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## INTRODUCTION

- Clinical practice guidelines in India recommend 13-valent pneumococcal polysaccharide conjugate vaccine (PCV13) followed by 23-valent pneumococcal polysaccharide vaccine (PPV23; PCV13→PPV23) for older adults as well as younger adults who are at elevated risk of pneumococcal disease<sup>1</sup>; however, vaccination with PPV23 or PCV13 alone is common in clinical practice, particularly in private settings
- In August 2025, a novel 20-valent PCV (PCV20) that targets a wider range of serotypes than earlier PCVs and offers longer-lasting immunity than PPV23 was licensed in India<sup>2</sup>

## OBJECTIVE

- To evaluate the cost-effectiveness of PCV20 versus PCV13→PPV23, PCV13 alone, and PPV23 alone, respectively, from the private/patient perspective in adults aged  $\geq 50$  years who are at elevated risk of disease
- To evaluate the cost-effectiveness of PCV20 versus PCV13→PPV23 from the government/payer perspective in adults aged  $\geq 60$  years who are at elevated risk of disease

## METHODS

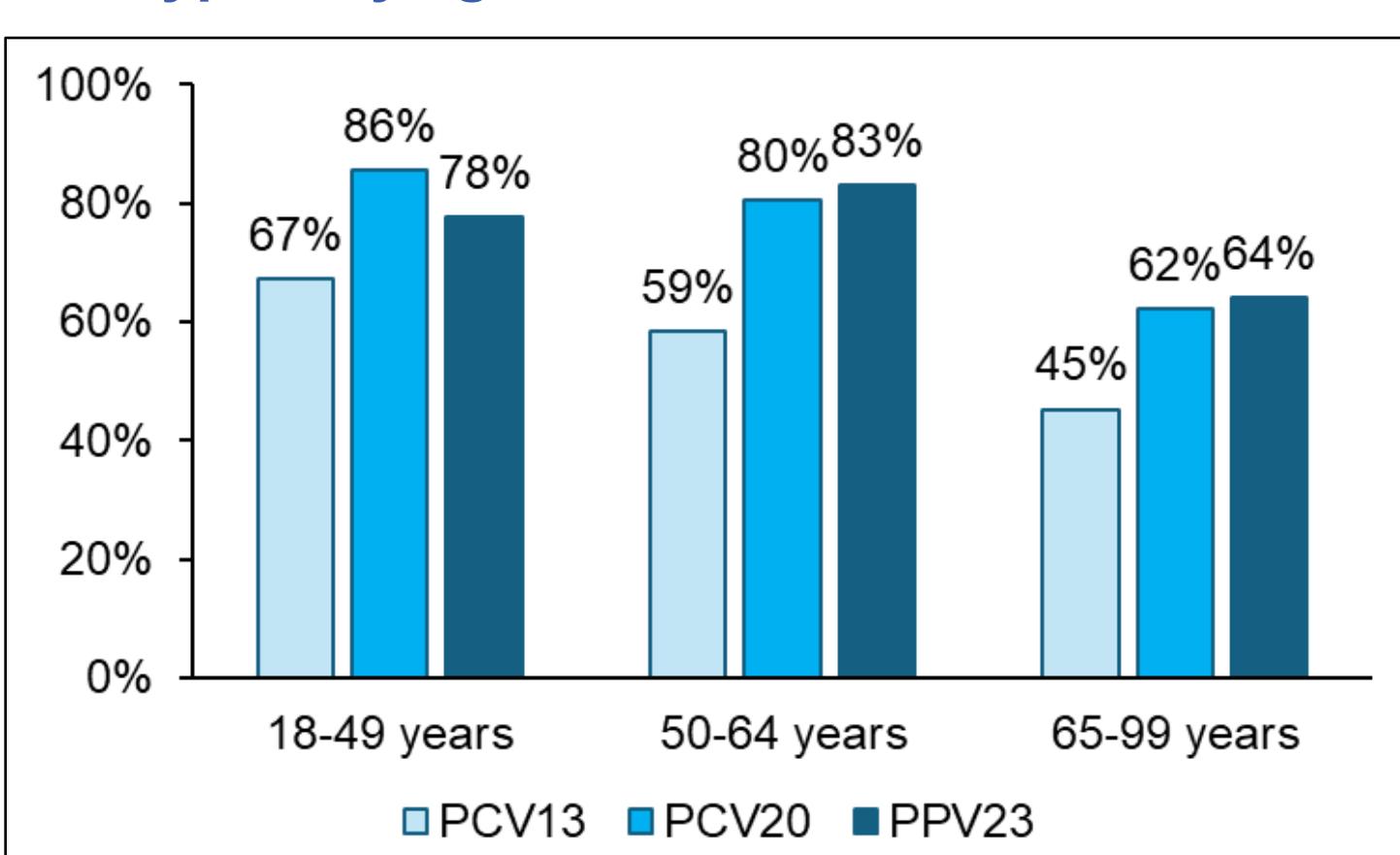
### Model Overview

- Lifetime risks and costs of invasive pneumococcal disease (IPD), including bacteraemia and meningitis, and all-cause non-bacteraemic pneumonia (NBP) were projected using a probabilistic cohort model with a Markov-type process
- Inputs for medical care costs and vaccine price were estimated from private/patient perspective (i.e., pricing for self-funded patients visiting a private healthcare facility), and, alternatively, government/payer perspective (i.e., pricing for government-funded medical care)
- Model population included adults aged 50-99 years and, alternatively, 60-99 years who are considered at-risk or high-risk of pneumococcal disease:
  - Population was characterised by age (in 1-year increments) and risk profile (i.e., healthy [immunocompetent without underlying medical conditions], at-risk [immunocompetent with  $\geq 1$  underlying medical condition], or high-risk [immunocompromised])<sup>3</sup>
- Vaccination strategies included PCV20 alone, PCV13→PPV23, PCV13 alone, or PPV23 alone:
  - In single-dose strategies, vaccine was administered at model entry; in the sequential strategy, persons received PCV13 at model entry and PPV23 one year later (if alive)
- Clinical and economic outcomes for each strategy were projected annually based on age, risk profile, disease/fatality rates, vaccination status/type, time since vaccination, and unit costs and include cases of IPD and all-cause NBP, deaths due to IPD and all-cause NBP, life-years (Lys) and quality-adjusted Lys (QALYs), and costs of vaccination and medical treatment for IPD and all-cause NBP

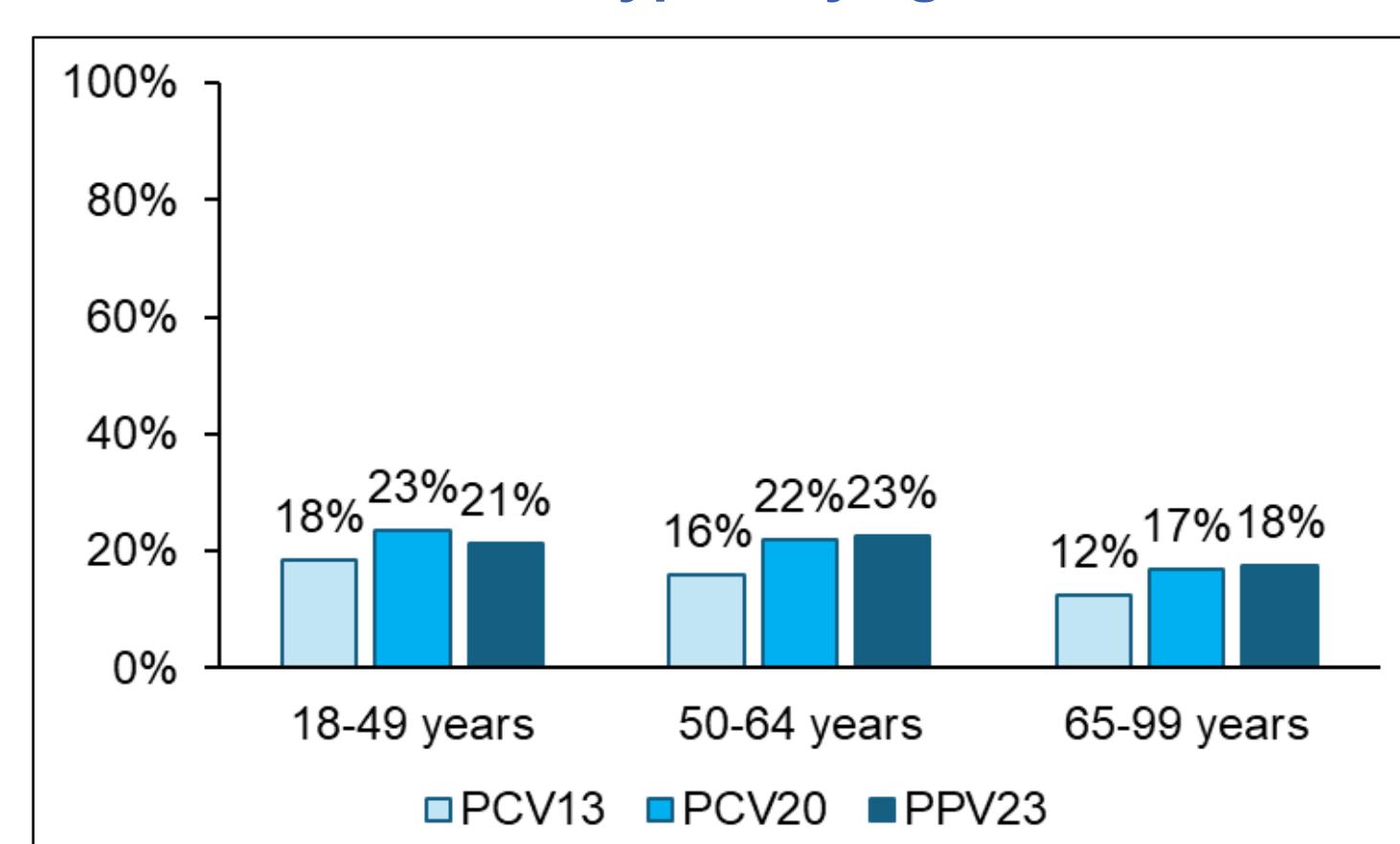
### Model parameters

- Model population comprised at-/high-risk adults aged 50-99 years ( $N = 160.0$  M) (Table 1) and, alternatively, at-/high-risk adults aged 60-99 years ( $N = 93.0$  M)<sup>4,5</sup>
- Herd effects were not considered due to low paediatric vaccine uptake; serotype coverage for each vaccine per age group was constant throughout the duration of the modelling horizon (Figures 1 & 2)
- VE-PCV20 and VE-PCV13 against VT disease was assumed to be durable for 5 years and to wane to 0% by year 16<sup>6</sup>; VE-PPV23 vs. VT-IPD was assumed to wane to 0% by year 10<sup>7</sup>
- QALY losses for persons with IPD, inpatient NBP, and outpatient NBP were 0.13, 0.13 and 0.004, respectively<sup>8,9</sup>
- Costs (in Indian rupee, ₹) included:
  - Medical care from private/patient perspective: bacteraemia, ₹ 539,380; meningitis, ₹ 783,769; inpatient NBP, ₹ 380,068; outpatient NBP, ₹ 12,039<sup>10</sup>
  - Medical care from government/payer perspective: bacteraemia, ₹ 72,692; meningitis, ₹ 34,923; inpatient all-cause NBP, ₹ 30,460; outpatient all-cause NBP, ₹ 3,860<sup>11</sup>
  - Vaccines (prices employed are confidential)
- Vaccine uptake was assumed to be 7.5% for all age and risk groups in the private/patient perspective, and to vary by risk profile only (low-risk: 7.5%; at-risk: 15%; high-risk: 30%) from government/payer perspective
- Other model inputs are summarized in Table 1

**Figure 1. Percentage of IPD due to vaccine serotypes, by age**



**Figure 2. Percentage of pneumococcal NBP due to vaccine serotypes, by age**



**Table 1: Base case model input values, by age and risk**

	Age (years)/Risk							
	50-64		65-74		75-84		85-99	
At-Risk	High-Risk	At-Risk	High-Risk	At-Risk	High-Risk	At-Risk	High-Risk	
Population (millions) <sup>4,5</sup>	73.4	22.5	31.6	10.6	12.7	4.6	3.3	1.3
Incidence of bacteraemia (per 100K) <sup>12,13</sup>	5.7	16.8	9.6	23.2	14.8	22.8	20.4	21.4
Incidence of meningitis (per 100K) <sup>12,13</sup>	0.4	1.2	0.7	1.6	1.0	1.6	1.4	1.5
Incidence of inpt NBP (per 100K) <sup>12</sup>	434	1,208	905	2,005	2,304	3,380	3,694	4,749
Incidence of outpt NBP (per 100K) <sup>14-16</sup>	902	1,690	1,662	2,255	2,560	3,475	3,564	4,837
General population mortality <sup>17</sup>	1.5	1.9	3.5	4.7	6.9	9.2	14.1	18.7
CFR for bacteraemia (per 100) <sup>18-20</sup>	24.1	37.4	31.6	42.9	40.1	44.2	48.4	38.4
CFR for meningitis (per 100) <sup>18-20</sup>	24.1	37.4	31.6	42.9	40.1	44.2	48.4	38.4
CFR for inpatient NBP (per 100) <sup>21</sup>	2.5	5.4	4.6	6.8	8.4	9.1	8.4	11.0
CFR for outpatient NBP (per 100)	0	0	0	0	0	0	0	0
Yr. 1 VE-PCV20/13 vs. VT-IPD <sup>6,22</sup>	79.2%	63.3%	75.0%	60.0%	75.0%	60.0%	75.0%	60.0%
Yr. 1 VE-PCV20/13 vs. VT-NBP <sup>6,22</sup>	32.3%	16.8%	30.9%	16.1%	28.1%	14.6%	20.5%	10.6%
Yr. 1 VE-PPV23 vs. VT-IPD <sup>7</sup>	51.3%	41.1%	45.0%	36.0%	45.0%	36.0%	45.0%	36.0%
General population health utility <sup>23,24</sup>	0.69	0.65	0.60	0.58	0.46	0.45	0.33	0.30

Abbreviations: CFR: case-fatality rate; inpt: inpatient; IPD: invasive pneumococcal disease; NBP: non-bacteraemic pneumonia; outpt: outpatient; PCV13: 13-valent pneumococcal polysaccharide conjugate vaccine; PCV20: 20-valent pneumococcal polysaccharide conjugate vaccine; PPV23: 23-valent pneumococcal polysaccharide vaccine; Yr: year

### Analyses

- Cost-effectiveness was calculated in terms of cost per QALY gained and evaluated using a 3x gross domestic product (GDP) per capita willingness-to-pay (WTP) threshold
- Analyses were conducted from the healthcare system perspective with benefits and costs discounted 3% annually
- Base case analysis compared PCV20 vs. PCV13→PPV23 among at-/high-risk adults aged  $\geq 50$  years and at-/high-risk adults aged  $\geq 60$  years from the private/patient and government/payer perspectives, respectively
- Scenario analyses compared PCV20 vs. PCV13 alone and vs. PPV23 alone among at-/high-risk adults aged  $\geq 50$  years from the private/patient perspective
- Probabilistic sensitivity analyses (PSA; 1,000 replications) were conducted on analyses comparing PCV20 vs. PCV13→PPV23 to account for uncertainty surrounding estimates of key model parameters

## RESULTS

### Private/Patient Perspective – At/High-Risk Adults Aged $\geq 50$ Years

- In base case analysis, PCV20 was cost-saving versus PCV13→PPV23 ( $\Delta$ Costs = -₹2,401 million [M];  $\Delta$ QALYs = 11,385; cost/QALY = Dominant) (Table 2)
- In scenario analyses, PCV20 was cost-effective versus PPV23 alone ( $\Delta$ Costs = ₹7,783M;  $\Delta$ QALYs = 40,965; cost/QALY = ₹189,982) and versus PCV13 alone ( $\Delta$ Costs = ₹7,677M;  $\Delta$ QALYs = 11,639; cost/QALY = ₹659,591)
- In PSA comparing PCV20 versus PCV13→PPV23, 36.0% of replications were cost saving (in the southeast quadrant) and 94.6% of replications were below the 3x GDP per capita WTP threshold from the private/patient perspective (Figure 3)

### Government/Payer Perspective – At/High-Risk Adults Aged $\geq 60$ Years

- In base case analysis, PCV20 was cost-effective versus PCV13→PPV23 ( $\Delta$ Costs = ₹10,209M;  $\Delta$ QALYs = 17,669; cost/QALY = ₹577,810) (Table 3)
- In PSA comparing PCV20 versus PCV13→PPV23, 70.6% of replications were below the 3x GDP per capita WTP threshold from the government/payer perspective (Figure 4)

**Table 2: Results - Private/Patient Perspective**

	PCV20	Difference in Outcomes (vs. PCV20)				
		Base Case		Scenarios		
	PCV13→PPV23 Difference	PPV23	Difference	PCV13	Difference	
No. cases						
IPD	388,960	390,945	-1,985	395,490	-6,531	391,140
Inpatient NBP	47,744,217	47,780,159	-35,942	47,877,021	-132,804	47,780,139
Outpatient NBP	57,290,489	57,340,016	-49,527	57,473,826	-183,337	57,339,994
No. deaths	3,812,643	3,815,647	-3,004	3,823,447	-10,804	3,815,713
LYs (discounted)	1,594,535,290	1,594,519,327	15,963	1,594,478,343	56,947	1,594,518,867
QALYs (discounted)	902,392,529	902,381,144	11,385	902,351,564	40,965	902,380,890
Costs (millions)						
Medical care	₹ 10,318,158	₹ 10,329,649	-₹ 11,492	₹ 10,360,221	-₹ 42,064	₹ 10,329,735
Vaccination	₹ 71,978	₹ 62,887	₹ 9,091	₹ 22,132	₹ 49,846	₹ 52,723
Total healthcare costs	₹ 10,390,136	₹ 10,392,536	-₹ 2,401	₹ 10,382,353	₹ 7,783	₹ 10,382,459
Cost per QALY	--	--	Dominant	--	₹ 189,982	--
						₹ 659,591

**Table 3: Results - Government/Payer Perspective**

	PCV20	Base case	