

French epidemiology of *Streptococcus pneumoniae* from invasive infections in pediatrics population from 2009 to 2022

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on behalf of the French Regional Pneumococcal Observatories (ORP) network

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Background

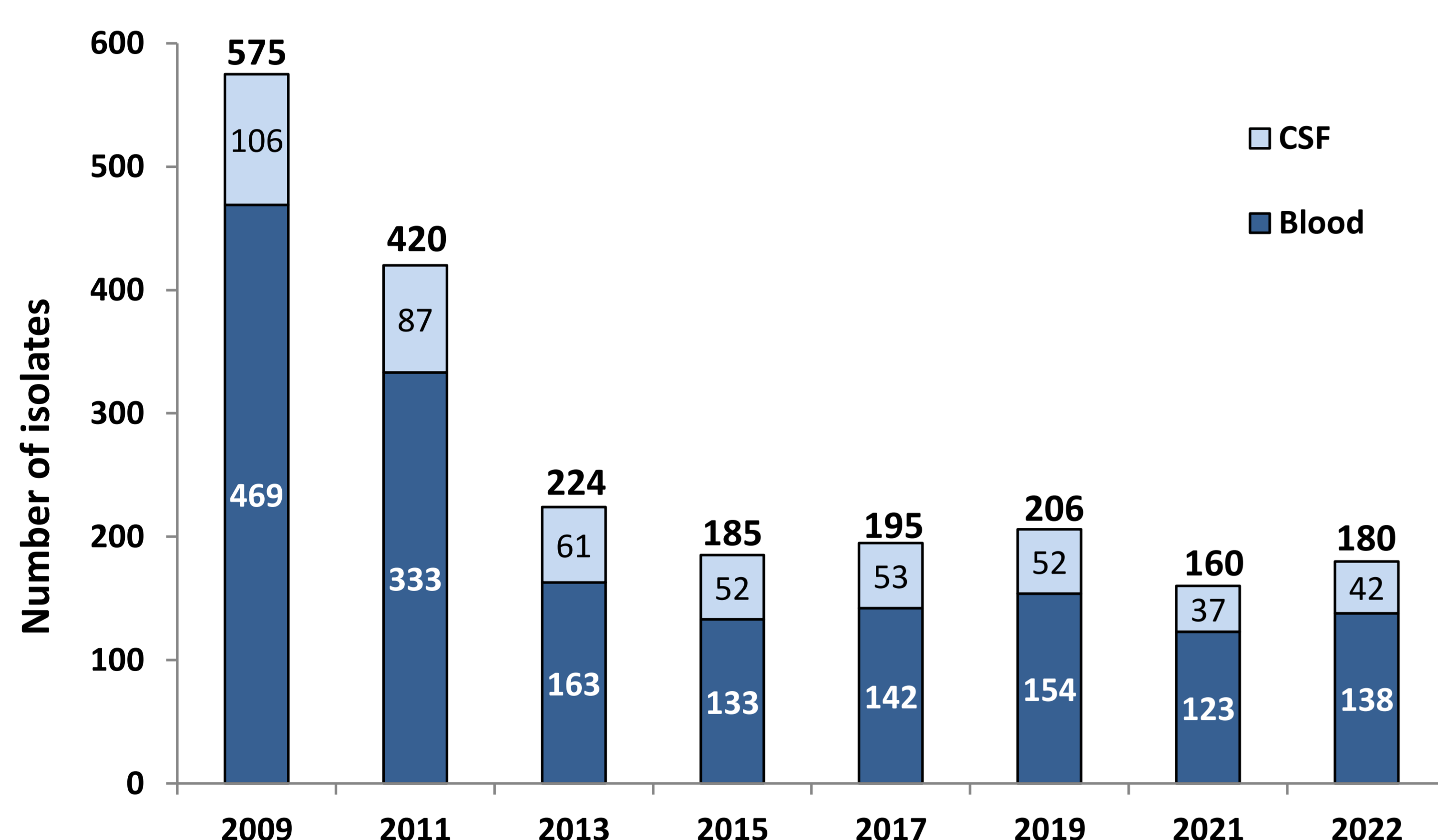
- WHO ? The French Regional Pneumococcal Observatories (ORP) and the National Reference Center for Pneumococcus (NRCP).
- TASK ? They are responsible for the epidemiological surveillance of invasive pneumococcal infections at national level.
- WHY ? To assess the impact of pneumococcal vaccination on the distribution of serotypes and trends in pneumococcal resistance to antibiotics.
- HOW ? They are supported by a network of 323 biology laboratories (78% public laboratories and 22% private laboratories) serving 418 health establishments throughout France.

Objectives & Methods

- GOAL ? To describe the evolution between 2009 (before the introduction of the PCV13 vaccine) and 2022 of beta-lactam resistance and serotype distribution of *S. pneumoniae* isolated from invasive infections (IIP) in pediatrics population (children <16 years).
- HOW ? For each strain isolated from cerebrospinal fluid (CSF) and blood culture
 - The resistance to penicillin G (PEN), amoxicillin (AMX) and cefotaxime (CTX) was assessed by dilution in agar medium until 2015, and by broth microdilution (Sensititre - Thermo Fisher) thereafter.
 - Serotypes were carried out at the NRCP.

Results

1) Evolution in the number of *S. pneumoniae* strains isolated from IIP in children between 2009 and 2022



- A total of 2,145 *S. pneumoniae* strains isolated from CSF (n=490) and Blood culture (n= 1655) were collected from children (<16 years) between 2009 and 2022.
- Between 2009 and 2015, the number of isolates decreased by 68%, followed by a decrease and a further reduction in 2021 (-22%), then an increase.

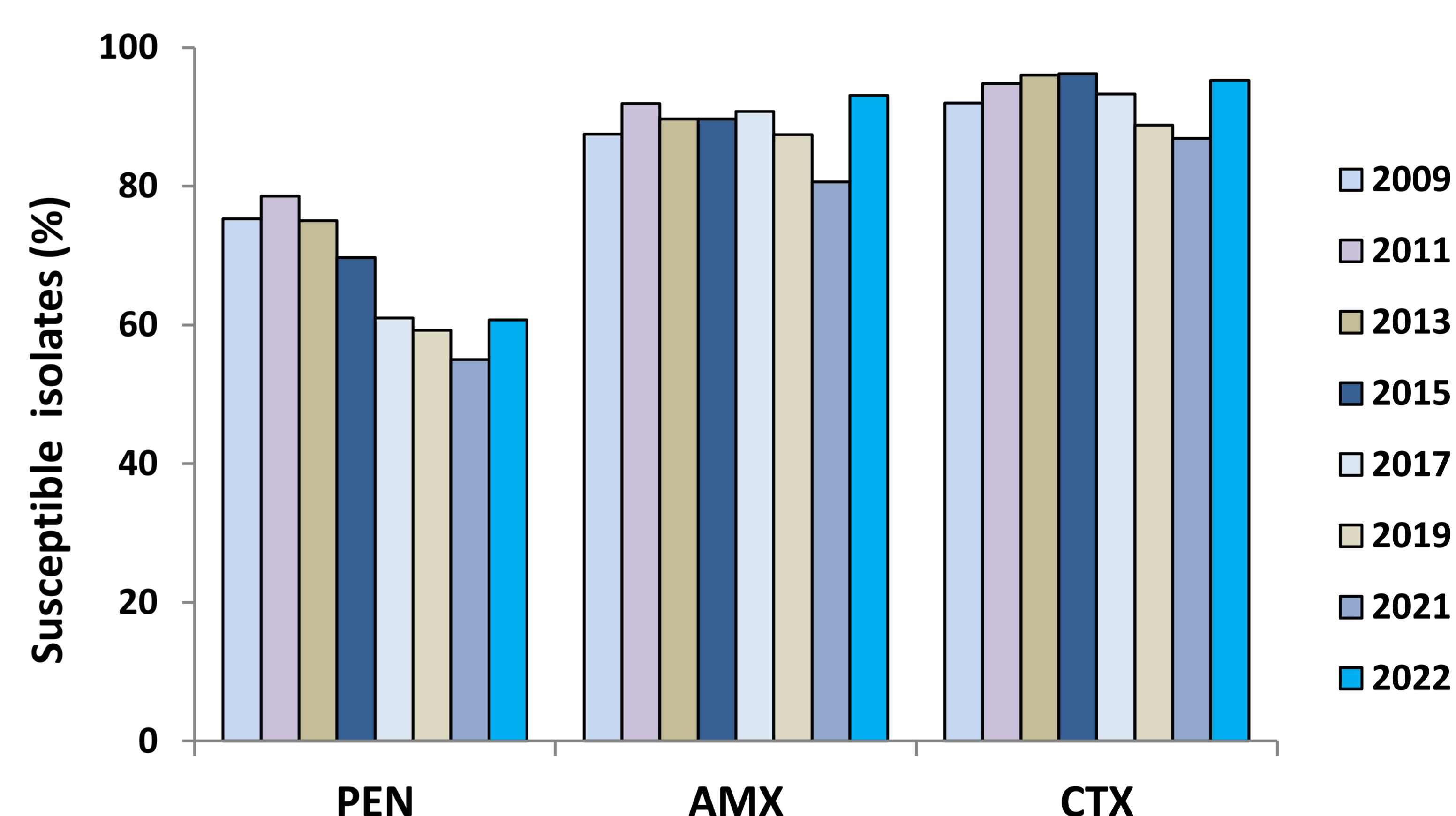
3) Changes in the frequency of *S. pneumoniae* strains isolated from IIP in children according to vaccine serotypes (2009-2022)

	2009	2011	2013	2015	2017	2019	2021	2022
PCV13	76.0	50.5	26.4	16.1	16.8	16.0	13.0	16.0
PCV15	78.4	55.3	34.5	22.6	23.7	22.7	19.5	24.4
PCV20	84.7	79.8	59.9	57.7	50.0	51.5	53.9	52.4
Other STs	13.3	18.4	36.5	33.9	45.3	42.8	42.9	47.6

PCV13 (4, 6B, 9V, 14, 18C, 19F et 23F, 1, 3, 5, 6A, 7F, 19A); PCV15 (PCV13 + 22F, 33F); PCV20 (PCV15 + 8, 10A, 11A, 12F, 15B/C)

- In 2009, PCV-13 vaccine serotypes represented 76% of the isolates and only 16% in 2022
- In 2022, the most common serotypes were the non-PCV13-vaccine 24F (15.6%), 10A (11.0%), 15B/C (9.1%), 8, 11A and 23B (6.5% each).
- None of them are included in PCV15 vaccine but 8, 10A and 11A are included in PCV20

2) Changes in the frequency of beta-lactam susceptibility of *S. pneumoniae* strains isolated from IIP in children between 2009 and 2022



- According to CA-SFM/EUCAST recommendations, in 2022 the frequency of resistant isolates amounted to 40 % for PEN (MIC > 0.06 mg/L), 8,3 % for AMX (MIC > 0.5 mg/L) and 6,1 % for CTX (MIC > 0.5 mg/L).
- The proportion of PDSP increased between 2009 and 2022 (24.7% vs 39.3%).

4) Serotypes and resistance in 2021 (last available data serotype/resistance)

- Concerning strains isolated from CSF :
 - 6 had a MIC to CTX > 0,5mg/L : 2 belonged to PCV13 and PCV15 (19F, 6B), 4 to PCV20 (19F, 6B, 2x11A) and 2 were non-vaccine serotypes (34, 35B)
- Concerning strains isolated from Blood :
 - * 13 had a MIC to CTX > 0,5mg/L : 2 belonged to PCV13 and PCV15 (19F x2), 9 to PCV20 (19Fx2, 10A, 11Ax6) and 4 were non-vaccine serotypes (24F, 29, 15A, 17F)
 - * No strain had a MIC to CTX > 2 mg/L
 - * 18 had a MIC to AMX > 0,5mg/L : 4 belonged to PCV13 and PCV15 (19Fx4), 12 to PCV20 (19Fx4, 11A x7, 10A) and 6 were non-vaccine serotypes (15A, 17F, 23A, 24F x2, 29)
 - * 11 had a MIC to AMX > 2mg/L : 1 belonged to PCV13 and PCV15 (19F), 8 to PCV20 (19F, 11Ax6, 10A) and 3 were non-vaccine serotypes (15A, 17F, 29)

Conclusions

Surveillance of strains involved in IIP is essential to assess the impact of pneumococcal vaccination, to adapt the vaccine strategy according to emerging serotypes and recommendations for the management of these infections according to resistance evolution