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Journal website	<a href="http://www.journals.uchicago.edu/doi/abs/10.1086/313508">http://www.journals.uchicago.edu/doi/abs/10.1086/313508</a>
Pubmed link	<a href="http://www.ncbi.nlm.nih.gov/pubmed/10585822">http://www.ncbi.nlm.nih.gov/pubmed/10585822</a>
DOI	10.1086/313508

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## Temporary Increase in Incidence of Invasive Infection Due to *Streptococcus pneumoniae* in the Netherlands

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In 1996 and 1997, the Netherlands Reference Laboratory for Bacterial Meningitis (Amsterdam) noted an increase in *Streptococcus pneumoniae* isolates from blood but not from CSF [1]. To find an explanation for this increase, we determined the incidence of invasive pneumococcal disease detected in the period 1991–1998 by 6 regional public health laboratories covering 18% of the Dutch population (15.4 million inhabitants in 1994). Subsequently, we related this incidence to the incidence of influenza and the severity of the winters in the study period [2]. Invasive pneumococci were defined as those isolated from blood or CSF. Repeated isolation of invasive *S. pneumoniae* from the same patient within 1 month was ignored. Incidences were calculated with 1 August as the start of a “pneumococcal year” (i.e., the year 1997 was from 1 August 1996 to 31 July 1997). The Royal Meteorological Institute (KNMI, De Bilt, Netherlands) provided a winter severity index, calculated as the negative sum of the negative 24-h average temperatures (°C) in the period 1 November to 31 March. The incidence of influenzalike illnesses was derived from a countrywide network of general practitioners (NIVEL, Utrecht, Netherlands). Age-specific incidences were calculated by use of yearly updated demographic data and the postal codes of the patients in the areas served by the laboratories. Differences in incidence between years and contributing laboratories were tested simultaneously by means of PROC GENMOD of SAS Version 6.12 (SAS Institute, Cary, NC), with year and laboratory as classes, the number of blood cultures as a covariate, and the catchment population as the offset variable. During the study period, 2182 *S. pneumoniae* isolates from blood and 113 *S. pneumoniae* isolates from CSF, summarized as invasive isolates, were reported by the participating laboratories. A second invasive isolate of *S. pneumoniae* was recovered only from 9 patients. Therefore, the number of confirmed cases of invasive pneumococcal infection and the number of invasive pneumococcal isolates were equal. The incidence of pneumococcal bacteremia or meningitis in the period 1991–1994 was 8.3–9.2 cases per 100,000 person-years (table 1). In 1996, the incidence increased significantly to 14.8 cases per 100,000 person-years, and in 1997 to 13.3 ( $P =$ ); but in 1998 it returned to 8.9 cases .0001 per 100,000 person-years. The incidence for the age group >65 years was approximately 4-fold higher and showed the same trend. The average number of pneumococcal isolates per 1000 blood cultures was 8.7 in the 2 years with the highest incidence of invasive

pneumococcal disease, in contrast to 6.1 in the other years (table 1). The gradual increase in the number of blood cultures in our study did not explain the sudden increase in invasive pneumococcal isolates in 1996 and 1997 [3]. The mean incidence of 23 cases per 100,000 person-years for the age category 0–1 year (table 1) was much lower than the incidence of 136 cases per 100,000 person-years reported by Pastor et al. [4]. An explanation may be that children with severe illness in the Netherlands are preferably admitted to specialized children's hospitals that are not served by the laboratories participating in our surveillance. No trends in the distribution of pneumococcal serotypes [1], changes in the occurrence of influenza viruses (table 1), or other respiratory viruses were noted. However, the higher incidence of invasive pneumococcal infections in 1996 and 1997 for the age group >65 years coincided with relatively severe winters, as shown by the winter severity index (table 1).

[TABLE 1]

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TABLE

Table 1. Winter severity index, incidence of influenza-like illnesses, no. of cases of invasive pneumococcal disease (IPD) per 1000 blood cultures, and incidence of IPD in the Netherlands by year.

Year	Winter severity index <sup>a</sup>	Incidence <sup>b</sup> of influenza-like illnesses	No. of cases of IPD/1000 blood cultures	Incidence <sup>b</sup> of IPD by age group (y)				
				Total	0–1	2–29	30–64	≥65
1991	77	2590	NA	8.6	19.7	2.8	5.2	36.1
1992	34	3170	6.0	8.3	29.6	1.6	5.3	34.2
1993	41	2950	6.3	9.2	17.0	2.8	5.7	38.5
1994	63	2960	5.9	8.4	15.7	1.6	5.2	37.5
1995	22	2060	6.8	10.9	33.0	2.3	8.2	40.3
1996	151	2630	9.3	14.8	18.7	2.6	10.4	63.4
1997	132	2264	8.1	13.3	31.9	3.0	8.7	53.7
1998	19	1970	5.1	8.9	15.9	1.4	5.7	39.1
1991–98		2574	6.8	10.3	22.7	2.3	6.9	43.1

NOTE. Catchment populations in 1994 for age groups were as follows: total, 2,771,992; 0–1 year, 70,177; 2–29 years, 1,045,229; 30–64 years, 1,291,126; and ≥65 years, 365,460. NA, not available.

<sup>a</sup> Negative sum of negative 24-h average temperatures.

<sup>b</sup> No. of cases per 100,000 person-years.