

# Cost-Effectiveness Analysis of Routine Use of PCV15 in the Pediatric Population of Saudi Arabia

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## Background

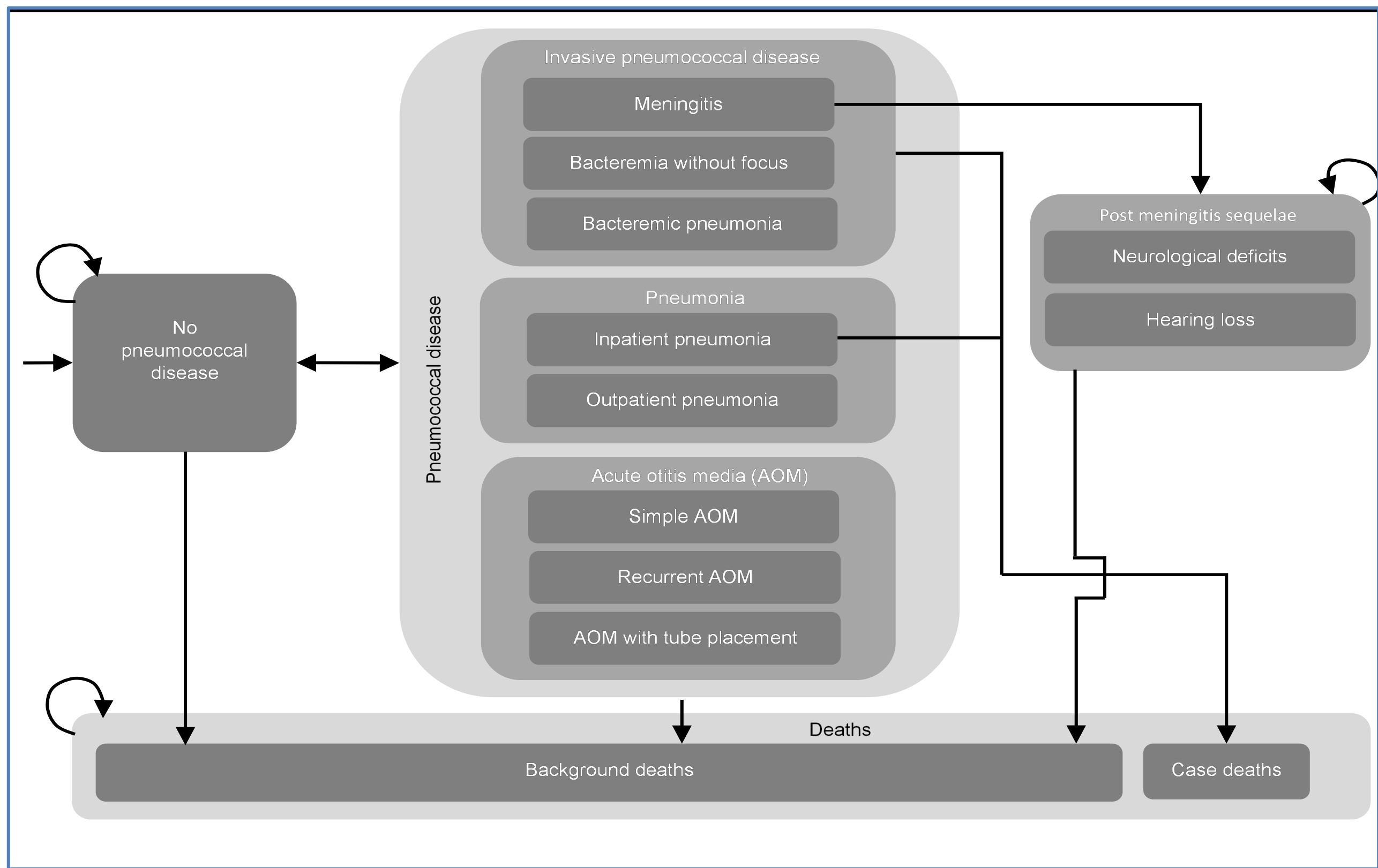
- Pneumococcal disease (PD), caused by Streptococcus pneumoniae, is a leading cause of morbidity and mortality in children under five years old. In February 2024, a 15-valent pneumococcal conjugate vaccine (PCV15) was approved for pediatric use in Saudi Arabia, offering broader serotype coverage compared to the previously recommended 13-valent pneumococcal conjugate vaccine (PCV13)<sup>1,2</sup>.
- This study evaluates the health and economic outcomes of introducing PCV15 into the routine immunization schedule for children under two years of age in Saudi Arabia compared to PCV13.

## Methodology

### Model Structure

- A state-transition Markov model (Figure 1) was constructed to simulates the lifetime health outcomes and economic costs of routine immunization with PCV15 compared to PCV13. The model followed a cohort of children from birth, capturing health states related to pneumococcal diseases, post-meningococcal sequelae (PMS), and death

Figure 1. A Schematic of the Model Showing the Natural History of Pneumococcal Diseases in Children



### Model Overview

- The analysis compared two vaccines following the same immunization schedule: 3 primary doses at 2, 4, and 6 months, followed by a booster dose at 12 months, for both PCV15 and PCV13.<sup>3</sup> Costs and outcomes were discounted at 3% annually. Time horizon was 77 years.<sup>8</sup>

### Model Inputs

- Clinical and epidemiological inputs were sourced from published literature and local Saudi healthcare data.<sup>4,5</sup> Vaccine effectiveness was modeled based on serotype-specific data, and costs were calculated from a societal perspective, incorporating direct and indirect costs.<sup>6,7</sup>

### Model Outcomes

- The model estimated the number of cases and deaths averted, life years (LYs), quality-adjusted life years (QALYs), and total costs.

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## Results

Table 1. Base case health gains of routine immunization with PCV15 compared to PCV13:

Clinical Outcomes	PCV15	PCV13	Cases/Deaths Prevented
IPD Cases	312,102	317,962	5,860
Pneumonia Cases	8,410,698	8,451,975	41,278
AOM (All-Cause)	14,082,500	15,214,949	1,132,450
PMS Cases	3,575	3,631	56
IPD Deaths	83,283	84,776	1,493
Pneumonia Deaths	172,007	172,358	351
Life Years	PCV15	PCV13	Life Years Saved
Discounted	842,847,245	842,839,322	7,923
Undiscounted	1,907,056,132	1,907,030,043	26,088

### Clinical Outcomes

- PCV15 prevented an additional 5,860 cases of IPD, 41,278 cases of pneumonia, and 1,132,450 cases of AOM.
- PCV15 averted 1,493 additional IPD-and pneumonia related deaths, resulting in 7,923 more life years saved.

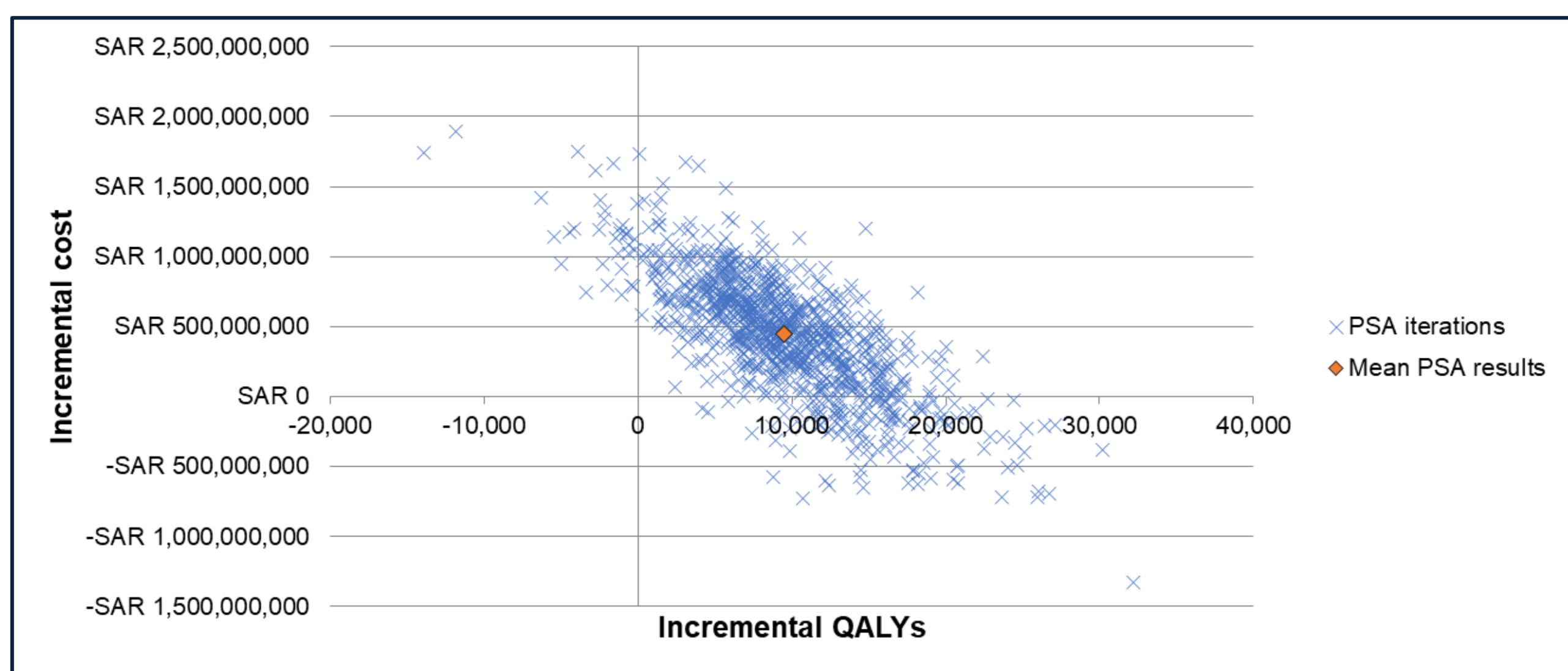
### Cost-Effectiveness

- The total discounted cost for PCV15 was SAR 131.69 billion compared to SAR 131.23 billion for PCV13. The incremental cost-effectiveness ratio (ICER) for PCV15 was SAR 48,444 per QALY gained, below the willingness-to-pay threshold of SAR 114,197 (1 GDP per capita). PCV15 generated 752,338,963 discounted QALYs compared to 752,329,512 discounted QALYs with PCV13.

Table 2. Base case cost savings of routine immunization with PCV15 vs. PCV13:

Vaccine	QALYs	Cost (SAR)	Incremental QALY	Increment Cost (SAR)	ICER (SAR/QALY)
PCV13	752,329,512	131,227,773,747	–	–	–
PCV15	752,338,963	131,685,612,633	9,451	457,838,886	48,444

Figure 2. A Plot of the Incremental QALYs and Costs



## Discussion

- The model demonstrated that PCV15 vaccination reduces pneumococcal disease burden in the long term by including additional serotypes, providing greater protection in pediatric population. PCV15 outperforms in preventing IPD, pneumonia, AOM, and deaths, leading to improved health outcomes and reduced mortality.<sup>14</sup>
- Sensitivity analysis confirmed robust results across various assumptions.

## Conclusion

The model shows PCV15 to be a cost-effective option for routine pediatric vaccination in Saudi Arabia, offering broader serotype coverage and improved clinical outcomes compared to the 13-valent PCV13. Given the significant reduction in disease burden and cost-effectiveness demonstrated by the model, including PCV15 in the current routine Saudi Arabia pediatric vaccination program can prevent a substantial number of pneumococcal cases/deaths and save a considerable amount of pneumococcal disease related costs.