Cost-effectiveness of a 13-valent conjugate pneumococcal vaccination program in COPD patients aged ≥50 years in Spain

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BACKGROUND

- Older adults and those with certain clinical conditions are at increased risk of developing pneumococcal disease (PD), particularly pneumonia, along with a higher risk of related mortality. One of the most relevant underlying conditions associated with increased risk for PD is chronic obstructive pulmonary disease (COPD)[1].
- Comorbidities increased invasive pneumococcal disease (IPD) risk and mortality. In particular, patients with chronic obstructive pulmonary disease (COPD) have more than four-fold increased risk of IPD[2].
- A 13-valent-pneumococcal-conjugate vaccine (PCV13) was approved for adult protection against invasive disease and pneumonia caused by *S. pneumoniae* serotypes included in the vaccine.

OBJECTIVE

This study estimated the incremental cost-effectiveness ratio (ICER) of vaccinating COPD-patients ≥50-years with PCV13 compared to current vaccination policy (CVP) with 23-valent-pneumococcal-polysacharide vaccine in Spain from a National Health System perspective.

METHODS

- A Markov model accounting for risks and costs for all-cause non-bacteremic pneumonia (NBP) and invasive pneumococcal disease (IPD) was developed.
- Five health states were considered: alive without PD, alive with IPD, alive with inpatient NBP, alive with outpatient-NBP and death.
- PD included both IPD (such as meningitis and bacteremia) and all-cause NBP (outpatient and inpatient).
- All expected outcomes were evaluated on an annual basis, from model entry through the end of the modeling horizon which was lifetime. In each year, pneumococcal-related outcomes were projected for each person in the model population based on age, risk profile and vaccination status.
- Population estimations were based on national figures from Spanish National Statistical Institute and considered COPD prevalence by age group and the proportion (26.9%) of diagnosed COPD in the Spanish population[3]. All parameters such as disease incidence, and costs (€2015), were based on published data (table 1).

Table 1. Vaccine coverage, incidence, mortality rates and herd protection effects used in the model

		AGE GROUP				
		50-64		65-74	75-84	85-99
VACCINE COVERAGE (%) [3, COPD subjects]		41.1		62.9	69.4	71.8
INCIDENCE RATES (/100,000)	IPD [4]	91.0		91.0	91.0	91.0
	Outpatient NBP [5,6]	143.2		422.0	1,089.0	2,476.5
	Inpatient NBP [5,6]	201.8		594.9	1,535.1	3,491.0
MORTALITY RATES (%)	General population [7]	0.74		1.66	5.98	14.27
	IPD [4]	18.30		32.90	32.90	32.90
	Patients with inpatient NBP [6]	7.08		8.00	12.32	20.61
HERD PROTECTION EFFECTS (%)*	IPD [8]	33.0		28.2	30.3	20.8
	Patients with NBP [9,10]	2.0		2.0	2.0	2.0
		Year 1	Year 2	Year 3	Year 4	Year 5+
% of maximum herd effects due to widespread use of PCV13 in young children, by year of modeling horizon		58.0	72.0	85.0	92.0	100.0

- PCV13 effectiveness was based on CAPiTA clinical trial results recently published[11]. Both vaccine effectiveness considered waning-effect over time. PPV23 effectiveness data was obtained from an investigation which evaluate the epidemiological impact of the PPV23 vaccination program in the elderly in England and Wales[12]. Herd protection effects were included. Revaccination was not considered.
- Estimation of age/risk-specific health-state utility and disutility values due to disease were based on published studies[13,14,15].
- The perspective of the analysis was that of the Spanish National Healthcare System, so only direct healthcare costs (disease management cost and drug cost) were considered. As pneumococcal vaccine was assumed to be administered with influenza vaccine, no administration costs were considered.
- Pharmaceutical costs were calculated based on the ex-factory price[16]. The 7.5% mandatory rebate was applied[17]. Unitary costs (€ 2015) are shown on table 2.

Table 2. Unit costs

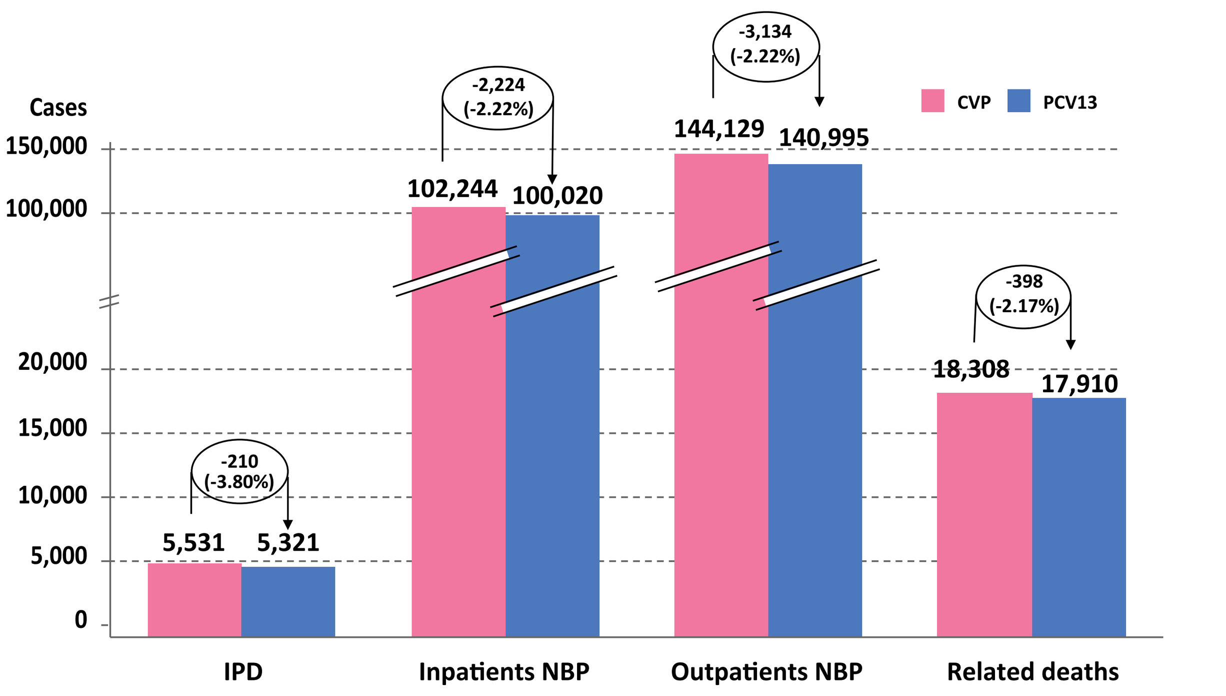
		AGE GROUP
PCV13 (Prevenar 13®)		€47.04/prefilled syringe [16]
PPSV23 (Pneumo 23®)		€8.70/prefilled syringe [16]
Management disease costs	IPD	€5,827.30 [18]
	Inpatient NBP	€4,647.03 [7]
	Outpatient NBP	€620.85 [7]

- Annual discount rate of 3%[18] was applied for both cost and health benefits for a lifetime horizon.
- Results were presented as pneumococcal cases averted and incremental cost–effectiveness ratio (ICER) in terms of quality adjusted life-year (QALY) of PCV13 versus CVP using a 23-valent pneumococcal-polysaccharide vaccine.
- Univariate and probabilistic sensitivity analyses (SA) were performed in order to test model robustness.

RESULTS

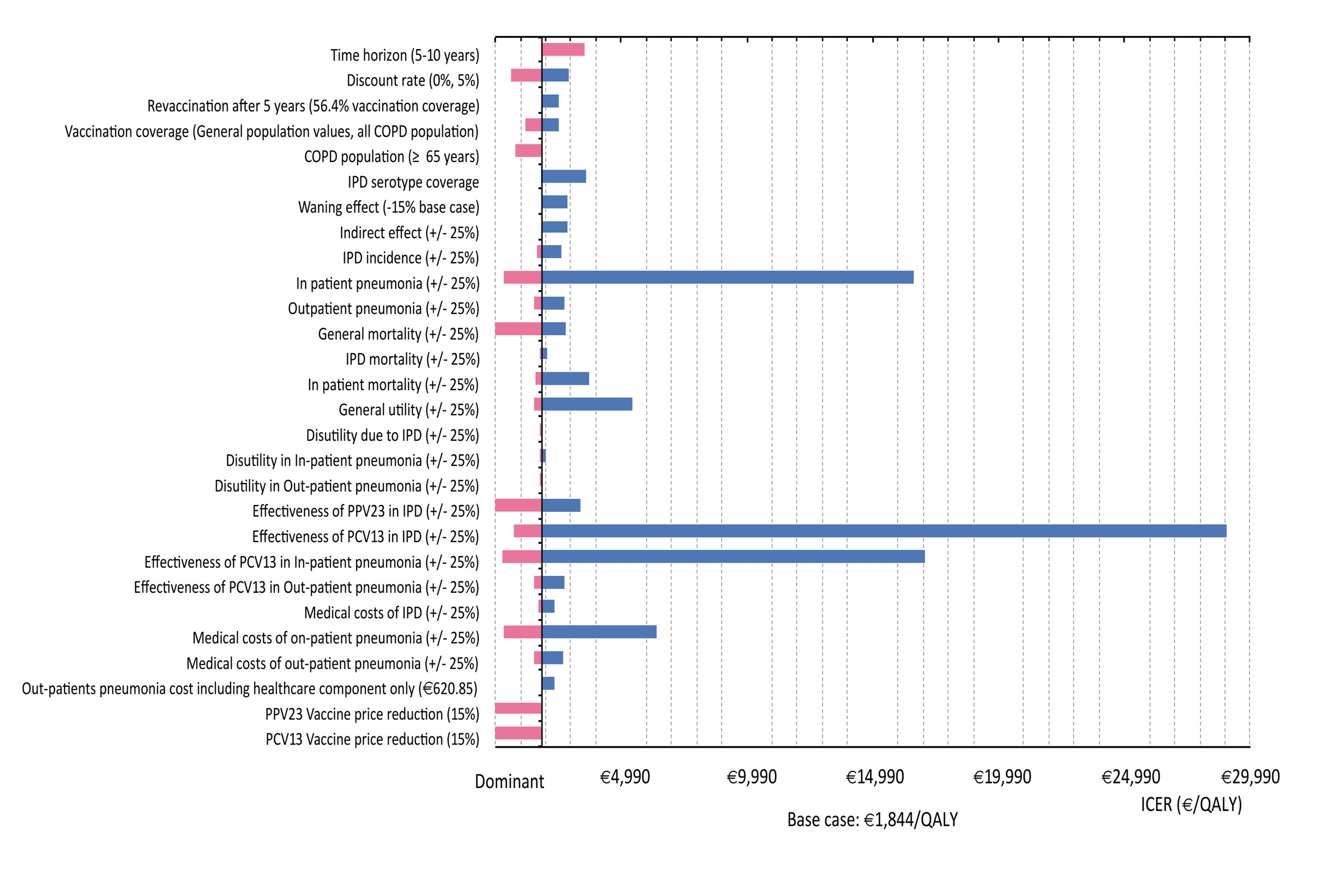
- Over a lifetime horizon and for a 629,747 COPD total population, PCV13 would prevent 2,224 inpatient-NBP, 3,134 outpatient-NBP and 210 IPD extra cases in comparison with CVP. Additionally, 398 related deaths would be averted (figure 1).

Figure 1. RESULTS: Clinical burden



- ICER was €1,518 per QALY gained for PCV13 versus CVP. PCV13 was found to be cost-effective versus CVP from 5 years horizon of modelling (1,302 inpatient-NBP, 1,835 outpatient-NBP and 182 deaths would be prevented (ICER €25,573/QALY).

Figure 2. Sensitivity analysis



- The most influential parameter was time horizon and also other univariate SA confirmed model robustness (figure 2). PSA results revealed that PCV13 vaccination strategy was a cost-effective option on 100% of 1,000 simulations performed.

CONCLUSIONS

At the commonly accepted willingness-to-pay threshold of €30,000/QALY[19] gained, PCV13 vaccination in COPD-patients aged ≥50-years was a cost-effective strategy compared to CVP from 5 years to lifetime horizon in Spain.

REFERENCES

1 Picazo JJ, et al. Rev Esp Quimioter. 2013; 26:232-52.
2 Inghammar. Clin Microbiol Infect. 2013. doi: 10.1111/1469-0691.12182
3 Miravitlles M, et al. Thorax. 2009; 64: 863–8.
4 Van Hoek. J Infect. 2012 ;65(1):17-24. Epub 2012 Mar 3
5 National Institute of Statistics. Hospital Morbidity Survey 2012. www.ine.es.
6 Sicras-Mainar A, et al. BMC Infect Dis 2012, 12:283.
7 Spanish National Statistical Institute. www.ine.es
8 Spanish National Health Survey 2011/2012. Available at URL: http://www.msssi.gob.es/estadEstudios/estadisticas/encuestaNacional/encuesta2011.htm (accessed on 27th April 2015)
9 Griffin MR, et al. N Eng J Med 2013; 369:2.
10 Grijalva CG, et al. 9th International Symposium on Pneumococci and Pneumococcal Diseases; 9-13 March 2014.
11 Bonten MJ, et al. N Engl J Med. 2015; 372:1114-25
12 Andrews NJ, et al. Vaccine. 2012; 30: 6802-8.
13 Sisk JE, et al. Ann Intern Med 2003; 138: 960-968.
14 Melegaro A, et al. Vaccine. 2004; 22: 4203-14.
15 Bennett JE, et al. Arch Pediatr Adolesc Med. 2000; 154:43-8.
16 BOT-PLUS www.portalfarma.com
17 Real Decreto-Ley 8/2010. www. boe.es
18 López Bastida J, et al. Eur J Health Econ. 2010;11:513–20.
19 Sacristán JA, et al. Gac Sanit. 2002;16:334-43.

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