EE798

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

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Background

- *Streptococcus pneumoniae* is a major global cause of pneumococcal disease (PD) and is responsible for substantial worldwide morbidity and mortality[1,2]
- Invasive pneumococcal disease (IPD) is associated with high morbidity and mortality, which causes substantial health and economic burden on the healthcare system[3]
- Although available vaccines have largely reduced the burden of IPD among adults, current data on IPD show substantial residual burden attributable to serotypes they do not currently cover[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[a], 16F, 17F, 19A, 20A, 22F, 23A, 23B, 24F, 31, 33F,*** and ***35B***
  - Eight (***15A, 15C[a], 16F, 23A, 23B, 24F, 31,*** and ***35B***) of the 21 serotypes are unique and are not included in any currently licensed vaccines
- In 2019, the serotypes in V116 accounted for ~82% of IPD in individuals aged 65+ (the unique 8 serotypes were responsible for ~22%) while PCV20 accounted for ~64%[4]

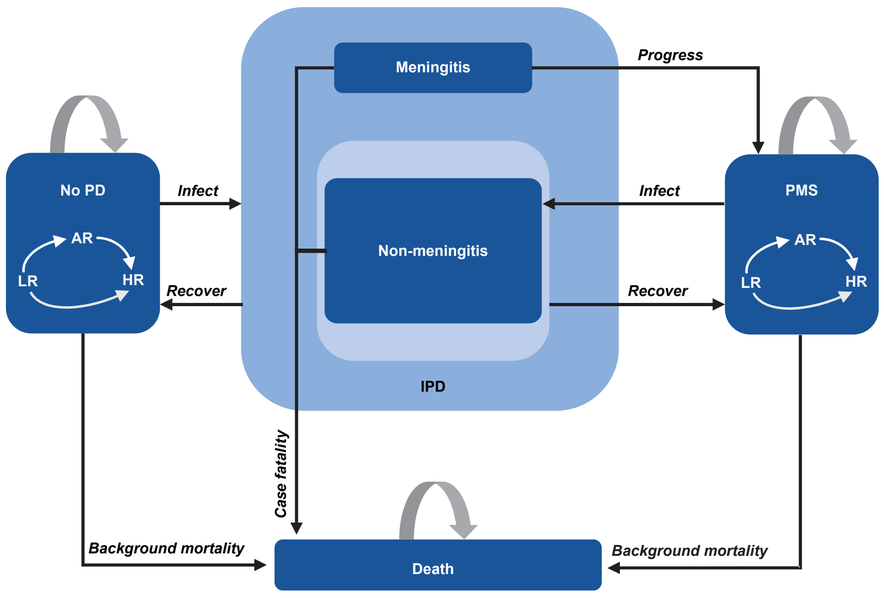
Objective

To quantify and compare the potential lifetime health and economic impact of vaccination with V116 vs PCV20 on IPD among German adults aged 50 and older.

Methods

- A multicohort Markov model (**Figure 1**) was built to estimate the lifetime (until death or turned 100 years old) IPD cases, PMS cases, IPD-related deaths, and the IPD-associated direct medical costs (in 2023 euro) among German adults aged 50-59 and 60+ with no vaccination or vaccinating with V116 or PCV20
- The study population was stratified into three 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 Pelton (2015)[5]
- Risk group transitioning was implemented in the model as individuals aged, as depicted in **Figure 1**
- 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 declines to zero in the following 10 years[6]
- Vaccine coverage rates are the same for the two vaccines: 12.5% for 50-59 year olds and 23.3 % for 60+[7,8]
- Base-case results are 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

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



AR, at risk; HR, high risk; IPD, invasive pneumococcal disease; LR, low risk; PD, pneumococcal disease; PMS, post meningitis sequelae.

Results

- In adults aged 50-59, V116 prevented 24,271 lifetime IPD cases and 4,325 IPD deaths – 29.2% more than the IPD cases and deaths prevented by PCV20 compared with no vaccination
  - The averted IPD cases from V116 vaccination resulted in an 0.9-million-euro reduction in total direct lifetime medical costs – 29.1% higher than the 0.7-million-euro costs averted by PCV20 (**Table 2**)
- Similarly, in adults aged 50-64, V116 prevented 26 cases of post-meningitis sequelae (PMS) – 29.2% higher than the 20 PMS cases prevented by PCV20 when compared to no vaccines (**Table 2**)
- In adults aged 60+, V116 prevented 27,993 IPD cases and 5,644 IPD deaths compared with no vaccination (29,078) – 42% more than the 28,312 IPD cases and 5,704 IPD deaths prevented by PCV20
  - The averted IPD cases from V116 vaccination resulted in a 4.4-million-euro reduction in total medical costs – 42% higher than the 3.1 million euros averted by PCV20 (**Table 3**)
- Among the parameters included in the OWSA, the top sensitive parameters are PCV efficacy against IPD, discount rates for costs and medical cost for IPD (AR, 65+)
- OWSA confirmed the robustness of the results; all scenarios showed a large lifetime direct medical cost (~1.7 million to 2.8 million) saved by V116 when compared to PCV20 (**Figure 2**)

Table 1. Key model parameters

	Low- risk	At-risk	High-risk	Source
IPD incidence (per 100,000 person-years)				
50-59	1.99	6.08	0.69	[9]
60-69	3.28	10.04	1.14	
70+	5.62	17.19	1.96	
IPD case fatality rate				
50-64	0.13			[9]
65-74	0.13			
75-84	0.22			
85-100	0.22			
% meningitis of IPD cases				
50-64	0.07			[10]
65-74	0.03			
75-84	0.03			
85-100	0.03			
IPD direct medical cost (euro, 2023)				
50-59	9,281	2,962	5,664	[9, 11]
65+	7,254	4,043	4,427	

AR, at risk; HR, high risk, IPD, invasive pneumococcal disease; LR, low risk.

Table 2. Estimated lifetime clinical and economic outcomes when vaccinating with V116 and PCV20 for ages 50-59

	V116	PCV20	No vaccine	Cases/costs averted, compared to "no vaccine"		Additional reduction by V116, compared to PCV20
				V116	PCV20	
Clinical outcomes (undiscounted)						
IPD cases	24,271	24,316	24,468	197	153	45 (29.19%)
IPD deaths	4,325	4,331	4,351	26	20	6 (29.15%)
PMS cases	689	691	695	6	5	1 (29.19%)
Economic outcomes (discounted, in 1 million Euros)						
Direct cost, IPD	64.8	665	65.7	0.9	0.7	0.2 (29.07%)

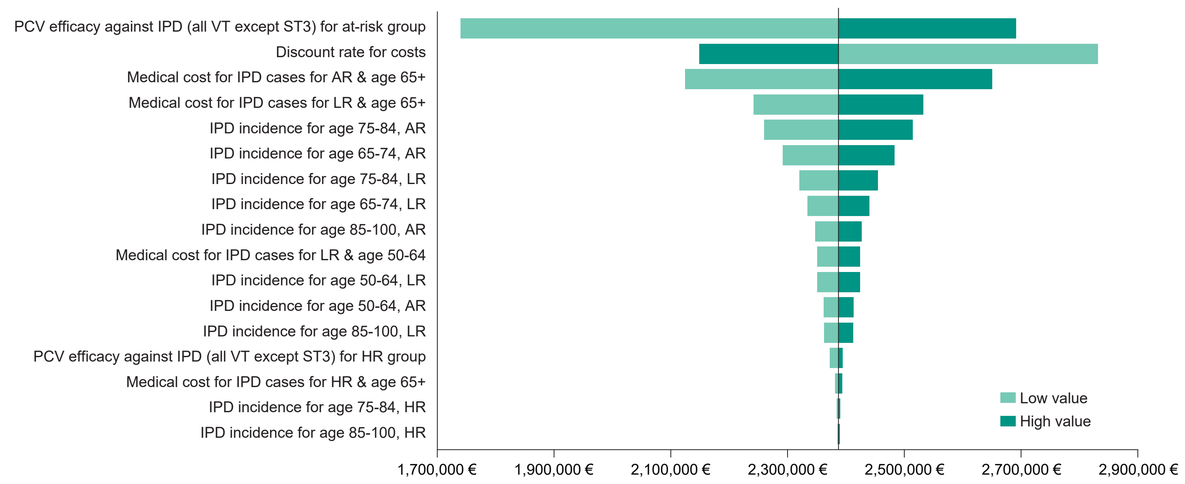
IPD, invasive pneumococcal disease; PCV20, 20-valent pneumococcal conjugate vaccine; PMS, post-meningitis sequelae; V116, a novel 21-valent pneumococcal conjugate vaccine.

Table 3. Estimated lifetime clinical and economic outcomes when vaccinating with V116 and PCV20 for ages 60+

	V116	PCV20	No vaccine	Cases/costs averted, compared to "no vaccine"		Additional reduction by V116, compared to PCV20
				V116	PCV20	
Clinical outcomes (undiscounted)						
IPD cases	27,993	28,312	29,078	1,085	766	319 (41.67%)
IPD deaths	5,644	5,704	5,848	204	144	60 (41.83%)
PMS cases	772	781	803	30	21	9 (41.63%)
Economic outcomes (discounted, in 1 million Euros)						
Direct cost, IPD	92.0	93.3	96.5	4.4	3.1	13 (41.63%)

IPD, invasive pneumococcal disease; PCV20, 20-valent pneumococcal conjugate vaccine; PMS, post-meningitis sequelae; V116, a novel 21-valent pneumococcal conjugate vaccine.

Figure 2. Sensitivity analysis - estimated lifetime direct medical cots for adults aged 50+ years svaed 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, comparing with PCV20, V116 led to a greater reduction of both the lifetime health burden and economic burden associated with IPD
- 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 Germany, compared to PCV20

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Disclosures

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

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

https://bit.ly/3O0bvFX

Presented at ISPOR Europe; Barcelona, Spain; 17-20 November 2024.

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