EE636

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

Muloongo Simuzingili[1]; Silvia Fernandez[2]; Nicole Cossrow[1]; Kelly D. Johnson[1]; Zinan Yi[1]; Kwame Owusu-Edusei[1]

[1]Merck & Co., Inc., Rahway, NJ, USA; [2]MSD Spain, Madrid, Spain

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 an investigational 21-valent pneumococcal conjugate vaccine (PCV) specifically designed for adults. It contains ***21*** serotypes: ***3, 6A, 7F, 8, 9N, 10A, 11A, 12F, 15A, 15C, 16F, 17F, 19A, 20A, 22F, 23A, 23B, 24F, 31, 33F,*** and ***35B***. ***Eight*** (***15A, 15C[a], 16F, 23A, 23B, 24F, 31, 35B***) of the 21 serotypes are unique and are not included in any currently licensed vaccines
- In 2019, the serotypes in V116 accounted for ~84% of IPD and the 8 unique serotypes accounted for ~24% of IPD in adults ≥65 years of age[4] in Spain

[a]Serotype protection proposed with deOAc15B as the molecular structures for deOAc15B and 15C are similar.

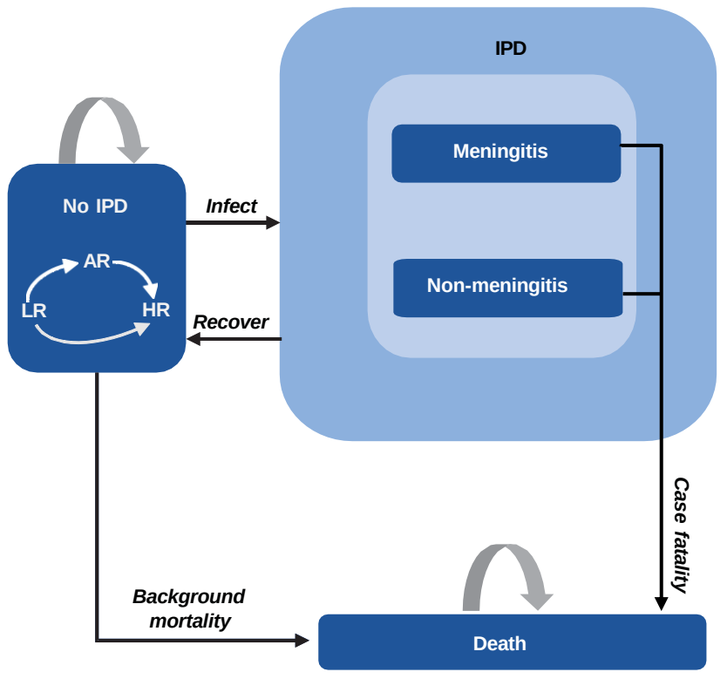
Objective

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

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 IPD-associated direct medical costs (in 2023 euro) among adults aged 50-64 and 65+ years in Spain 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 Cantarero (2023)[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 declined to zero in the following 10 years[6]
- Vaccine coverage rates are the same for the two vaccines, averaging 41%[5,7] for all groups. Other key model parameters are shown in **Table 1**
- 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



Results

- In adults aged 50-64 years, V116 prevented 74,212 cumulative lifetime IPD cases and 17,636 IPD deaths – 40% more than the IPD cases and deaths prevented by PCV20 compared with no vaccination. The averted IPD cases from V116 vaccination resulted in €0.7 million reduction in total lifetime medical costs (both direct and indirect) – 39.7% higher than the €0.5 million costs averted by PCV20 (**Table 2**)
- In adults aged 65+ years, V116 prevented 3,886 IPD cases and 973 IPD deaths compared with no vaccination – 39.5% more than the 1,577 IPD cases and 189 IPD deaths prevented by PCV20. The averted IPD cases from V116 vaccination resulted in €32.9 million reduction in total medical costs – 39.2% higher than the €23.6 million costs averted by PCV20 (**Table 3**)
- Among the parameters included in the OWSA, the top sensitive parameters are PCV efficacy and discount rate for costs
- OWSA confirmed the robustness of the results. All scenarios showed a large lifetime direct medical cost (~7.6 million to 11.2 million euros) 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)				
50-64	8.4	13.8	34.1	Cantarero et al. (2023)[5]
65-74	12.0	23.8	41.2	
75-84	20.5	32.5	64.7	
85-100	33.0	65.3	99.6	
IPD case fatality rate (%)				
50-64	10.5			Cantarero et al. (2023)[5]
65-74	13.0			
75-84	19.0			
85-100	39.7			
Vaccine coverage rate (%)				
50-64	1.3	15.1	59.1	Rodríguez (2016)
65+	37.2	46.0	64.1	Cantarero (2023)[5,7]
IPD indirect nonmedical cost (€, 2023)				
50-64	10,103	10,103	10,103	Cantarero et al. (2023)[5]
65+	9,948	9,948	9,948	

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

Table 2. Estimated lifetime clinical and economic outcomes when vaccinating with V116 and PCV20 for ages 50-64 years

	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	74,212	74,237	74,299	87	62	25 (39.90%)
IPD deaths	17,636	17,639	17,646	10	7	3 (40.04%)
Economic outcomes (discounted; in million €)						
Direct cost, IPD	397.2	397.4	397.9	0.7	0.5	0.2 (39.67%)

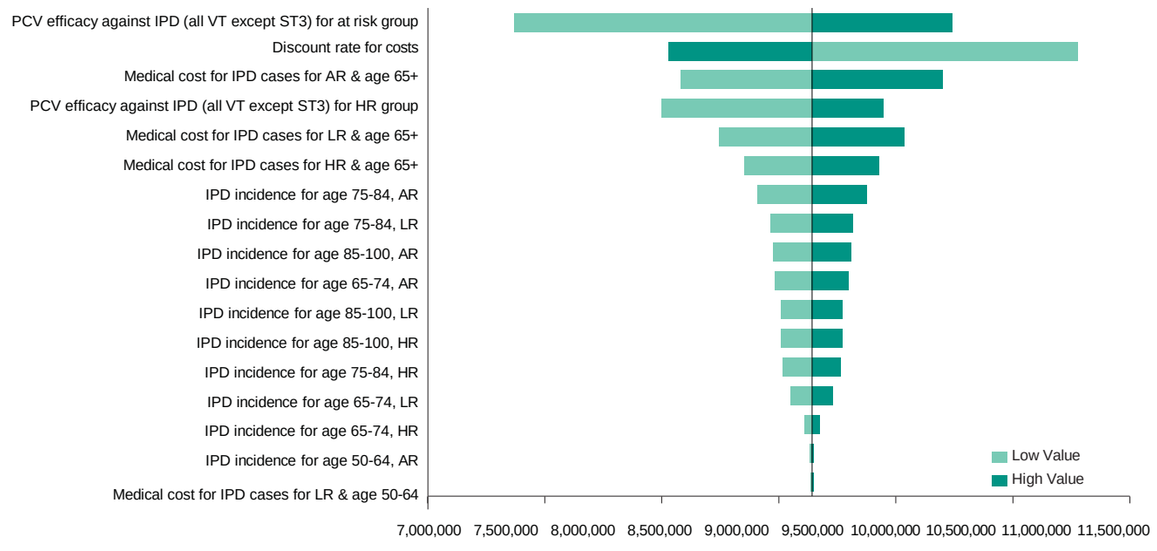
IPD, invasive pneumococcal disease; PCV20, 20-valent pneumococcal conjugate vaccine; PMS, post-meningitis sequelae; V116, an investigational 21-valent pneumococcal conjugate vaccine.

Table 3. Estimated lifetime clinical and economic outcomes when vaccinating with V116 and PCV20 for ages 65+ years

	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	47,527	48,627	51,413	3,886	2,786	1,100 (39.48%)
IPD deaths	14,457	14,733	15,430	973	697	276 (39.64%)
Economic outcomes (discounted; in million €)						
Direct cost, IPD	338.8	348.1	371.7	32.9	23.6	9.3 (39.24%)

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

Figure 2. Sensitivity analysis – estimated lifetime clinical and economic outcomes of V116, compared to PCV20 (2023 euro)



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 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 the Spain, compared to PCV20

References

1. GBD 2016 Lower Respiratory Infections Collaborators. *Lancet Infect Dis*. 2018;18(11):1191-1210.
2. Safiri S, et al. *Front Public Health*.. 2023;10:1028525.
3. US Centers for Disease Control and Prevention. Pneumococcal disease. Available from: https://www.cdc.gov/vaccines/pubs/pinkbook/pneumo.html#streptococcus-pneumoniae. Accessed March 14, 2024.
4. European Centre for Disease Prevention and Control. Available from: https://www.ecdc.europa.eu/en/data-dashboards-and-databases.
5. Cantarero D, et al. *Vaccine*. 2023;41(36):5342-5349.
6. Rubin JL, et al. *Vaccine*. 2010;28(4 8):7634-7643.
7. Rodríguez González-Moro JM, et al. *Clin Drug Investig*. 2016;36(1):41-53.
8. Jit M (2010) the risk of sequele due to pneumococcal meningitis in high income countries.

Corresponding author

Muloongo Simuzingili at muloongo.simuzingili@merck.com

Disclosures

All authors are employees of Merck Sharp & Dohme LLC or MSD Spain., subsidiaries of Merck & Co., Inc., Rahway, NJ, USA.V116 was developed by Merck & Co., Inc., Rahway, NJ, USA.

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