

A public health and budget impact analysis (BIA) of vaccinating children against pneumococcal-diseases in Austria

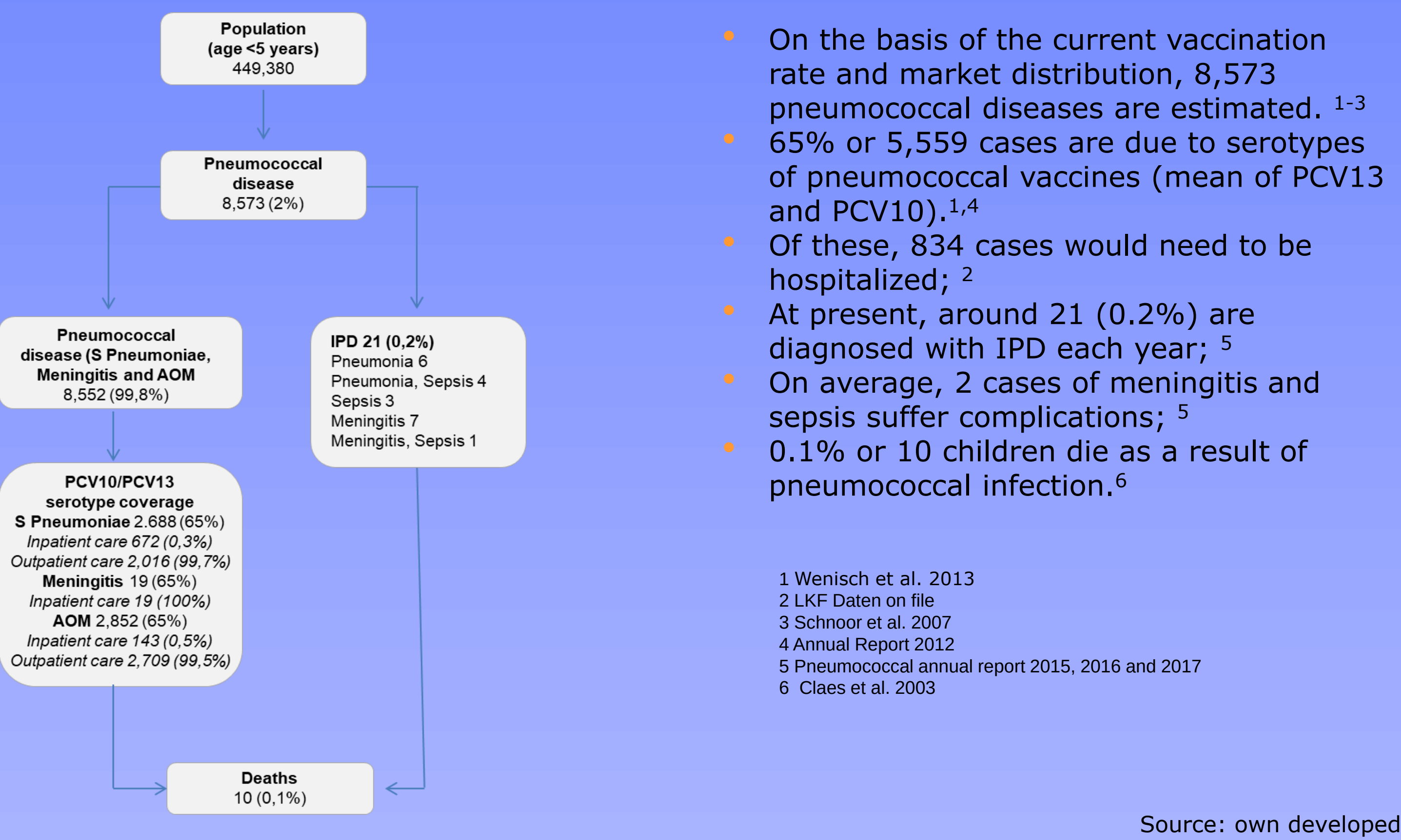
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Objectives

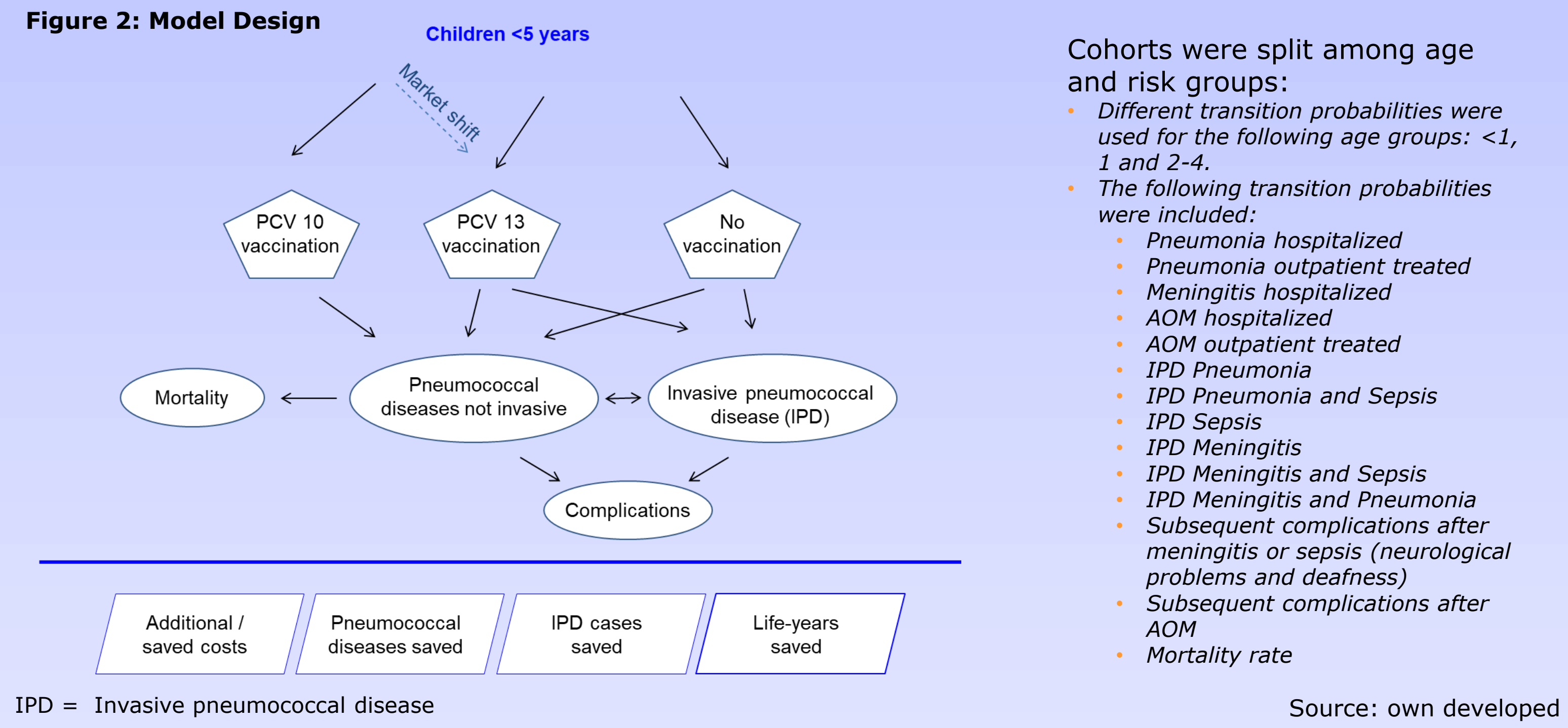
Around 2 million people die every year from pneumococcal infections world-wide. 50% of them are children. In Austria around 9,000 children (<5 years) develop pneumococcal infections every year. About 20 children develop invasive pneumococcal disease (IPD). Vaccination with a pneumococcal conjugate vaccine (PCV) for all children <2 years is recommended and reimbursed in Austria. Currently PCV10 is being used exclusively but could now be replaced by PCV13. The aim of this BIA is to quantify the monetary impact of an increasing proportion of PCV13 vaccinated children in the different age-groups compared to the present situation, after an observed serotype shift of reported cases.

Figure 1: Patient flow of the current market situation (2019)



Methods

A multi-cohort, population-based model was developed over a 5-year time-horizon (2020-2024), which included the following states: hospitalized and outpatient pneumococcal disease (pneumonia, meningitis and AOM), IPD, associated complications and mortality in children <5. Within the present vaccination coverage of 80%; 75% receive PCV10; 15% PCV13. The model evaluates PCV10 being replaced by PCV13 with PCV13 achieving 83% market share in year 5. The model includes a serotype shift over time. Results included savings that could be achieved from the health-care-systems perspective.



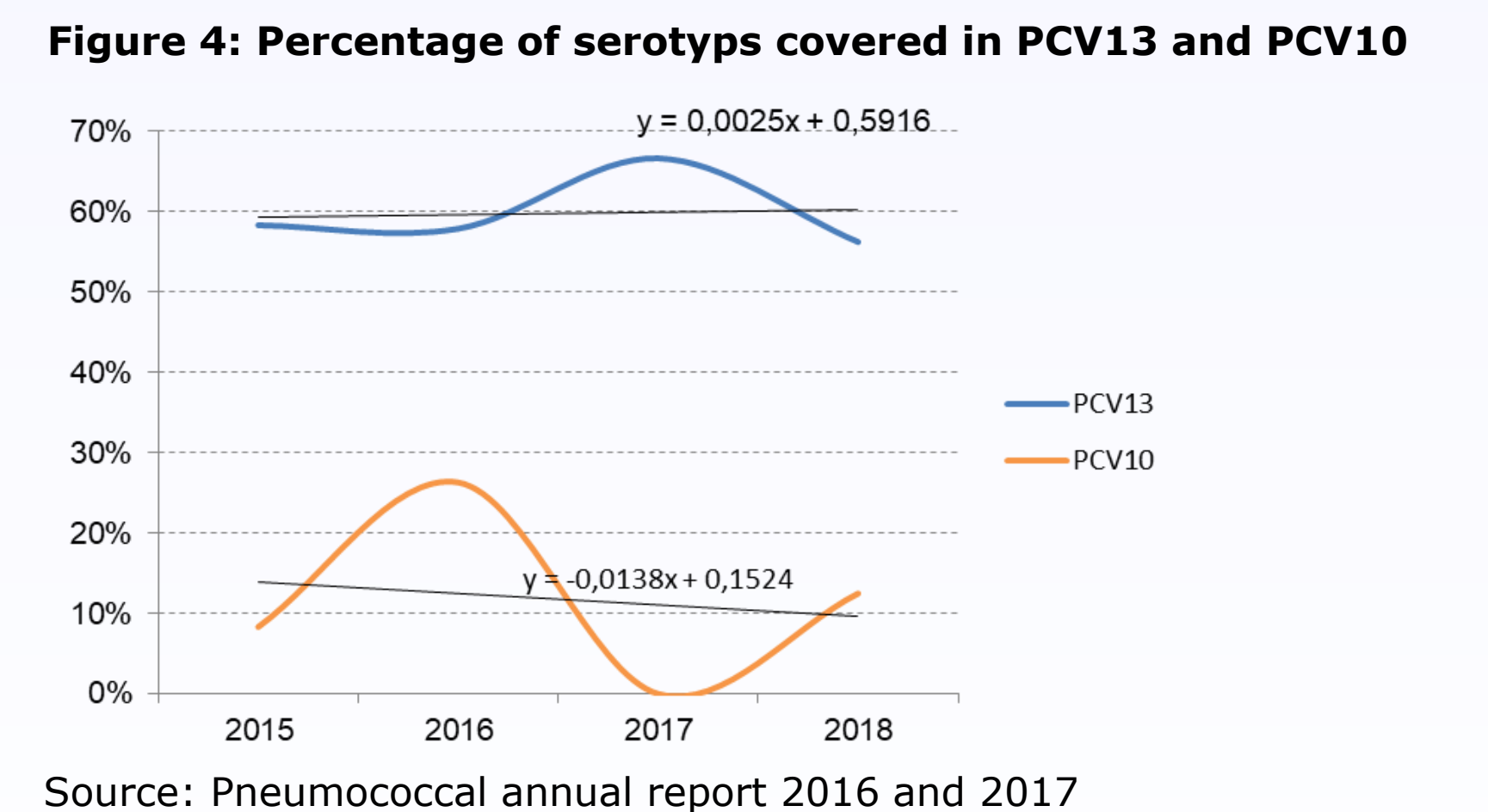
Epidemiological und clinical Data

The vaccine is included in the free vaccination program for children up to the age of 2 years. A conjugate vaccine according to the 2 + 1 scheme in the 3rd, 5th and 12th (-14th) month of life is recommended. Even children with risks are vaccinated according to the 2 + 1 scheme. These children will receive the free vaccination until their 5th birthday. For children, two conjugate vaccines are approved, one 10-valent vaccine (PNC10, Synflorix) and one 13-valent vaccine (PNC13, Prevenar13). The free vaccine program currently includes only the 10-valent vaccine. With the present vaccination rate (75% see table 2) 5,580 pneumococcal diseases were calculated.

Table 1: No. of IPD cases per age group, 1 st year			
IPD cases	<1	1	2-4
Pneumonia	0	2	4
Pneumonia and Sepsis	2	1	2
Sepsis	3	1	0
Meningitis	5	1	2
Meningitis and Sepsis	1	0	0

Source: Pneumococcal annual report 2016 and 2017, Wenisch et al 2013

From 2015 to 2018, the reported serotypes of IPD showed a decreasing serotype coverage of the PCV10 vaccine (see Figure 4). The "efficacy" of vaccination (PCV10 and PCV13) is considered according data from Earnshaw et al. 2012.



Immunization rate

The current vaccination rate was based on a publication by Richter et al. 2019 and estimated for 2020-2024.

Table 3: Vaccination rate over 5 years, present situation

Age groups	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)
PCV10	75.0%	75.7%	76.4%	77.1%	77.8%
PCV13	5.0%	6.0%	7.0%	8.0%	9.0%
No vaccination	20.0%	18.3%	16.6%	14.9%	13.2%

Source: Richter et al. 2019

Table 4: Market after market shift

Age groups	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)
PCV10	30.0%	6.7%	6.4%	5.1%	3.8%
PCV13	50.0%	75.0%	77.0%	80.0%	83.0%
No vaccination	20.0%	18.3%	16.6%	14.9%	13.2%

Source: estimated

Direct costs

The BIA includes costs of inpatient and outpatient pneumonia and AOM treatment, inpatient meningitis and IPD treatment (Pneumonia, Meningitis and Sepsis) including treatment of subsequent complications (neurological problems and deafness). Costs were presented from the payers perspective. The costs of pneumococcal vaccination are borne by the health care system.

Results

Based on the current vaccination coverage annual savings of 1.1 million € (1st year) to 3 million € (5th year) [total: 10.6 million € over 5 years] could be achieved. A market shift will reduce pneumococcal disease from 1,013 (1st year) to 2,821 (5th year) [total: 9,100 over 5 years]. The prevented IPDs are between 4 (1st year) and 11 (5th year) [total: 36 over 5 years].The prevented deaths range from 2 (1st year) to 6 (5th year) [total: 19 over 5 years].

Figure 5: Total budget-impact

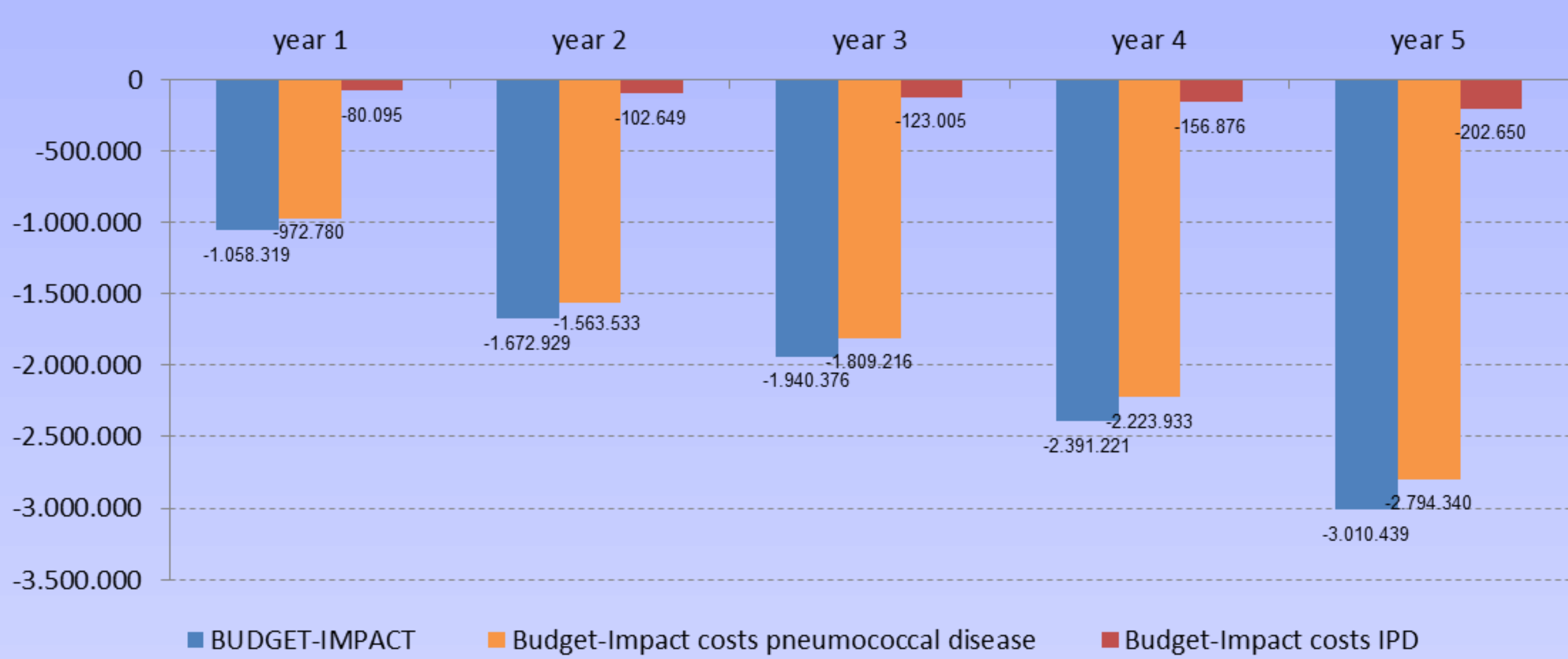


Table 5: Prevented cases due to Pneumococcal vaccination

Prevented cases	Year 1	Year 2	Year 3	Year 4	Year 5
Pneumococcal disease*	-1,013	-1,406	-1,691	-2,168	-2,821
IPD cases**	-4	-6	-7	-8	-11
Deaths	-2	-3	-4	-4	-6

* pneumonia, meningitis and AOM (not invasive)

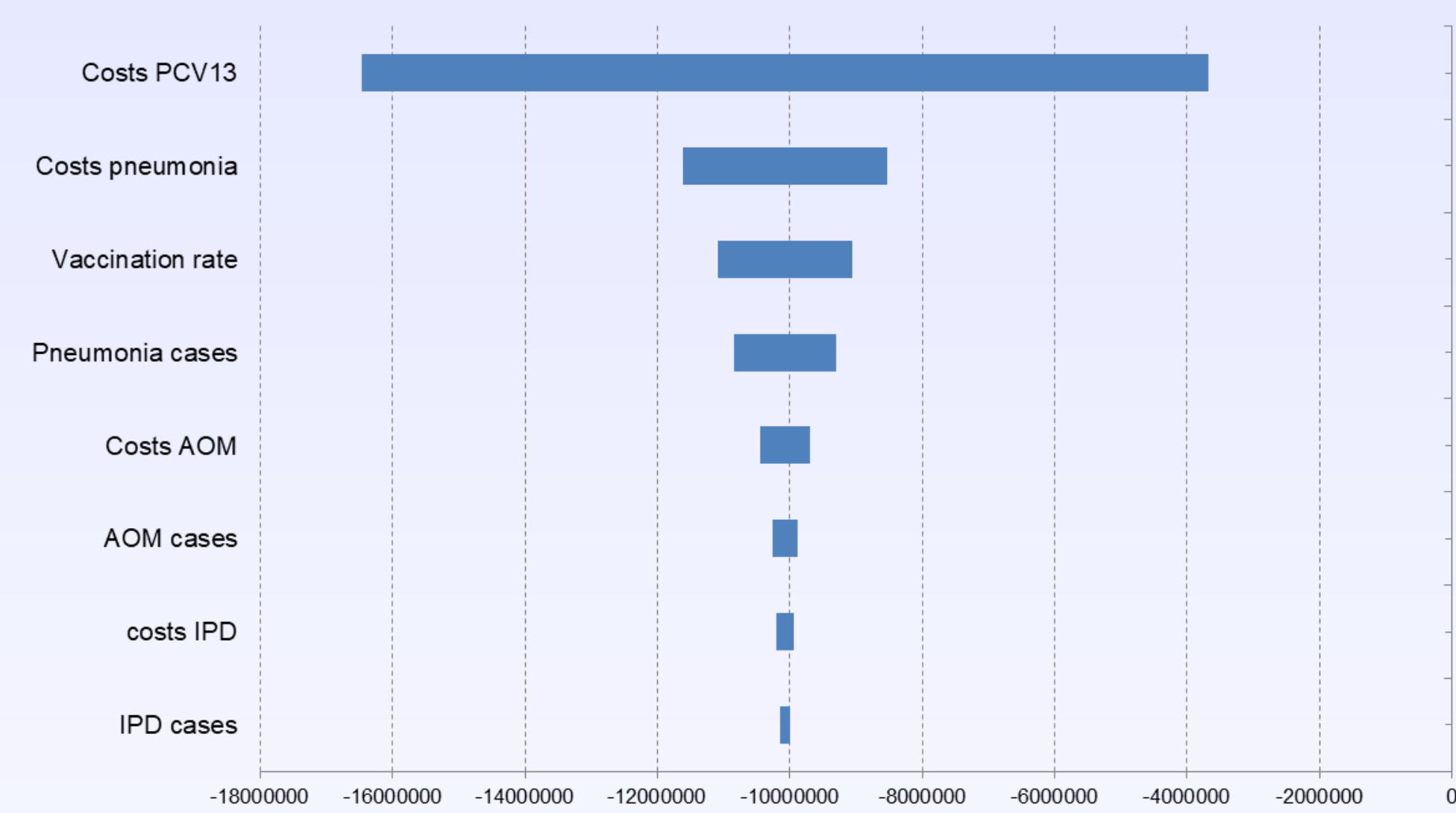
** Invasive pneumococcal disease including pneumonia, meningitis and AOM

Source: own calculations

Sensitivity Analysis

Deterministic sensitivity analysis was carried out in order to assess the impact of variation in the respective variable on the final result.

Table 6: Sensitivity analysis



Source: own calculations

Sensitivity analysis shows that the cost of PCV13 vaccination, the cost of pneumonia and the rate of vaccination, have the greatest impact on the results. The range of the budget impact is between € -16.4 million and € -3.7 million.

Conclusion

An increase in PCV13 immunized children – due to a change in the reimbursement rule – would reduce disease-burden significantly and lead to huge savings.

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Additional literature with the author