EE61

A Cost-effectiveness Analysis of the 20-valent Pneumococcal Conjugate Vaccine in the Mexican Adult Population

Jose Luis Huerta,[1] An Ta,[2] Elizabeth Vinand,[2] Gustavo Ivan Torres,[1] Warisa Wannaadisai,[3] Liping Huang[4]

[1]Pfizer, Mexico; [2]Cytel, United Kingdom; [3]Pfizer, United Kingdom; [4]Global Value and Evidence, Vaccines, Pfizer Inc., NY, United States

INTRODUCTION

- In Mexico, the current standard of care (SoC) for the prevention of pneumococcal disease (PD) among adults aged ≥60 years is 13-valent pneumococcal conjugate vaccine (PCV13) in sequence with 23-valent pneumococcal polysaccharide vaccine (PPSV23), one year apart.[1]
- Despite the successful introduction of pneumococcal conjugate vaccines (PCV) into the Mexican National Immunization Program (NIP), resulting in reduced incidence of PD, challenges persist.[2]
- Licensure of a novel 20-valent PCV (PCV20) is expected in 2024.

OBJECTIVE

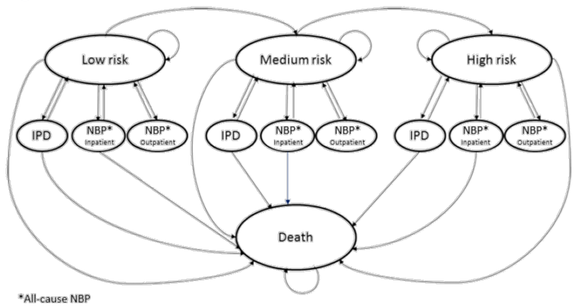
- This study evaluated the cost-effectiveness of a single dose of PCV20 versus the current SoC (PCV13→PPSV23) for preventing PD in adults aged ≥60 years in Mexico.

METHODS

- A Markov cohort model was developed to estimate the cost-effectiveness of PCV20 versus SoC in Mexico from a payer perspective over a lifetime horizon (Figure 1).
- The model predicted the lifetime risk of invasive PD (IPD) and non-bacteremic pneumonia (NBP), as well as the clinical and economic impact of different vaccination strategies. The model population was grouped by age and risk profile (i.e., low, moderate, or high risk of PD).
- Epidemiological[1,3-9] and cost[1,10-13] inputs were based on published literature and Mexican-specific sources (Table 1).
- Vaccine effectiveness (VE) against IPD and NBP for PCV13 and PCV20 was based on data from the CAPiTA trial and Mangen et al. (Table 2).[14,15] Initial VE was assumed to persist for the first five years for all ages and risk groups, then wane at 5% annually during years 6–10 and 10% during years 11–15, resulting in no efficacy from year 16 onward.[15,16]
- Effectiveness of PPSV23 against IPD was based on . Djennad (Table 2).[17] Beyond year 1, VE was assumed to wane across all age and risk groups with a linear decline to 76.2% by year 5, and to no efficacy by year 10. No VE against NBP was assumed for PPSV23 based on published sources.[2]
- The indirect effects against IPD and NBP were only applied to newly covered serotypes in PCV20, as it was assumed that PCV13 and PPSV23 were already at steady state. To account for NBP outcomes from *Streptococcus pneumonia* an adjustment ratio of 18% was applied to all-cause NBP.[18] Indirect effects were assumed to begin from year 2 onward using United Kingdom IPD surveillance accrual data (Table 3).[19,20]
- The robustness of the model was assessed by deterministic and probabilistic sensitivity analyses (DSA and PSA, respectively).

MODEL KEY PARAMETERS

Figure 1. Model Structure



Abbreviations: IPD, invasive pneumococcal disease; NBP, non-bacteremic pneumonia.

Table 1. Epidemiology, Medical Cost, and Utility Inputs

Outcome	Age group, years	Disease incidence per 100,000 individuals[1,3-8]			Fatality rate, %[1,4]	Direct medical costs (per episode), $MXN[1,11]
		Risk group				
		Low	Moderate	High		
Bacteremia*	60–64	0.8	2.2	3.5	4.1	99,872.06
	≥65					186,063.22
Meningitis*	60–64	0.5	1.4	2.2	20.0	209,618.51
	≥65				25.3	296,369.71
Inpatient NBP	60–64	97.8	274.0	430.5	12.4	74,804.87
	65–74	188.7	528.4	830.4	12.6	74,937.11
	75-84				16.5	
	85-89				19.1	
	90-99				21.1	
Outpatient NBP	60–64	487.8	1,365.1	2,146.1	-	52,672.73
	65–74	416.1	1,165.1	1,830.8	-	52,766.07
	75–84	264.5	740.7	1,163.9	-	
	85–99	204.5	572.6	899.7	-	

*The proportion of cases of meningitis and bacteremia was 38.90% and 61.10%, respectively.[2]
Abbreviations: $MXN, Mexican Peso; NBP, non-bacteremic pneumonia.

Table 2. Direct Effects

Vaccine	Vaccine effectiveness, %[14,15,17]										
	PCV (non-serotype 3)				PCV (serotype 3)				PPSV23*		
Outcome	IPD		NBP		IPD		NBP		IPD		
Risk group	Low/ mod.	High	Low/ mod.	High	Low/ mod.	High	Low/ mod.	High	Low	Mod.	High
Age group, years: 60–64	76.9	61.5	47.6	38.1	76.9	61.5	47.6	38.1	54.2	30.1	15.6
65–74	75.0	60.0	45.0	36.0	75.0	60.0	45.0	36.0	52.4	29.1	15.1
75–84									47.7	26.5	13.8
85-89									40.0	22.2	11.6
90-99									27.4	15.2	7.9

*Base-case analysis assumed no effects against NBP from PPSV23.[2]
Abbreviations: IPD, invasive pneumococcal disease; mod, moderate; NBP, non-bacteremic pneumonia; PCV, pneumococcal conjugate vaccine; PPSV23, 23-valent pneumococcal polysaccharide vaccine.

MODEL KEY PARAMETERS (cont.)

Table 3. Indirect Effects and Serotype Coverage

Age group, years	Indirect effects, %						
	Maximum reduction		Accrual data by year				
	IPD	NBP	2	3	4	5	6–10
60–64	51.23	25.2	37.5	52.8	67.7	82.7	100.0
≥65	69.10	26.9					
	Serotype coverage: IPD, %						
	PCV13	PCV20	PPSV23	Serotype 3	Serotype 6A		
60–64	36	50	52	11	2		
≥65	23	40	42	11	0		
	Serotype coverage: NBP, %						
	PCV13	PCV20	PPSV23	Serotype 3	Serotype 6A		
60–64	49	64	65	15	2		
≥65	31	49	51	15	0		

Abbreviations: IPD, invasive pneumococcal disease; NBP, non-bacteremic pneumonia; PCV13, 13-valent pneumococcal conjugate vaccine; PCV20, 20-valent pneumococcal conjugate vaccine; PPSV23, 23-valent pneumococcal polysaccharide vaccine.

RESULTS

- The results of this analysis are presented in Table 4.
- This analysis indicated that a single dose of PCV20 would offer superior health outcomes compared with the current SoC (PCV13→PPSV23) for pneumococcal vaccination of individuals aged ≥60 years in Mexico.
- PCV20 was estimated to avert more cases of bacteremia, meningitis, inpatient and outpatient NBP, and deaths due to disease versus PCV13→PPSV23, reducing the overall clinical burden of PD.
- For discounted results, PCV20 was estimated with an incremental life-years (LYs) gained of 15,963 and a cost saving of over 5 million $MXN over a lifetime horizon versus SoC.
- For undiscounted results compared with PCV13→PPSV23, PCV20 resulted in an additional 29,192 life-years (LYs) gained, with a cost saving of over 6 million $MXN over a lifetime horizon. Therefore, PCV20 was the dominant, cost-saving strategy compared with the current SoC in Mexico.
- In all iterations and parameter testing under DSA and PSA, PCV20 remained dominant. (The PSA results in Figure 2). Results were confirmed to be robust with minimal variance from the base case.

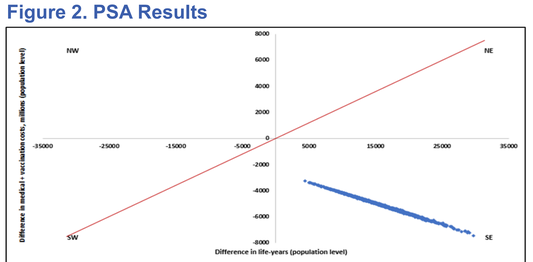
Table 4. Cost-effectiveness Discounted Results

Outcome	Difference in reported cases, PCV20 versus PCV13→PPSV23	
	Discounted	Undiscounted
Meningitis	-51	
Bacteremia	-80	
Cases of inpatient all-cause NBP	-17,708	
Cases of outpatient all-cause NBP	-37,229	
Incremental deaths due to disease	-2,580	
Incremental costs, $MXN	-5,132,908	-6,009,090
Cost of doses, $MXN	-2,555,327	-2,690,684
Medical costs, $MXN	-2,577,580	-3,318,406
Incremental LYs	15,963	29,192
ICER cost per LY	PCV20 is dominant	

Abbreviations: $MXN, Mexican Peso; ICER, incremental cost-effectiveness ratio; LY, life-year; NBP, non-bacteremic pneumonia; PCV13, 13-valent pneumococcal conjugate vaccine; PCV20, 20-valent pneumococcal conjugate vaccine; PPSV23, 23-valent pneumococcal polysaccharide vaccine.

RESULTS (cont.)

Figure 2. PSA Results



Quadrant*	Incremental Cost (IC)	Incremental Effectiveness (IE)	ICER	ICER vs WTP	Simulations	
					Number	Percent
SE	IC < 0	IE > 0	Dominant	---	1000	100%
NE	IC > 0	IE > 0	ICER > 0	ICER < WTP	0	0%
SW	IC < 0	IE < 0	ICER > 0	ICER < WTP	0	0%
NE	IC > 0	IE > 0	ICER > 0	ICER > WTP	0	0%
SW	IC < 0	IE < 0	ICER > 0	ICER > WTP	0	0%
NW	IC > 0	IE < 0	Dominated	---	0	0%

*The red line represents the WTP threshold. *Simulations in the NE quadrant represent ICERs for PCV20 versus SoC; simulations in the SW quadrant represents ICERs for SoC versus PCV20.*
Abbreviations: PSA, probabilistic sensitivity analysis.

CONCLUSIONS

- **A single dose of PCV20 was estimated to be dominant versus the current SoC (PCV13→PPSV23) among Mexican adults aged ≥60 years.**
- **Replacing the current SoC with PCV20 in the adult NIP is expected to yield considerable health benefits, preventing further clinical burden from PD alongside substantial cost savings in medical expenses in Mexico.**

References: **1.** Wasserman M, et al. Hum Vaccin Immunother. 2019;15:560–9. **2.** Sistema Regional de Vacunas (SIREVA). REPORTE GIVEBPVac, 2021. Accessed March 2024. https://www.insp.mx/lineas-de-investigacion/medicamentos-en-salud-publica/sireva.html. **3.** Sistema Regional de Vacunas (SIREVA). Accessed February 2024. https://www.insp.mx/lineas-de-investigacion/medicamentos-en-salud-publica/sireva.html. **4.** Buzzo AR, et al. Int J Infect Dis. 2013;17:e673–7. **5.** Nieto Guevara J, Guzman-Holst A. Hum Vaccin Immunother. 2021;17:4667–72. **6.** Statistica. Number of pneumonia cases in Mexico in 2019, by age group. Accessed February 2024. https://www.statista.com/statistics/1171500/mexico-pneumonia-cases-age/. **7.** Shea KM, et al. Open Forum Infect Dis. Mar 2014;1(1):ofu024. **8.** Parellada C, et al. Value Health. 2022;25(12):S90. **9.** World Health Organization. Life tables by country: Mexico. Accessed February 2024. https://apps.who.int/gho/data/view.main.61060?lang=en. **10.** Tabulador de cuotas de recuperación. Instituto Nacional de Neurología y Neurocirugía, 2018. Accessed February 2024. https://www.gob.mx/salud/innn/documentos/tabulador-de-cuotas-de-recuperacion. **11.** INEGI. Índice Nacional de Precios al Consumidor. Accessed February 2024. https://www.inegi.org.mx/app/indicesdeprecios/CalculadoraInflacion.aspx. **12.** Huang L, et al. Presented at ECCMID 2023; April 15–18, 2023; Copenhagen, Denmark. **13.** GOB360. Análisis de mercados de la industria farmacéutica pública en México. Accessed March 2024. https://bi.gob360.mx/#/signin. **14.** Mangen MJ, et al. Eur Respir J. Nov 2015;46(5):1407-16. **15.** Patterson S, et al. Trials Vaccinol. 2016;5:92-96. **16.** Bonten MJM, et al. N Engl J Med. 2015;372(12):1114-1125. **17.** Djennad A, et al. EClinicalMedicine. 2019;6:42-50. **18.** Lansbury L, et al. EClinicalMedicine. 2022;44:101271. **19.** Ladhani SN, et al. Lancet Infect Dis. 2018;18(4):441-451. **20.** Perdrizet J, et al. Infect Dis Ther. 2023;12(5):1351-1364. **21.** Mangen M-JJ, et al. BMC Infect Dis. 2017;17(1):208.

Acknowledgments: The authors thank Sally Neath, Cytel, for Medical Writing support, funded by Pfizer.

Disclosures: The study was funded by Pfizer. The sponsor was involved in the study design, analysis, and interpretation of the data. JLH, GIT, WW, and LH report employment by Pfizer. EV and AT report consulting fees from Pfizer to their employer (Cytel).

For more information please contact:
José Luis, Huerta Osuna, Value and Evidence
Pfizer, Inc. 40 Tamarindos; Mexico City
Phone: (+52)-4049-1513
joseluis.huerta@.pfizer.com
www.pfizer.com

FPO QR Code

Presented at ISPOR 2024; May 5–8, 2024; Georgia World Congress Center, Atlanta, GA, US