EPH56

Delta Price Cost-Effectiveness Analysis of PCV21 vs PCV20 Use in Adults Aged ≥18 Years in Austria

Peter P. Mueller[1]; Maria Klicznik-Hollerer[2]; Evelyn Walter[3]; Eleana Tsoumani[4]; Agnes MM Sonnenschein-van der Voort[5]; Zinan Yi[1]; Christoph Jandl[2]; Theresa Pritz[2]; Philipp Wurm[2]; Kwame Owusu-Edusei[1]

[1]Merck & Co., Inc., Rahway, NJ, USA; [2]MSD Austria, Vienna, Austria; [3]IPF Institute for Pharmaeconomic Research, Vienna, Austria; [4]MSD Greece, Athens, Greece; [5]MSD Netherlands, Haarlem, Netherlands

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 impacts and economic costs on the Austrian health care 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]
  - Specifically for the unique 8 serotypes covered by PCV21 and not by any previous licensed vaccine (15A, 15C[a] [generated from deOAc-15B], 16F, 23A, 23B, 24F, 31 and 35B)

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

Objective

- In this cost-effectiveness analysis, we estimated outcomes prevented and applied a delta price method[3] to determine the price range over which PCV21 is either cost-saving or cost-effective compared to PCV20

Methods

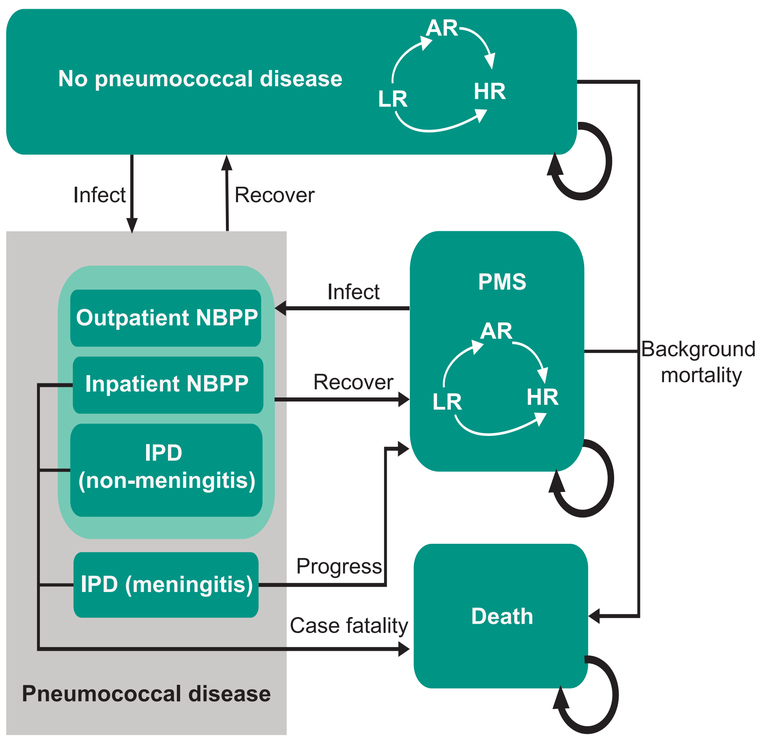
- Data specific to Austria, including demographic, epidemiological, vaccination, and cost data, were used to adapt a previously published Markov model[4,5] to the adult population in Austria
- We compared health and economic outcomes, for PCV21 vs PCV20, in adults ages ≥60 as well as 18-59 with risk conditions[6]
- With limited historical adult vaccination coverage rates, data from the influenza vaccine were used[7]
- The analysis determined the maximum price differences between PCV21 and PCV20 at which PCV21 was cost-effective using a willingness-to-pay threshold of €40,000 per per quality-adjusted life-year (QALY) gained
- Due to limited data availability, the non-bacteremic pneumococcal pneumonia (NBPP) serotype distribution was assumed to be the same as that of IPD

Risk condition details

The Markov model tracks individuals with varying risk conditions. Model parameter values that differ by risk conditions include: disease incidence, vaccine efficacy, and treatment costs. They are grouped as follows:

- High-risk: People with functional or anatomic asplenia, cerebrospinal fluid leaks, immunosuppression, acquired or congenital immunodeficiency, cochlear implant, cystic fibrosis, organ transplant, chronic renal failure, or nephrotic syndrome
- At-risk: People who have one or more of the following conditions: smoker, alcohol use disorder, hypertension, atherosclerosis, chronic bronchitis, chronic cardiac disease, chronic respiratory disease, chronic lung disease (asthma, emphysema, COPD), diabetes mellitus, chronic liver disease, chronic renal disease, or celiac disease
- Low-risk: People who have no underlying chronic medical conditions listed above and are not immunocompromised

Figure 1. Markov model schematic



LR, low-risk; AR, at-risk; HR, high-risk; NBPP, non-bacteremic pneumococcal pneumonia; IPD, invasive pneumococcal disease; PMS, post-meningitis sequelae.

Results for ages 60 and above

- With a 15%-35% vaccination coverage rate (**Table 3**), PCV21 prevented an additional 51 IPD cases, 757 hospitalized NBPP cases, and 486 outpatient NBPP cases compared to PCV20 (**Table 1**)
- PCV21 saved an extra €2.9 million in direct treatment costs and €3.1 million in indirect costs beyond that of PCV20 (**Table 1**)
- Between the range of price parity (€0 price premium) and a €9.16 price premium per vaccine, PCV21 is cost-saving compared to PCV20
- At a willingness-to-pay threshold of €40,000/QALY, PCV21 remains cost-effective up to a €36.07 price premium per vaccine, compared to PCV20

Table 1. Health and economic outcomes for the 60+ age-based recommendation, comparing PCV21 and PCV20. Cumulative results are presented over a 40-year time horizon

	PCV21	PCV20	PCV21 vs PCV20
Outcomes (undiscounted)			
IPD cases	5,974	6,025	-51
PMS cases	283	285	-2
NBPP-IP cases	143,939	144,696	-757
NBPP-OP cases	92,414	92,900	-486
IPD deaths	842	849	-7
NBPP deaths	24,135	24,254	-119
Life-years	35,867,333	35,866,358	975
Outcomes (discounted)			
QALYs	19,466,794	19,466,351	443
Total costs (discounted)	€833,800,909	€839,846,125	-€6,045,216
Vaccine admin cost	€9,895,195	€9,895,195	€0
Direct treatment cost	€462,877,116	€465,773,544	-€2,896,428
Indirect treatment cost	€361,028,598	€364,177,386	-€3,148,788

IPD, invasive pneumococcal disease; PMS, post meningitis sequelae; NBPP, non-bacteremic pneumococcal pneumonia; IP, inpatient; OP, outpatient; QALYs, quality-adjusted life-years.

Results for ages 18-59 with risk conditions

- With a 10%-25% vaccination coverage rate (**Table 3**), PCV21 prevented an additional 8 IPD cases, 35 hospitalized NBPP cases, and 22 outpatient NBPP cases compared to PCV20 (**Table 2**)
- PCV21 saved an extra €221 thousand in direct treatment costs and €1.3 million in indirect costs beyond that of PCV20 (**Table 2**)
- Between the range of price parity (€0 price premium) and a €7.79 price premium per vaccine, PCV21 is cost-saving compared to PCV20
- At a willingness-to-pay threshold of €40,000/QALY, PCV21 remains cost-effective up to a €12.83 price premium per vaccine, compared to PCV20

Table 2. Health and economic outcomes for the 18-59 risk-based recommendation, comparing PCV21 and PCV20. Cumulative results are presented over an 82-year time horizon (lifetime)

	PCV21	PCV20	PCV21 vs PCV20
Outcomes (undiscounted)			
IPD cases	11,282	11,290	-8
PMS cases	567	567	0
NBPP-IP cases	163,377	163,412	-35
NBPP-OP cases	104,894	104,916	-22
IPD deaths	1,000	1,001	-1
NBPP deaths	22,289	22,292	-3
Life-years	48,882,887	48,882,821	66
Outcomes (discounted)			
QALYs	19,638,138	19,638,113	25
Total costs (discounted)	€1,589,831,097	€1,591,349,719	-€1,518,622
Vaccine admin cost	€2,925,512	€2,925,512	€0
Direct treatment cost	€362,179,354	€362,400,024	-€220,670
Indirect treatment cost	€1,224,726,231	€1,226,024,183	-€1,297,952

IPD, invasive pneumococcal disease; PMS, post meningitis sequelae; NBPP, non-bacteremic pneumococcal pneumonia; IP, inpatient; OP, outpatient; QALYs, quality-adjusted life-years.

Figure 2. Delta-price analysis consisting of the cost-effective and cost-saving price premium (the difference between the vaccine acquisition costs of PCV21 and PCV20) for (A) adults aged 60+ years, and (B) adults aged 18-59 years with risk conditions

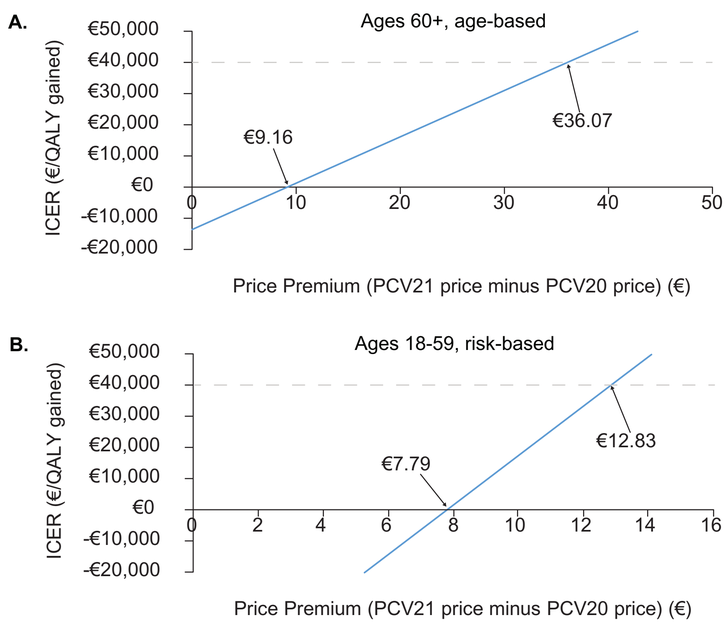


Table 3. Disease coverage and vaccination coverage rates

	Disease coverage[2]		
Age group	PCV21	PCV20	Unique 8
15-44	81.15%	78.26%	7.25%
45-64	85.72%	79.77%	9.52%
65+	87.84%	75.45%	16.44%
	Vaccination coverage rate (VCR)[7]		
Age group	Low-risk	At-risk	High-risk
18-59	N/A	10%	25%
60-64	15%	15%	30%
65+	30%	30%	35%

Limitations

It is worth noting the following limitations:

- The Markov model simulates the vaccination strategies by applying a vaccination coverage rate – at the start of the simulation – to a closed cohort of individuals
- Therefore, no one gets a vaccination later in the simulation as we:
  - Do not look at revaccination
  - Nor do we have new people aging into the cohort to be vaccinated
- And thus, beyond the first 15 years (of the lifelong time horizon) the vaccines have fully waned, but we still count cases that occur beyond the first 15 years
- This results in muted impacts of vaccination for the 40-year time horizon of the 60+ multi-cohort, but especially for the 82-year time horizon of the 18-59 multi-cohort of at-risk individuals

Conclusions

- PCV21 yields better health outcomes and saves more medical and indirect costs than PCV20. As a result, PCV21 has a wide range of price differences over which it is either cost-saving or cost-effective compared to PCV20
- Significant increases to cases prevented and costs saved could be seen under higher vaccination coverage rates (VCRs). Our assumption to use values between 10%-35% (based on the influenza vaccine in Austria) is significantly less than the pneumococcal VCRs seen in other countries
- The price premiums are lower in the 18-59 at-risk cohort for the following major drivers:
  - Lower vaccination effectiveness is assumed in immunosuppressed individuals (**Table 3**)
  - The difference in the disease coverage between PCV21 and PCV20 is slightly less in younger adults (**Table 3**)

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Disclosures

Peter P. Mueller, Maria Klicznik-Hollerer, Eleana Tsoumani, Agnes Sonnenschein-van der Voort, Zinan Yi, Christoph Jandl, Theresa Pritz, Philipp Wurm, and Kwame Owusu-Edusei are employees of Merck Sharp & Dohme LLC, a subsidiary of Merck & Co., Inc., Rahway, NJ, USA; MSD Austria, Vienna Austria; MSD Greece, Athens, Greece; and MSD Netherlands, Haarlem, Netherlands.

PCV21 was developed by Merck & Co., Inc., Rahway, NJ, USA.

Contact info

Corresponding author: Peter P. Mueller, peter.mueller@merck.com

Poster

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