EE625

Cost-effectiveness analysis of 20-valent pneumococcal conjugate vaccine (PCV20) to prevent pneumococcal disease in the Greek pediatric population.

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INTRODUCTION

- Pneumococcal disease, which is a significant global health issue, includes invasive pneumococcal disease (IPD), like meningitis and bacteremic pneumonia, as well as non-invasive forms, such as non-bacteremic pneumonia, sinusitis, and otitis media (1-3).
- Pneumococcal conjugate vaccines (PCVs) have greatly reduced vaccine-type pneumococcal carriage and disease, though emerging serotypes not included in PCVs are now prevalent (4).
- Since 2010, PCV13 has been part of Greece's National Immunization Program (NIP) for infants. According to 2015-2020 local epidemiological data, PCV13 was estimated to cover a 42.9% of pneumococcal disease, while PCV15 and PCV20 serotypes were estimated to cover 46.3% and 64.9%, respectively(5,6).

OBJECTIVE

- The objective of the present study was to evaluate the cost-effectiveness of PCV20 compared to PCV13 and PCV15 for prevention of pneumococcal disease in the pediatric population in Greece.

METHODS

- A state-transition Markov cohort model was adapted to assess the public health and economic impact of implementing PCV20 (under a 3+1 schedule) into Greece's pediatric NIP, compared to PCV13 and PCV15 (both under a 2+1 schedule), over a 10-year horizon.
- Epidemiological, utilities, serotype coverage, and direct medical costs inputs (in euros, 2024), were obtained from published literature and official sources (Table 1, Table 2).
- Direct vaccine effects were derived from published studies, while the indirect effects were considered in the whole population (i.e. both unvaccinated population and children whose vaccination protection is not 100%) for all disease states based on efficacy, effectiveness, and impact studies from PCV7 and PCV13 (Table 1).
- The analysis was conducted from a public payer perspective and an annual discounting of 3.5% was applied for future model outcomes.
- Model outcomes included the number of IPD, non-invasive hospitalized pneumonia, non-hospitalized pneumonia and otitis media cases, attributable deaths, costs and quality-adjusted life-years (QALYs) for each vaccination strategy, along with incremental cost-effectiveness ratios for each comparison.
- Probabilistic sensitivity analysis (PSA) and deterministic sensitivity analysis (DSA) were conducted to account for uncertainty in the model.

Table 1. Epidemiological and health inputs by age considered in the model

Parameters	<2 years	2–4 Years	5–17 years	18–34 years	35–49 years	50–64 years	65+ years	Source
Disease Incidence per 100,000 Individuals								
IPD	12	5	2	3	6	12	22	Local clinical experts
Non-invasive hospitalized Pneumonia	585	293	94	123	123	476	1,500	
Non-hospitalized Pneumonia	2,900	3,300	1,200	620	620	1,594	2,800	
Complex OM	6,350	3,800	1,177	–	–	–	–	
Simple OM	57,150	34,200	10,588	–	–	–	–	
Breakdown of invasive pneumococcal disease cases								
Meningitis	10.2%	10.2%	10.2%	6.2%	8.5%	8.7%	9.3%	(6) & Local experts
Bacteremia	89.80%	89.80%	89.80%	93.8%	91.5%	91.3%	90.7%	
Age-specific case fatality rates for meningitis, bacteremia and hospitalized Pneumonia								
Meningitis	5.99%	1.85%	6.41%	5.07%	5.07%	10.73%	13.88%	(7,8)
Bacteremia	5.99%	1.85%	6.41%	5.07%	5.07%	10.73%	13.88%	
Hospitalized Pneumonia	0.44%	0.20%	0.30%	1.40%	1.40%	3.80%	7.97%	(8,9)

Direct effects	**IPD**	**Hospitalized Pneumonia**	**Non-hospitalized Pneumonia**	**OM**	
2+1 schedule	78.2%	25.5%	6%	7.8%	(14-17)
3+1 schedule	89.7%				

Indirect effect – ramp-up	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6-10**	
PCVs	0%	37.5%	52.8%	67.7%	82.7%	100%	(18-19)

Indirect effect – maximum reduction		**IPD**	**Hospitalized Pneumonia**	**Non-hospitalized Pneumonia**	**OM**	
Age group	<5 years	83%	30.5%	25.5%	20%	(18-22)
	5-17 years	83%	30.5%	25.5%	20%	
	18-49 years	88%	15%	-	-	
	50-64 years	77%	15%	-	-	
	≥65 years	73%	15%	-	-	

Abbreviations: IPD = invasive pneumococcal disease, OM = otitis media, PCV = Pneumococcal conjugate vaccine.
Indirect vaccine impact data were adjusted using serotype coverage pre-PCV13 to current era for higher-valent vaccines[18,20-22]. Direct vaccine efficacy data were adjusted using serotype coverage pre-PCV7 to current year for higher-valent vaccines. PCV7 all-cause efficacy data were adjusted for pre-PCV7 era to pre-PCV20 era for PCV20 and PCV15

Table 2. Cost inputs by age considered in the model

Parameters	<17 years	18–34 years	35–49 years	50–64 years	65+ years	Source
Direct Medical Cost per Episode						
IPD-Meningitis	€7,969	€19,947	€19,947	€36,060	€36,060	(10)
IPD-Bacteremia	€4,347	€10,880	€10,880	€19,670	€19,670	
Non-invasive hospitalized Pneumonia	€4,133	€7,688	€7,688	€7,688	€7,688	(10,11)
Non-hospitalized Pneumonia	€115	€115	€115	€115	€115	(11)
Complex OM	€4,075	–	–	–	–	(10)
Simple OM	€25.72	–	–	–	–	(12, 13)
Vaccine acquisition & administration cost						

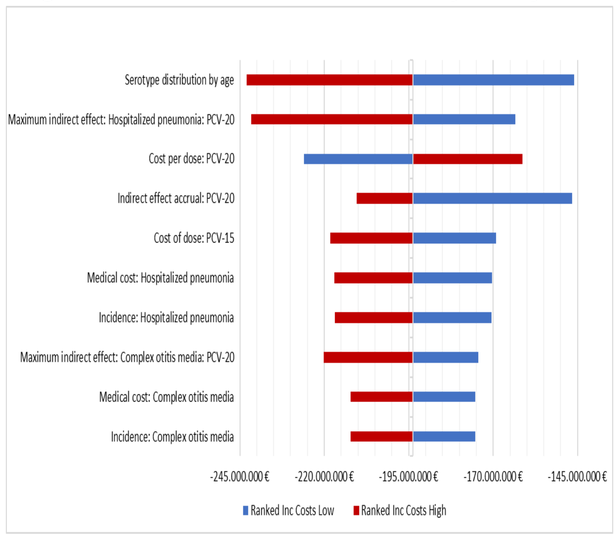
Vaccine	Cost of dose	Administration cost per dose	
PCV20 3+1	€70.98	€10	(12) & GG, Ministerial Decision
PCV13 2+1	€63.07	€10	
PCV15 2+1	€72.32	€10	

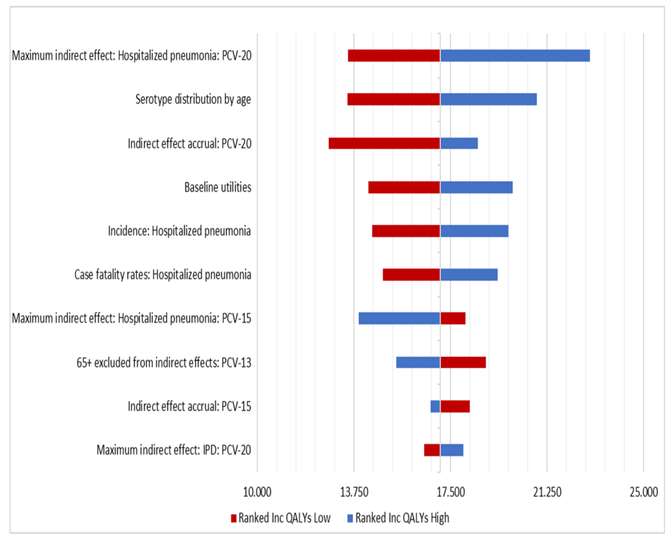
Abbreviations: IPD = invasive pneumococcal disease, OM = otitis media, PCV13 = 13-valent pneumococcal conjugate vaccine, PCV15 = 15-valent pneumococcal conjugate vaccine, PCV20 = 20-valent pneumococcal conjugate vaccine, G.G=Government Gazette

RESULTS

- PCV20, compared to PCV13 averted 1,953 additional IPD cases, 26,888 hospitalized pneumonia cases, 28,068 non-hospitalized pneumonia cases, 343,353 OM cases, and 1,377 deaths, resulting 23,065 additional QALYs versus with PCV13.
- Compared to PCV15, PCV20 prevented 1,514 IPD cases, 20,131 hospitalized pneumonia cases, 21,938 non-hospitalized pneumonia cases, 271,864 OM cases, and 987 deaths, yielding 17,118 QALYs gained compared to PCV15 .
- These reductions in disease cases and deaths translated into significant cost savings of circa €249 million compared to PCV13 and €192 million compared to PCV15.
- Incremental analysis confirmed PCV20 as a dominant strategy, providing better health outcomes at lower costs than PCV13 and PCV15.
- In the DSA for costs, the key parameter was the serotype distribution by age. The main drivers impacting QALYs were the maximum indirect effects on hospitalized pneumonia (PCV20) followed by serotype distribution by age.
- In the PSA, PCV20 was more effective and less costly than PCV13 and PCV15 in 100% of cases in 1,000 iterations.

Figure 1. Deterministic sensitivity analysis results: PCV20 vs PCV15





CONCLUSIONS

- **PCV20 offers broader serotype coverage, potentially preventing more cases and deaths than PCV13 and PCV15.**
- **Vaccination with PCV20 leads to significant cost savings for the public payer.**
- **PCV20 is the dominant strategy for pneumococcal disease prevention in Greek infants.**

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Disclosures
This study was funded by Pfizer Inc. JP, IK, MB and VK are employees of and may hold shares in Pfizer. MP is an employee of Health Through Evidence, while C.T and G.G are owners of Health Through Evidence which was contracted by Pfizer to conduct this study.

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