EE680

Estimating the Potential Lifetime Health and Economic Impact of V116, an Adult-Specific 21-Valent Pneumococcal Conjugate Vaccine, on Invasive Pneumococcal Disease in the Netherlands

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Background

- *Streptococcus pneumoniae* causes invasive pneumococcal disease (IPD) and non-bacteremic pneumococcal pneumonia (NBPP) in adults, with those considered immunocompromised/suppressed being at highest risk[1]
- IPD and NBPP are associated with high morbidity and mortality, which causes substantial health and economic burden on the healthcare system[1]
- Although available vaccines have largely reduced the burden of pneumococcal diseases (PD) among adults, current data on PD show substantial residual burden attributable to serotypes they do not currently cover[2,3]
- V116 is a novel 21-valent pneumococcal conjugate vaccine (PCV) specifically designed for adults. It contains ***21 serotypes: 3, 6A, 7F, 8, 9N, 10A, 11A, 12F, 15A, 15C*** [from deOAc-15B], ***16F, 17F, 19A, 20A, 22F, 23A, 23B, 24F, 31, 33F,*** and ***35B***. Eight of the 21 serotypes (***15A, 15C, 16F, 23A, 23B, 24F, 31, 35B***) are unique and are not included in any currently licensed vaccines
- In addition, V116 and PCV20 have ***10*** serotypes (***3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F***) in common. The remaining ***11*** serotypes (***9N, 17F, 20A, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35B***) included in V116 are ***not*** covered by PCV20
- According to the National Institute for Public Health and the Environment (RIVM) surveillance data of 2019, V116 serotypes account for a higher incidence of IPD vs PCV20. In 2020, disease coverage for V116 and PCV20 are 90.9% and 76.7%, respectively. The eight unique serotypes in V116 account for 11% of all IPD incidence[2,3]

Objective

To quantify and compare the potential lifetime health and economic impact of vaccination with V116 vs PCV20 on IPD in adults aged 60+ years in the Netherlands.

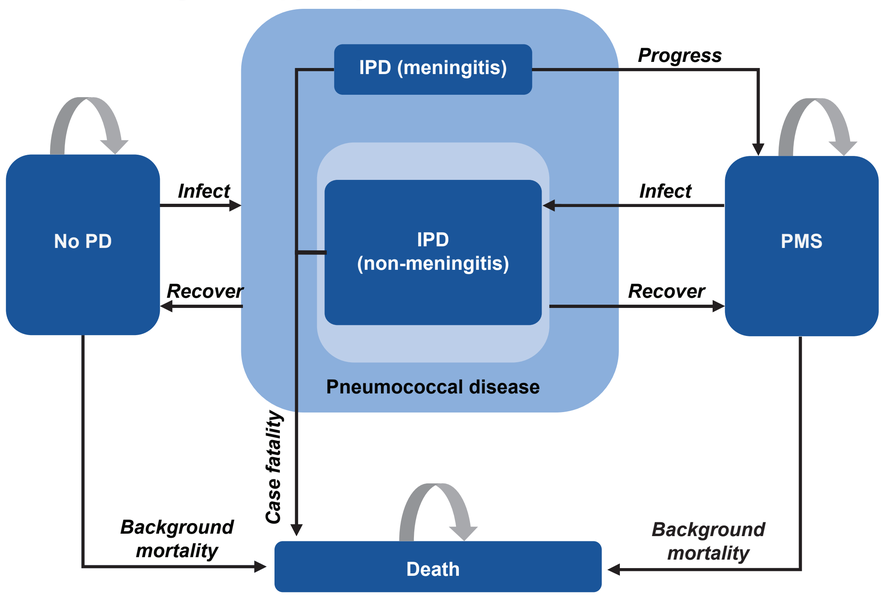
Methods

- A multicohort Markov model (structure depicted in **Figure 1**) was built to estimate the lifetime (until death or turned 100 years old) IPD cases, IPD-related deaths, and associated direct and indirect medical costs (in 2023 Euro) among current US adults aged 60-79 and 80+ years (assuming 2023 population figures) with no vaccination or vaccinating with V116 or PCV20
- The study population was stratified into 3 mutually exclusive risk groups: low-risk (LR), at-risk (AR), and high-risk (HR) adults based on the age group-specific proportions and classifications from Mangen et al., 2015[5]
- The same serotype-specific vaccine effectiveness was assumed for the two vaccines. The waning of the effectiveness was assumed to be flat for the first 5 years and then linearly decline to zero in the following 10 years[6]
- Vaccine coverage rates are the same for the two vaccines and for all age and risk groups: 70%[4]
- Discounting rate for costs is 4%. Other key model parameters are shown in **Table 1**
- Base case results were summarized for V116 and PCV20, as well as no vaccination
- One-way sensitivity analysis (OWSA) was conducted to assess the robustness of the results and to identify the most influential parameters on the total direct medical costs saved by V116 when compared to PCV20. Parameters varied in the OWSA included vaccine efficacy, direct medical treatment cost for IPD by age and risk groups, IPD fatality rates, and discounting rate for costs

Results

- In adults aged 60-79 years, compared to no vaccination, V116 prevented 7,525 IPD cases and 1,213 IPD deaths – 20% more than the 6,264 IPD cases and 1,010 IPD deaths prevented by PCV20. The averted IPD cases by V116 saved €103 million in total medical costs – 20% higher than the €86 million in costs averted by PCV20 (**Table 1**)
- In adults aged 80+ years, compared to no vaccination, V116 prevented 1,659 IPD cases and 403 IPD deaths – 20% more than the 1,381 IPD cases and 335 IPD deaths prevented by PCV20. The averted IPD cases by V116 saved €23 million in total medical costs – 20% higher than the €19 million in costs averted by PCV20 (**Table 2**)
- Among the parameters included in the OWSA, the most sensitive parameters are vaccine and IPD medical costs (**Figure 2**)
- OWSA confirmed the robustness of the results. All scenarios showed a large lifetime direct medical cost (€14 million to €25 million) saved by V116 when compared to PCV20 (**Figure 2**)

Figure 1. A schematic diagram depicting the structure of the state-transition Markov model



PD, pneumococcal disease; IPD, invasive pneumococcal disease; PMS, post-meningitis sequelae.

Table 1. Key model parameters

	Low-risk	At-risk	High-risk	Source
Risk group split				
60-64	81.21%	16.91%	1.88%	Mangen et al., 2015[2]
65-74	61.45%	34.00%	4.55%	
75+	47.01%	43.73%	9.26%	
IPD incidence (per 100,000 person-years)				
60-64	28.0	28.0	28.0	de Boer, 2024[3]
65-74	40.2	40.2	40.2	
75-84	57.9	57.9	57.9	
85+	79.0	79.0	79.0	
IPD direct medical cost				
50-64	€15,275			de Boer, 2024[3] Inflation index[7]
65+	€16,867			
IPD indirect nonmedical cost				
50-64	€4,735			
65-74	€377			
75+	€0			

IPD, invasive pneumococcal disease.

Table 2. Estimated lifetime clinical and economic outcomes when vaccinating with V116 and PCV20 for ages 60-79

	V116	PCV20	No vaccine	Cases/costs averted, compared to "no vaccine"		Additional reduction by V116, compared to PCV20
				by V116	by PCV20	
Clinical outcomes (undiscounted)						
IPD cases	32,260	33,521	39,785	7,525	6,264	1,261 (20.1%)
IPD deaths	6,521	6,725	7,734	1,213	1,010	203 (20.1%)
Economic outcomes (discounted; in million €)						
Direct cost, IPD	316	332	416	100	83	17 (20.1%)
Indirect cost, IPD	4	4.5	6.9	2.9	2.4	0.5 (20.1%)

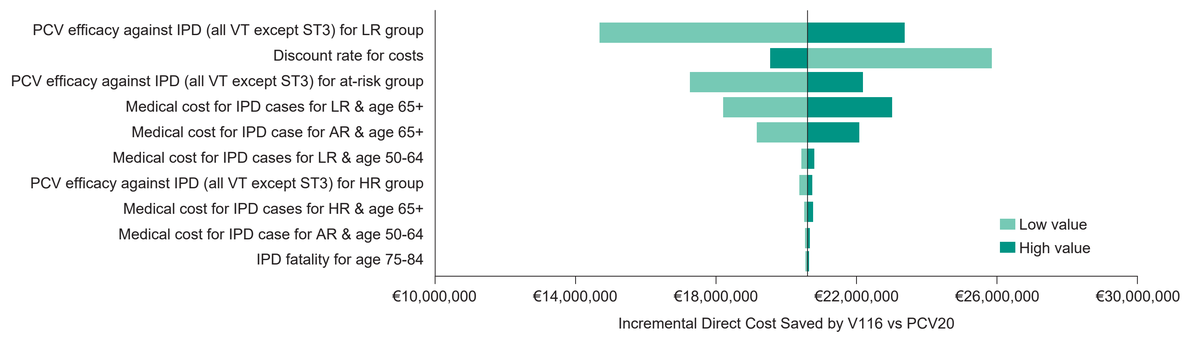
IPD, invasive pneumococcal disease; PCV20, 20-valent pneumococcal conjugate vaccine; V116, a 21-valent pneumococcal conjugate vaccine.

Table 3. Estimated lifetime clinical and economic outcomes when vaccinating with V116 and PCV20 for ages 80+

	V116	PCV20	No vaccine	Cases/costs averted, compared to "no vaccine"		Additional reduction by V116, compared to PCV20
				by V116	by PCV20	
Clinical outcomes (undiscounted)						
IPD cases	2,969	3,247	4,628	1,659	1,381	287 (20.1%)
IPD deaths	730	797	1,133	403	335	67 (20.1%)
Economic outcomes (discounted; in million €)						
Direct cost, IPD	39	43	62	23	19	4 (20.1%)
Indirect cost, IPD	-	-	-	-	-	-

IPD, invasive pneumococcal disease; PCV20, 20-valent pneumococcal conjugate vaccine; V116, a 21-valent pneumococcal conjugate vaccine.

Figure 2. Sensitivity analysis: Estimated lifetime direct medical cost in ages 60+ saved by V116, compared with PCV20 (2023 Euro; discounted)



AR, at-risk; HR, high-risk; IPD, invasive pneumococcal disease; LR, low-risk; PCV, pneumococcal conjugate vaccine; ST3, serotype 3; VT, vaccine type.

Conclusions

- In both age groups, compared to PCV20, V116 led to a greater reduction of both the health and economic burden associated with IPD in the Netherlands
- The addition of V116 to the national vaccination recommendations has the potential to substantially reduce the health and economic burden associated with PD among adults in the Netherlands, compared to PCV20

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Disclosures

All authors are employees of Merck Sharp & Dohme LLC or MSD B.V., subsidiaries of Merck & Co., Inc., Rahway, NJ, USA.

V116 was developed by Merck & Co., Inc., Rahway, NJ, USA.

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