THE PHEBUS STUDY: A RETROSPECTIVE ANALYSIS OF THE BURDEN OF PNEUMOCOCCAL INFECTIONS IN THE PEDIATRIC POPULATION USING THE FRENCH HOSPITAL DISCHARGE DATABASE (PMSI)

EPH251

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INTRODUCTION

- Pneumococcal infections (PIs) can be divided into non-invasive pneumococcal disease (NIPD, notably non-bacteriemic pneumonia (NBPP)), and invasive pneumococcal disease (IPD, notably bacteriemia (PB) and meningitis (PM));
- PIs which are a major cause of morbidity and mortality usually occur in children under 5 years old and more commonly in those less than two years;
- The first pneumococcal conjugate vaccine (PCV) received marketing authorization in the early 2000s. Pneumococcal vaccination is now recommended for all children under 2 years of age, as well as for children with conditions that increase their risk of invasive pneumococcal infection ;
- With the development of new generation of PCVs, it is necessary to continue monitoring the burden of PIs.

OBJECTIVES

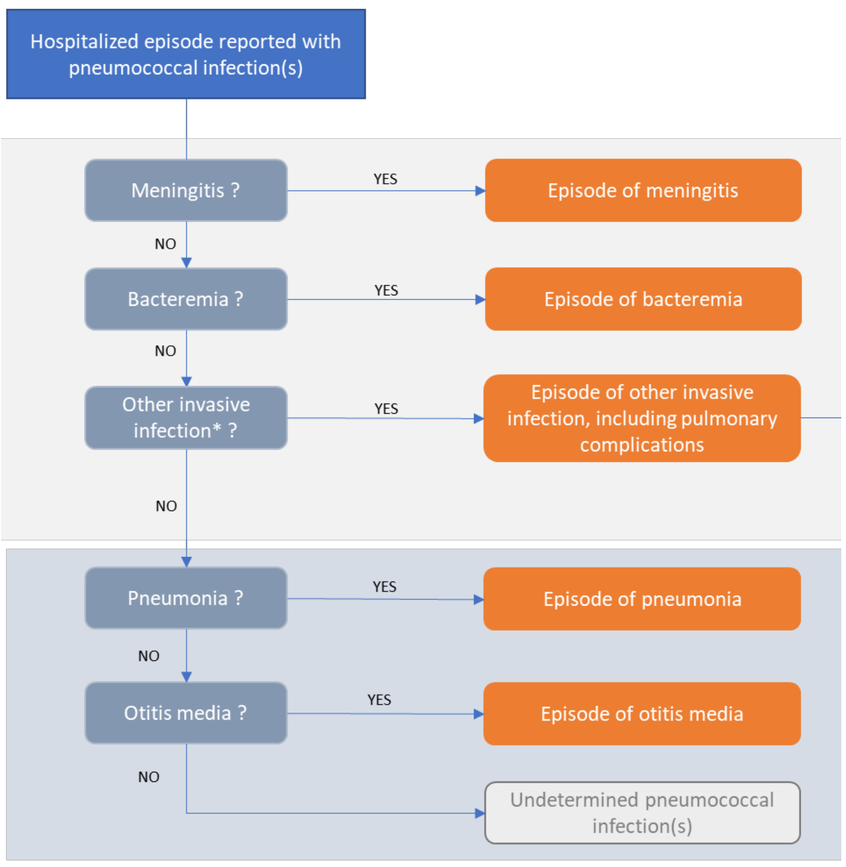
Overall objective: estimation of epidemiological and economic hospital burden of all-cause pneumonia and pneumococcal infections in pediatric population between 2015 and 2019.

- **Primary objective:** estimate the annual incidence of hospitalized stays of interest, overall, per age group and per risk group.
- **Secondary objectives:** describe patient characteristics, estimate the hospital case fatality rates (CFR), describe rates and timing of rehospitalizations for respiratory causes and evaluate the associated costs.

METHODS

- Design: observational retrospective database study;
- Source: PMSI database (French nationwide exhaustive hospital discharge database); hospital stays for PIs were recorded as principal diagnosis or optionally as associated diagnoses, both coded using ICD-10.
- Populations:
  - ❑ correspond to hospitalized episodes of PI for children under 18 years old at the beginning of the infection, between 2015 and 2019, in France;
  - ❑ for longitudinal analysis, only hospitalized episodes included until 2020 were part of the analyses at 365 days from episodes.
  - ❑ as subpopulations diagnosed with PI should be exclusive, a prioritization in case of stays with multiple PI diagnoses of interest was made, as illustrated in Figure 1

Figure 1: Prioritization flow chart in case of multiple diagnosis recorded within the same stay



- Direct hospital costs of hospitalized episodes of PIs were estimated from health insurance perspective or collective perspective.

RESULTS

Infants <1 yo represented 23.9%, 30.7% and 45.4% of hospitalizations for NBPP, PB and PM respectively. Incidences (per 100,000) were 25.3, 10.6 and 10.9, respectively (Table 1).

Table 1: Rate of pneumococcal disease and incidence by age group

	NBPP (N=3568)		PB (N=1158)		PM (N=699)	
	Age (years)		Age (years)		Age (years)	
Mean (SD)	4	4.38	3.3	4.03	3.6	4.48
Median (Q1 - Q3)	3	(1-5)	1	(0.8-4)	1	(0.5-6)
	%	Incidence (/100 000)	%	Incidence (/100 000)	%	Incidence (/100 000)
[0-1[year	23.9	25,3	30.7	10,6	45.4	10,9
[1-2[year	15.1	16,6	20	7,2	12	3,4
[2-5 [years	31.1	11,2	26	3,1	13.6	1,1
[5-16 [years	26.1	2,5	21.1	0,6	27.3	0,5
[16-18 [years	3.9	2,0	2.2	nc	1.7	nc

nc : not computable

The median length of stay for NBPP, PB, and PM was 4, 6, and 12 days in the overall pediatric population and 5, 7, and 14 days for infants, respectively.

Transfers to a critical care unit occurred in 27.1%, 28.4%, and 52.6% of NBPP, PB, and PM cases in children overall, and in 43.5%, 33.6%, and 57.1% of cases among infants, respectively.

CFR for NBPP, PB, and PM were 0.8%, 2.1%, and 5.1% in children overall, and 1.3% and 6.5% for NBPP and PM in infants, respectively (Table 2).

Table 2: Characteristics of hospitalized episodes of NBPP, PB and PM, by age group and overall

		< 1 year		1 year		2-4 years		5-15 years		16-17 years		Overall	
		N=894		N=602		N=1276		N=1102		N=161		N=4035	
NBPP	Median length of episode (days, Q1-Q3)	5	(3-9)	3	(2-6)	3	(2-6)	3	(2-8)	5	(3-12)	4	(2-7)
	Transfer to critical care unit (N, %)	389	43.5	136	22.6	261	20.5	253	23	56	34.8	1095	27.1
	CFR (N, %)	12	1.3	≤10	nc	≤10	nc	11	1	-	nc	34	0.8
		N=375		N=261		N=351		N=279		N=28		N=1294	
PB	Median length of episode (days, Q1-Q3)	7	(4-12)	5	(3-8)	6	(4-9)	7	(4-12)	7.5	(5-15.5)	6	(4-10)
	Transfer to critical care unit (N, %)	126	33.6	52	19.9	77	21.9	95	34.1	18	64.3	368	28.4
	CFR (N, %)	≤10	nc	≤10	nc	≤10	nc	≤10	nc	0	0	27	2.1
		N=387		N=123		N=126		N=227		N=14		N=877	
PM	Median length of episode (days, Q1-Q3)	14	(6-20)	11	(2-16)	10	(4-14)	11	(8-15)	14	(12-17)	12	(6-16)
	Transfer to critical care unit (N, %)	221	57.1	60	48.8	58	46	115	50.7	≤10	nc	461	52.6
	CFR (N, %)	25	6.5	≤10	nc	≤10	nc	≤10	nc	0	0	45	5.1

nc: not computable

In the 30, 90 and 180 days following the discharge, 1.0%, 3.2% and 5.3% of children with NBPP were re-hospitalized for a respiratory reason, these ratios being slightly the same for infants (Table 3).

Table 3: Proportion of re-hospitalization rate for respiratory causes after hospitalized episodes of NBPP

	< 1 year		1 year		2-4 years		5-15 years		16-17 years		Overall	
	N=894		N=602		N=1276		N=1102		N=161		N=4035	
	n	%	n	%	n	%	n	%	n	%	n	%
At 30 days	≤10	nc	≤10	nc	13	1	13	1.2	≤10	nc	42	1
At 90 days	28	3.2	15	2.5	37	2.9	40	3.7	≤10	nc	127	3.2
At 180 days	48	5.4	31	5.2	57	4.5	65	6	≤10	nc	211	5.3

nc : not computable

The total costs for NBPP, PB and PM were 17,8M €, 10,1 M€ and 6,6 M€, with infants accounting for 25.9%, 26.9% and 47.3% of these total costs, respectively (Table 4).

Table 4: Total annual direct hospital costs for NBPP, PB and PM by age group - Health Insurance and collective perspectives

	< 1 year	1 year	2-4 years	5-15 years	16-17 years	Overall
NBPP						
Health Insurance Perspective	4 610 150.1 €	2 280 636.4 €	4 683 826.4 €	5 141 899.1 €	1 090 939.3 €	17 807 451 €
Collective perspective	5 894 869.9 €	2 721 230.8 €	5 993 509.7 €	6 330 745.2 €	1 466 520.9 €	22 406 877 €
Bacteremia						
Health Insurance Perspective	2 708 935.7 €	1 771 958.2 €	2 481 627.9 €	2 845 384.2 €	275 750.3 €	10 083 656 €
Collective perspective	4 057 585.7 €	2 105 009.6 €	3 333 915.8 €	3 492 528.5 €	312 104.1 €	13 301 144 €
Meningitis						
Health Insurance Perspective	3 100 607.5 €	869 466.9 €	824 112.2 €	1 648 902.7 €	118 108.6 €	6 561 198 €
Collective perspective	5 459 483.5 €	1 500 967.6 €	1 270 401.0 €	2 490 283.2 €	193 544.1 €	10 914 679 €

CONCLUSIONS

- **This study highlights the significant health-economic impact of pneumococcal infections in pediatric populations, particularly among infants. Ongoing monitoring is essential to adapt public health policies for the most vulnerable groups.**

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