reported data.

• Nine Member States used the EU-2012 case definition, 15 Member States used the EU-2008 case definition, and one Member Stated used the EU-2002 case definition. Three Member States used other case definitions. The 2012 and 2008 case definitions are identical but differ from the 2002 EU case definition in no longer including possible and probable cases and in counting the detection of S. pneumoniae antigen at a normally sterile site as a confirmed case.

• National IPD surveillance systems are heterogeneous. Surveillance systems in Member States and at the European level have also changed over time, including changes in representativeness and reporting procedures.

• Most national surveillance systems are comprehensive, except for Belgium, France, the Netherlands and Spain. Notification rates were not calculated for Belgium, for which population coverage was unknown. All countries – except for Bulgaria and Croatia – report case-based data (Annex 1).

• Serotypes were analysed for Member States that provided serotype data.

• IPD data from France are reported through two different systems: one based on physicians (FR-EPIBAC), the other on laboratories (FR-PNEUMO-NRL). Data reported from FR-EPIBAC are included in all indicators and distributions not related to serotype. Data reported from FR-PNEUMO-NRL are used for all indicators and distributions related to serotype and antimicrobial susceptibility.

Epidemiology

For 2014, 17 528 confirmed cases of IPD were reported by 28 countries. The notification rate was 4.8 cases per 100 000 population, lower than in the previous four years (Table 1). The United Kingdom had the highest number of confirmed cases (4 157), followed by France (3 184) (Figure 1). The highest notification rates were reported in Slovenia, the Netherlands, Denmark and Finland, with 13.4, 13.0, 12.9 and 12.9 confirmed cases per 100 000 population, respectively (Figure 2).

Table 1. Reported confirmed cases of invasive pneumococcal disease 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	325	3.9	158	1.9	234	2.8	350	4.1	Y	C	322	322	3.8	3.5
Belgium	1851	..	1836	..	1738	..	1604	..	N	C	1192	1192	..	..
Bulgaria	26	0.4	37	0.5	19	0.3	17	0.2	Y	A	21	21	0.3	0.3
Croatia	..	..	..	..	18	0.4	16	0.4	Y	A	27	27	0.6	0.2
Cyprus	12	1.5	15	1.8	19	2.2	8	0.9	Y	C	14	14	1.6	1.7
Czech Republic	300	2.9	384	3.7	335	3.2	424	4.0	Y	C	337	337	3.2	3.1
Denmark	960	17.3	924	16.6	882	15.8	842	15.0	Y	C	725	725	12.9	12.1
Estonia	14	1.1	18	1.4	20	1.5	24	1.8	Y	C	12	12	0.9	0.9
Finland	834	15.6	779	14.5	752	13.9	724	13.3	Y	C	703	703	12.9	12.0
France	5117	10.5	5037	10.4	4430	9.0	3687	7.6	74%	C	3184	3184	6.5	6.2
Germany	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Greece	38	0.3	41	0.4	43	0.4	40	0.4	Y	C	30	30	0.3	0.3
Hungary	108	1.1	107	1.1	186	1.9	202	2.0	Y	C	150	150	1.5	1.5
Iceland	32	10.1	33	10.4	27	8.4	19	5.9	Y	C	24	24	7.4	8.8
Ireland	304	6.7	357	7.8	350	7.6	347	7.6	Y	C	342	342	7.4	8.3
Italy	854	1.4	713	1.2	814	1.4	977	1.6	Y	C	957	957	1.6	1.4
Latvia	16	0.8	51	2.5	56	2.7	56	2.8	Y	C	51	51	2.5	2.4
Liechtenstein	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lithuania	9	0.3	9	0.3	7	0.2	17	0.6	Y	C	7	6	0.2	0.2
Luxembourg	2	0.4	2	0.4	1	0.2	1	0.2	Y	C	1	1	0.2	0.2
Malta	11	2.7	11	2.7	15	3.6	6	1.4	Y	C	22	22	5.2	4.9
Netherlands	571	13.8	622	14.9	635	15.2	652	15.5	25%	C	550	546	13.0	12.4
Norway	748	15.4	729	14.8	626	12.6	620	12.3	Y	C	569	569	11.1	11.3
Poland	333	0.9	351	0.9	441	1.2	540	1.4	Y	C	705	705	1.9	1.9
Portugal	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Romania	80	0.4	90	0.4	79	0.4	92	0.5	Y	C	62	62	0.3	0.3
Slovakia	18	0.3	57	1.1	49	0.9	84	1.6	Y	C	78	78	1.4	1.5
Slovenia	224	10.9	255	12.4	245	11.9	278	13.5	Y	C	276	276	13.4	12.8
Spain	2212	5.9	2220	5.9	2260	6.0	2026	5.4	80%	C	1856	1856	5.0	4.7
Sweden	1456	15.6	1361	14.5	1387	14.6	1316	13.8	Y	C	1159	1159	12.0	11.0
United Kingdom	5616	9.0	4631	7.3	5208	8.2	5045	7.9	Y	C	4157	4157	6.5	6.3
EU/EEA	**22071**	**6.0**	**20828**	**5.7**	**20876**	**5.7**	**20014**	**5.4**	**.**	**C**	**17533**	**17528**	**4.8**	**4.6**

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

Figure 1. Reported confirmed cases of invasive pneumococcal disease, EU/EEA, 2014

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

Figure 2. Number of reported confirmed cases of invasive pneumococcal disease per 100 000 population, EU/EEA, 2014

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

Age and gender distribution

In 2014, invasive pneumococcal disease was predominantly found in infants and the elderly, with 13.8 confirmed cases per 100 000 population in adults aged 65 years or older and 11.3 confirmed cases per 100 000 population in children under one year of age (Figure 3). As in previous years, the rates of disease were lowest in people between 5 and 44 years. There was a predominance of cases in males in all age groups, giving an overall male-to-female ratio of 1.2:1.

Figure 3. Reported confirmed cases of invasive pneumococcal disease cases, by age and gender, EU/EEA, 2014

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

Seasonality and trend

The seasonal distribution of IPD cases followed a pattern similar to that of other respiratory diseases. The lowest rates were observed during summer. Case numbers increased rapidly with the onset of autumn and winter, showing a peak in December. This pattern was similar to 2010–2013 (Figures 4 and 5). The number of cases as well as the notification rates of IPD gradually declined over the years (Figure 5), with the lowest values so far in 2014.

Figure 4. Seasonal distribution of reported confirmed cases of invasive pneumococcal disease, EU/EEA, 2014 compared with 2010–2013

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

Figure 5. Trend and number of reported confirmed cases of invasive pneumococcal disease, EU/EEA, 2010–2014

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

Serotype

For 2014, 25 EU/EEA countries reported data on serotype for 12 980 (74%) of 17 528 cases. The 10 most common serotypes were, 3, 8, 22F, 19A, 7F, 12F, 1, 9N, 15A and 24F (ordered by frequency), accounting for 56% of all cases with known serotype (Figure 6). This was similar to the 10 most common serotypes observed in 2012 and 2013, with differences due to a proportional increase in serotypes 9N and 24F, and a proportional decrease in serotypes 14 and 6C.

Among cases aged <1 year, serotype 10A was the most common (8%), followed by 33F (7%). Among children aged 1–4 years, serotypes 24F (11%) and 19A (9%) were the most common (Table 2). Of all cases aged <5 years, 13% were caused by a PCV7 serotype (4, 6A, 6B, 9V, 14, 18C, 19F, 23F), 6% by a PCV10non7 serotype (1, 5, 7F), and 13% by a PCV13non10 serotype (3, 19A). The proportion of cases caused by PCV10non7 and PCV13non7 serotypes has decreased since 2011. In 2014, 68% of cases <5 years of age were caused by a serotype not included in any PCV vaccine, a gradual increase from 38% in 2011 (Figure 7).

Among cases aged 5–64 years, 9% were caused by a PCV7 serotype, 14% by a PCV10non7 serotype, and 15% by a PCV13non10 serotype. The proportion of cases caused by PCV7 and PCV10non7 serotypes has gradually decreased since 2011, when 15% of cases were caused by a PCV7 serotype, and 27% by a PCV10non7 serotype. The proportion of cases caused by PCV13non10 serotypes has remained stable.

Among adults 65 years and over, the most frequent serotypes were 3 (12%) and 22F (8%) (Table 2). Sixty-seven percent were caused by a PPV23 serotype, and 33% were caused by a PCV13 serotype. The proportion caused by a PCV13 serotype has gradually declined since 2011, 50% of cases aged 65 years and over were caused by a PCV13 serotype. Thirty-three percent of cases aged 65 years and over were caused by a serotype not covered by either PCV13 or PPV23.

Serotypes covered by different pneumococcal vaccines:

• 7-valent pneumococcal conjugate vaccine (PCV7): 4, 6B, 9V, 14, 18C, 19F, 23F

• 10-valent pneumococcal conjugate vaccine (PCV10): 4, 6B, 9V, 14, 18C, 19F, 23F, 1, 5, 7F

• 13-valent pneumococcal conjugate vaccine (PCV13): 4, 6B, 9V, 14, 18C, 19F, 23F, 1, 5, 7F, 3, 6A*, 19A (* Although serotype 6A is included in PCV13 and not in PCV7, it is considered to be a PCV7 serotype in the analysis due to documented cross-protection provided by the serotype 6B antigen in PCV7.)

• 23-valent pneumococcal polysaccharide vaccine (PPV23): 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, 33F

Figure 6. Distribution of confirmed cases of invasive pneumococcal disease: most common serotypes in 2014 (n=12 980), 2013 (n=14 811) and 2012 (n=14 845)

* covered by PCV7, PCV10, PCV13 and PPV23
~ covered by PCV10, PCV13 and PPV23
† covered by PCV13 and PPV23
^ covered by PPV23

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

Table 2. Proportion of the five most frequent serotypes among confirmed cases of invasive pneumococcal disease, by age group, 2014 (n= 12 898*)

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Age group (years)	<1	1–4	5–14	15–24	25–44	45–64	≥65
Five most common serotypes by age group (% of all cases)	**10A** (7.9%)	**24F** (11.2%)	**1** (26.8%)	**8** (16.6%)	**8** (13.2%)	**8** (12.1%)	**3** (11.9%)
	33F (7.3%)	**19A** (9.0%)	**7F** (9.4%)	**7F** (11.2%)	**7F** (10.8%)	**3** (10.2%)	**22F** (8.0%)
	19A (6.8%)	**12F** (7.9%)	**12F** (5.5%)	**1** (6.8%)	**3** (7.9%)	**22F** (7.8%)	**8** (7.7%)
	12F (6.5%)	**14** (7.4%)	**23B** (4.8%)	**19A** (6.3%)	**1** (6.7%)	**7F** (6.3%)	**19A** (6.4%)
	24F (5.9%)	**1** (6.3%)	**19A** (4.5%)	**3** (6.3%)	**12F** (6.7%)	**19A** (6.5%)	**7F** (4.3%)

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

* Number of cases for which information on serotype and age was available. Number of cases for which serotype information was available by age group: <1 year: n= 355; 1-4 years: n= 599; 5-14 years: n= 308; 15-24 years: n= 205; 25-44 years: n= 1 354; 45-64 years: n= 3 458; >65 years: n= 6 675.

Figure 7. Invasive pneumococcal disease, reported, confirmed cases aged <5 years: serotype distribution by PCV vaccine type, 2011–2014 (n= 4 783)

* Although serotype 6A is included in PCV13 and not in PCV7, it is considered to be a PCV7 serotype in the analysis due to documented cross-protection provided by the serotype 6B antigen in PCV7. PCV7 serotypes: 4, 6A, 6B, 9V, 14, 18C, 19F, 23F; PCV10non7 serotypes: 1, 5, 7F; PCV13non10 serotypes: 3, 19A; non-PCV serotypes: all remaining serotypes.

Antimicrobial susceptibility

The prevalence of non-susceptibility (combined intermediate and resistant categories) to penicillin increased from 8% in 2012 to 11% in 2014. In 2014, non-susceptibility to erythromycin was 14% after decreasing from 17% in 2012. Cefotaxime/ceftriaxone non-susceptibility increased from 2% in 2012 to 6% in 2014 (Figure 9). In 2014, the prevalence of non-susceptibility varied between countries, with the highest percentages of non-susceptibility reported by Italy (erythromycin: 28.0%), Poland (penicillin: 28.3%), and Spain (cefotaxime/ceftriaxone: 12.5%).

Figure 8. Susceptibility of confirmed cases of invasive pneumococcal disease to cefotaxime/ceftriaxone, penicillin and erythromycin, 2012–2014

Sources:

For penicillin, country reports from Austria, Belgium, Cyprus (2012), Denmark, Estonia, Finland, France, Hungary, Iceland (2012, 2014), Ireland, Italy, Latvia (2013, 2014), Lithuania (2012, 2013), Norway, Poland, Romania (2013), Slovakia, Slovenia, Spain, the United Kingdom (2012, 2013, 2014). Total number of cases – 2012: n=12 226; 2013: n=11 493; 2014: n=9 283.

For erythromycin, country reports from Austria, Cyprus (2013, 2014), Denmark, Estonia, Finland, France, Hungary, Iceland (2012, 2014), Ireland, Italy, Latvia (2013, 2014), Lithuania (2012, 2013), Norway, Poland, Romania (2013), Slovakia, Slovenia, Spain, the United Kingdom (2012, 2013, 2014). Total number of cases – 2012: n=9 685; 2013: n=9 202; 2014: n=7 548.

For cefotaxime/ceftriaxone, country reports from Austria (2012, 2013), Cyprus (2012), Denmark, Estonia, Finland (2012, 2014), France (2012), Hungary, Iceland (2012, 2014), Ireland, Latvia (2013, 2014), Lithuania (2012, 2013), Norway, Poland, Romania (2013), Slovakia, Slovenia, Spain, the United Kingdom (2012, 2013, 2014). Total number of cases – 2012: n=4 419; 2013: n=4 715; 2014: n=4 592.

Note: SIR values (susceptible, intermediate, and resistant) are displayed as interpreted by the reporting countries. 'Intermediate' and 'resistant' were categorised as 'non-susceptible'.

Clinical presentation

The clinical presentation was known for 10 353 (59%) of all cases. Bacteraemia was reported in 5 943 cases (57%), bacteraemia and pneumonia in 2 417 cases (23%), meningitis in 1 456 cases (14%), and a further 537 cases (5%) had other clinical presentations. Bacteraemia was the most common clinical presentation in all age groups and with the 15 most common serotypes, except for serotypes 14 and 1, which were most commonly associated with bacteraemia and pneumonia.

Outcome

The outcome was known for 4 772 (27%) of all cases. Among cases with known outcome, 713 (15%) were reported as fatal. However, due to the poor completeness of this variable, these results must be interpreted with caution. The true case fatality is expected to be considerably lower.

Discussion

In 2014, the notification rate of confirmed IPD was lower than in previous years and varied by country, ranging from 0.2 to 13.4 cases per 100 000 population. The variation in notification rates between countries may be due to better case ascertainment and the implementation of enhanced surveillance systems in some countries. The elderly and infants continue to be the most affected age groups.

In all age groups, the proportion of cases caused by PCV serotypes decreased, and the majority of cases were caused by non-PCV serotypes. PCV7 was first licensed in 2001 for use in infants and young children, and EU/EEA Member States began introducing the vaccine into their routine child immunisation schedules in 2006. In 2009, the higher valency PCV10 and PCV13 vaccines were licensed and have progressively replaced PCV7. To date, 25 Member States have introduced one of the conjugate vaccines into their routine national childhood immunisation programme [1].

The introduction of pneumococcal conjugate vaccines has proved to be very effective in reducing the incidence of IPD [2]. Moreover, the vaccination of infants and young children has resulted in herd protection by reducing nasopharyngeal carriage and transmission of the bacterium, contributing to a decrease in morbidity and mortality among the older age groups [3-6]. Over time, serotype replacement has gradually reduced the effectiveness of PCV7, as the rates of carriage and disease caused by non-vaccine serotypes have increased [7]. There is evidence that such increases in non-vaccine serotypes are continuing, following the introduction of PCV10 and PCV13 [5, 6]. In Europe in 2014, serotypes four and two – which belong to the five most common serotypes in infants and children aged 1–4 years – are not included in any of the currently licensed pneumococcal conjugate vaccines. Both serotypes could be potential targets for future higher valency vaccines.

Among the elderly, the majority of cases continue to be caused by PPV23 serotypes, with a third of all cases caused by PCV13 serotypes. In 2011, PCV13 was approved for use in adults aged 50 years and over. Studies have shown that PCV13 vaccination in the elderly can induce an immune response against vaccine serotypes that is non-inferior or better than PPV23. The vaccine is safe and effective in preventing non-invasive pneumococcal pneumonia and invasive pneumococcal disease [8]. However, decreases in PCV13 serotypes and increases in non-PCV13 serotypes in the elderly as an indirect effect of routine childhood vaccination may decrease the potential benefit of elderly PCV13 vaccination [9]. Further monitoring of IPD serotype trends in the elderly and post-marketing impact studies in adults are essential. Twenty Member States offer different vaccines for persons 50 years and over, and/or for risk-groups in certain age groups. Fifteen Member States offer PPV23 and nine offer PCV13 vaccination for the elderly [1].

Public health conclusions

The decision to introduce a vaccine to the routine national immunisation programme depends on context-specific factors in each country, such as the disease and serotype burden, cost-effectiveness, and feasibility. It is essential to continue to monitor circulating serotypes and antimicrobial resistance in Europe in order to assess interventions such as treatment options and the development of new vaccines.

In August 2012, ECDC has started funding SpID-net (Streptococcus pneumoniae Invasive Disease network), a project which aims to establish active surveillance of IPD in the EU/EEA in order to monitor changes in the epidemiology of IPD, estimate vaccine effectiveness of PCV vaccines, and evaluate the impact of PCV vaccination programmes. The project has study sites in ten Member States and covers around 20% of the total EU/EEA population.

References

1. European Centre for Disease Prevention and Control. Vaccine scheduler. [Internet.] Stockholm: ECDC; 2016. Available at: http://vaccine-schedule.ecdc.europa.eu/Pages/Scheduler.aspx

2. Feikin DR, Kagucia EW, Loo JD, Link-Gelles R, Puhan MA, Cherian T, et al. Serotype-specific changes in invasive pneumococcal disease after pneumococcal conjugate vaccine introduction: a pooled analysis of multiple surveillance sites. PLoS Med. 2013;10(9):e1001517.

3. Tocheva AS, Jefferies JM, Rubery H, Bennett J, Afimeke G, Garland J, et al. Declining serotype coverage of new pneumococcal conjugate vaccines relating to the carriage of Streptococcus pneumoniae in young children. Vaccine. 2011 Jun 10;29(26):4400-4.

4. Flasche S, Van Hoek AJ, Sheasby E, Waight P, Andrews N, Sheppard C. Effect of pneumococcal conjugate vaccination on serotype-specific carriage and invasive disease in England: a cross-sectional study. PLoS Med. 2011 Apr;8(4):e1001017.

5. Waight PA, Andrews NJ, Ladhani SN, Sheppard CL, Slack MP, Miller E. Effect of the 13-valent pneumococcal conjugate vaccine on invasive pneumococcal disease in England and Wales 4 years after its introduction: an observational cohort study. Lancet Infect Dis. 2015 May;15(5):535-43. Erratum in: Lancet Infect Dis. 2015 Jun;15(6):629.

6. D'Ancona F, Caporali MG, Del Manso M, Giambi C, Camilli R, D'Ambrosio F, et al. Invasive pneumococcal disease in children and adults in seven Italian regions after the introduction of the conjugate vaccine, 2008–2014. Epidemiol Prev. 2015 Jul-Aug;39(4 Suppl 1):134-8.

7. Lynch JP 3rd, Zhanel GG. Streptococcus pneumoniae: epidemiology and risk factors, evolution of antimicrobial resistance, and impact of vaccines. Curr Opin Pulm Med. 2010 May;16(3):217-25.

8. Tomczyk S, Bennett NM, Stoecker C, Gierke R, Moore MR, Whitney CG, et al. Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine among adults aged ≥65 years: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep. 2014 Sep 19;63(37):822-5. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm

9. Hanquet G, Lepoutre A, Ciruela P, Frimann Vestrheim D, Smith-Palmer A, Krizova P, et al. Indirect effect of childhood PCV10/13 vaccination on invasive pneumococcal disease among seniors 65 years old and over in six European countries (Spidnet network): Implications for PCV13 vaccination of the elderly. European Scientific Conference on Applied Infectious Disease Epidemiology – ESCAIDE; 2015 11–13 Nov; Stockholm. Stockholm: ECDC; 2015. [ESCAIDE abstract book, reference number 3064].

Additional information

ECDC Surveillance Atlas of Infectious Diseases

ECDC annual epidemiological report, 2014: http://ecdc.europa.eu/en/publications/Publications/AER-VPD-IBD-2014.pdf

ECDC enhanced surveillance report, 2012: http://ecdc.europa.eu/en/publications/Publications/Surveillance%20of%20IBD%20in%20Europe%202012.pdf

ECDC External quality assurance scheme for Streptococcus pneumoniae, 2012: http://ecdc.europa.eu/en/publications/Publications/streptococcus-pneumoniae-EQA-2012.pdf

ECDC surveillance report on invasive bacterial diseases in Europe 2011: http://ecdc.europa.eu/en/publications/Publications/invasive-bacterial-diseases-surveillance-2011.pdf

ECDC surveillance report on invasive pneumococcal diseases in Europe 2010: http://ecdc.europa.eu/en/publications/Publications/invasive-pneumococcal-disease-surveillance-2010.pdf

Annex

Table. Invasive pneumococcal disease, 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.