EE423

# Cost-Effectiveness of Vaccinating Adults ≥65 Years and At-Risk Individuals 18-64 years with the 20-Valent Pneumococcal Conjugate Vaccine Versus Recommended Vaccine Regimens in Sweden

Dorange AC[1], Palmborg A[1], Sato R[2], Atwood M[3]
[1]Pfizer AB, Sollentuna, Sweden; [2]Pfizer Inc., Collegeville, PA, USA; [3]Policy Analysis Inc., MA, USA;

## OBJECTIVE AND BACKGROUND

We evaluate the cost-effectiveness of a single dose of the 20-valent pneumococcal conjugate vaccine (PCV20) versus recommended adult pneumococcal vaccination regimens in Sweden set by the Public Health Agency (PHA)[1, 2] from both a societal- and health care perspective.

- Immunocompetent adults with chronic medical conditions ≥18 years of age is recommended one dose of 23-valent pneumococcal polysaccharide vaccine (PPV23), and adults ≥65 years are recommended one dose of PPV23.[1]
- In addition, high-risk immunocompromised adults were previously recommended 13-valent pneumococcal conjugate vaccine (PCV13) followed by PPV23. Since May 2022, the recommendation is one dose of PCV20, hence, we compare to the previous recommendation.[1, 2]

## METHODS

### Model Structure

- The model uses a deterministic framework and Markov-type process to depict lifetime risks and costs of IPD (including bacteraemia and meningitis) and in- and outpatient all-cause CAP (AC-CAP) among adults in Sweden.
- Population is characterised by age and risk profile (low [immunocompetent without underlying conditions], moderate [immunocompetent with underlying conditions], high [immunocompromised or other high-risk conditions]).[3, 4, 5]
- Strategies: PCV13+PPV23, PPV23, or PCV20 at model entry.
- Clinical and economic outcomes include cases of IPD and AC-CAP; mortality due to IPD and inpatient AC-CAP; life-years (LYs) and quality-adjusted life-years (QALYs); vaccination costs; medical care costs for IPD and AC-CAP. 92% of IPD cases were assumed to be bacteremia and 8% menigitis.[6,7]
- Herd effect from future higher-valent pediatric PCVs were not considered nor was previous vaccination history in the targeted population, consistent with the PHA.[8,9]
- Vaccine uptake assumed to be 75%, consistent with the PHA's assumptions.[8,9]
- PCV20 vaccine effectiveness (VE) assumed durable for 5 years and to wane to 0% by year 16 based on PCV13 data.[10-15]
- VE for PPV23 vs. vaccine type (VT)-IPD waned to 0% by year 10[16]; VE for PPV23 vs. VT-CAP assumed 0% in *Scenario 1*[17-20] but assumed some efficacy[21] in *Scenario 2-3*, consistent with the PHA assumptions and the Dental and Pharmaceutical Benefits Agency (TLV) decision on reimbursement for PCV20[8,9 22]

### Analyses

- A Societal perspective (including work loss) was employed for 18-64 years as well as analysis from a health care perspective, *Scenario 1 (S1)*
- Sensitivity analysis where PPV23 is assumed to have efficacy for CAP [21, 8, 9] was conducted, *Scenario 2 (S2)*
- Adding to S2, the scenario of less vaccination taken place at the same time as other health service visits, assuming a frequency of 20% instead of 50%, *Scenario 3 (S3)*

- Disutility of 0.13 for hospitalized episode[23] and 0.0045 for outpatient CAP episode[12] was used along with the aged based health states[24] for Sweden.
- Costs[25]: meningitis (204,012 kr), bacteremia (109,641 kr), hospitalized CAP (70,377 kr) and outpatient CAP (3,656 kr). Vaccine costs[26]: PPV23 (315 kr), PCV13 (588,99 kr), PCV20 (648,69 kr); administration fee (727 kr).[25] We assume that 50% of the vaccinations takes place at the same time as other visits to the health service *Scenario 1-2* and 20% in Scenario 3, consistent with the TLV decision.
- Serotype distribution for IPD and CAP as reported in Sweden.[27, 28] Other model input values are set forth in *Table 1*.

**Table 1. Input by age and risk group**

| Age | Risk group | No. of adults (Total: 8 144 874) | IPD per 100K | Inpatient AC-CAP, incidence per 100K | Outpatient AC-CAP, incidence per 100K | General population mortality (%) | IPD mortality (%) | Yr 1 VE (%) PCV20 vs. VT-IPD / VT-CAP | Yr 1 VE (%) PPV23 vs. VT-IPD / VT-CAP in S2-S3 |
|---|---|---|---|---|---|---|---|---|---|
| 18-49 | Mod | 1 306 793 | 15,0 | 312 | 807 | 0,07 | 4 | 81,5 / 55,6 | 32,8 / 24,3 |
| | High | 75 878 | 61,0 | 312 | 947 | 0,07 | 4 | 65,2 / 44,5 | 17,1 / 12,6 |
| 50-64 | Mod | 735 304 | 15,0 | 600 | 807 | 0,37 | 4 | 79,2 / 51,3 | 32,3 / 24,3 |
| | High | 113 841 | 61,0 | 600 | 947 | 0,37 | 4 | 63,3 / 41,1 | 16,8 / 12,5 |
| 65-74 | Low | 504 012 | 3,0 | 251 | 496 | 1,33 | 11 | 75 / 45 | 55,7 / 41,3 |
| | Mod | 485 304 | 15,0 | 1160 | 1203 | 1,33 | 11 | 75 / 45 | 30,9 / 22,9 |
| | High | 111 147 | 61,0 | 1160 | 1632 | 1,33 | 11 | 60 / 36 | 16,1 / 11,9 |
| 75-84 | Low | 300 305 | 3,0 | 599 | 496 | 3,65 | 22 | 75 / 45 | 50,8 / 37,6 |
| | Mod | 308 725 | 15,0 | 2128 | 1203 | 3,65 | 22 | 75 / 45 | 28,1 / 20,8 |
| | High | 92 618 | 61,0 | 2128 | 1632 | 3,65 | 22 | 60 / 36 | 14,6 / 10,8 |
| 85-99 | Low | 115 384 | 3,0 | 1827 | 496 | 14,31 | 22 | 75 / 45 | 37,9 / 28,1 |
| | Mod | 106 769 | 15,0 | 3797 | 1203 | 14,31 | 22 | 75 / 45 | 20,5 / 15,2 |
| | High | 38 896 | 61,0 | 3797 | 1632 | 14,31 | 22 | 60 / 36 | 10,6 / 7,9 |

## RESULTS

- Both from a healthcare and a societal perspective, PCV20 alone is dominant (i.e., cost-saving) versus comparator vaccine regimens in all analysis, *Table 2*; *S1-S3*.
- Compared to the previous recommended vaccine regimen (PCV13+PPV23) for the high-risk group ≥18 years, PCV20 would prevent an additional 347 and 2,448 cases of invasive pneumococcal disease (IPD) and CAP, respectively, as well as 236 disease-related deaths.
- For the moderate risk group 18-64 years and low and moderate risk groups ≥65 years of age, PCV20 would prevent an additional 2,217 and 43,686 cases of IPD and CAP, respectively, as well as 3,293 disease-related deaths.
- The sensitivity analysis where PPV23 is assumed to have efficacy for CAP, *S2*, as well as the analysis adding to *S2* less vaccination at the same time as other visits to the health service, *S3,* demonstrates that the results are robust.
- The results are dominant for all groups included both from a societal perspective and a health care perspective.

**Table 2. Results by age and risk group**

| | PCV20 vs. PCV13+PPV23 for high-risk group ≥18 years | PCV20 vs. PPV23 for moderate risk group 18-64 years and low + moderate risk groups ≥65 years |
|---|---|---|
| **QALY Difference** | | |
| Scenario 1 | 0,0026 | 0,0056 |
| Scenario 2 | 0,0025 | 0,0049 |
| Scenario 3 | 0,0025 | 0,0049 |
| **Cost saving per patient, Societal Perspective** | | |
| Scenario 1 | 788 kr | 736 kr |
| Scenario 2 | 772 kr | 619 kr |
| Scenario 3 | 925 kr | 619 kr |
| **Cost saving per patient, Healthcare Perspective** | | |
| Scenario 1 | 652 kr | 187 kr |
| Scenario 2 | 642 kr | 137 kr |
| Scenario 3 | 769 kr | 137 kr |
| **Cost per QALY** Scenario 1-3 | Dominant both in a societal perspective and a health care perspective | Dominant both in a societal perspective and a health care perspective |

## CONCLUSIONS

- PCV20 is cost saving compared to PCV13+PPV23 in the high-risk groups ≥18 years, and cost savings compared to PPV23 in the moderate risk group 18-64 years and low and moderate risk groups ≥65 years.
- PCV20 vaccination is expected to prevent more hospitalizations, save more lives, and yield lower overall costs than current recommendations.
- PCV20 vaccination is a cost saving strategy both from a societal perspective as well as from a health care perspective and the model is robust to various sensitivity analyses.

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