

Pneumococcal Serotype Distribution: Recent Data in Adult Populations Around the World, 2017–2019

N. Vendetti¹, D. Badgley², H. Khoury², E. Chmielewski-Yee¹, P. Saddier¹, Y.A. Cui¹

¹CORE Pharmacoepidemiology, Merck & Co., Inc., Kenilworth, NJ, USA

²Certara, Evidence & Access, Montreal, QC, Canada

BACKGROUND AND AIMS

- Pneumococcal disease remains a global health problem despite availability of vaccines (pneumococcal polysaccharide (PPV23) and pneumococcal conjugate vaccines (PCVs))
- After introduction of PCVs into infant vaccination programs, non-vaccine serotypes have increased in many regions worldwide in both the adult and pediatric populations
- Literature was reviewed, as part of ongoing surveillance, to monitor vaccine impact and identify newly emerging serotypes

METHODS

- Medline, EMBASE, and Cochrane databases were searched from February 2017 to May 2019
- Search terms included serotype, serogroup, pneumococc*, *Streptococcus pneumoniae*. Studies with N<100 or those including data prior to 2012 were excluded
- Reported serotype distribution data for adults ≥18 years were extracted and summarized
- Serotype prevalence was calculated from pooled data and summarized globally, by WHO region and by disease type (invasive pneumococcal disease (IPD) vs non-IPD)

RESULTS

- Serotype data were available in 22 articles covering from 2012 onwards: IPD (n=14), non-IPD (n=4), carriage (n=3), and IPD/non-IPD combined (n=3)

Table 1. Study characteristics

Region / Source	Country	Period	Pneumococcal disease type	N	Age group	Infant vaccine program*
Europe						
Kandasamy et al. 2019 ¹	United Kingdom	2014-15	IPD	2697	18-64 y	PCV13
Kovacs et al. 2019 ²	Hungary	2015-16	IPD/non-IPD combined	56	≥50 y	PCV13
Quirk et al. 2019 ³	Iceland	2012-14	Non-IPD	116	18-64 y	PCV10
		2015-17		137	≥65 y	
				128	18-64 y	
				102	≥65 y	
Richter et al. 2019 ⁴	Austria	2013-16	IPD	1080	≥50 y	PCV10
Fenoll et al. 2018 ⁵	Spain	2012-15	IPD	650	≥18 y	PCV13
Horacio et al. 2018 ⁶	Portugal	2012-15	Non-IPD	339	18-49 y	PCV13
				382	50-64 y	
				714	≥65 y	
Ladhani et al. 2018 ⁷	England and Wales	2016-17	IPD	2947	≥65 y	PCV13
Lataza Zamalloa et al. 2018 ⁸	Spain	2013-15	IPD	709	>59 y	PCV13
Maraki et al. 2018 ⁹	Greece	2014-16	IPD/non-IPD combined	45	≥18 y	PCV13
Regev-Yochay et al. 2018 ¹⁰	Israel	2013-15	IPD	81	≥18 y	PCV13
Shoji et al. 2018 ¹¹	Spain	2013-16	IPD	57	>18 y	PCV13
			Non-IPD	288		
Southern et al. 2018 ¹²	England	2012-13	IPD	1348	21-59 y	PCV13
			NPC	7		
		2015-16	IPD	1893		
			NPC	8		
Corcoran et al. 2017 ¹³	Ireland	2015-16	IPD	175	≥65 y	PCV13
Asia Pacific						
Takeda et al. 2019 ¹⁴	Japan	2012	Non-IPD	24	50-100 y	PCV7
		2013		27	29-95 y	
		2014		29	27-91 y	PCV13
		2015		43	37-90 y	
Ganaie et al. 2018 ¹⁵	India	2016	NPC (pre-Haji)	205	≥18 y	PCV13
			NPC (post-Haji)	242		
			OPC (pre-Haji)	207		
			OPC (post-Haji)	242		
Kim et al. 2018 ¹⁶	South Korea	2013-15	IPD	189	≥18 y	PCV13
Ubukata et al. 2018 ¹⁷	Japan	2014-16	IPD	880	≥18 y	PCV13
North America						
Demczuk et al. 2018 ¹⁸	Canada	2012-16	IPD	5303	≥65 y	PCV13
Latin America						
Brandileone et al. 2018 ¹⁹	Brazil	2014-15	IPD	968	18-64 y	PCV10
Christophe et al. 2018 ²⁰	Brazil	2013-15	IPD	284	≥65 y	PCV10
				102	≥50 y	PCV10
African/Eastern Mediterranean						
Usuf et al. 2018 ²²	Gambia	2013-14	NPC	370	18-45 y	PCV13
Ktari et al. 2017 ²¹	Tunisia	2012-16	IPD/non-IPD combined	146	>18 y	Pre-PCV**

- Overall the top 3 most commonly reported serotypes were 3 (9.9%), 8 (9.5%) and 22F (6.4%)
- The overall serotype distribution, globally and by region, among adults is shown in **Figure 1**
 - Serotypes covered by the PPV23 vaccine and not included in a currently licensed PCV were the most prevalent globally and in Europe, led by serotypes 8 and 12F
- The serotype distribution in adults ≥65 years is shown in **Figure 2**
 - Globally, the serotype distribution among older adults was similar to that in the overall adult analysis
 - Non-vaccine serotypes accounted for a higher proportion of disease among adults ≥65 years (28.8% vs 22.1%)

Figure 1. Pooled pneumococcal serotype distribution globally and by region among adults ≥18 years^a

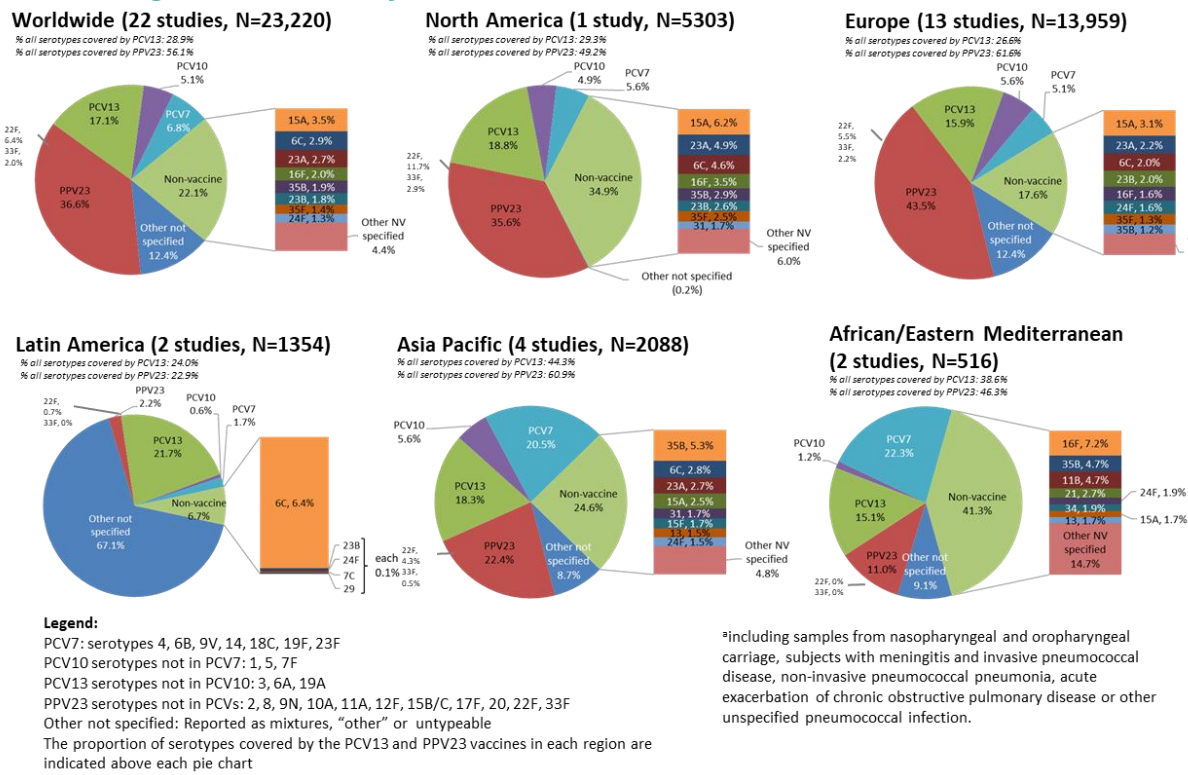
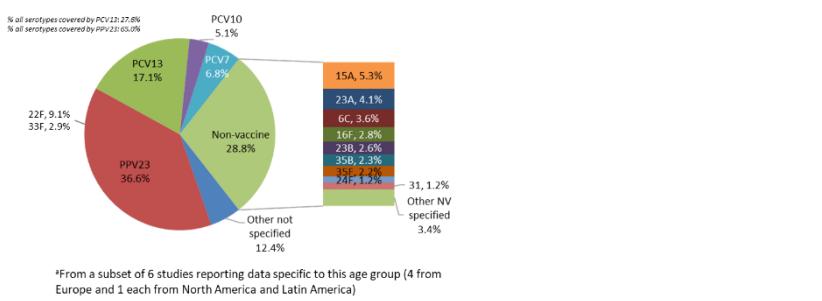
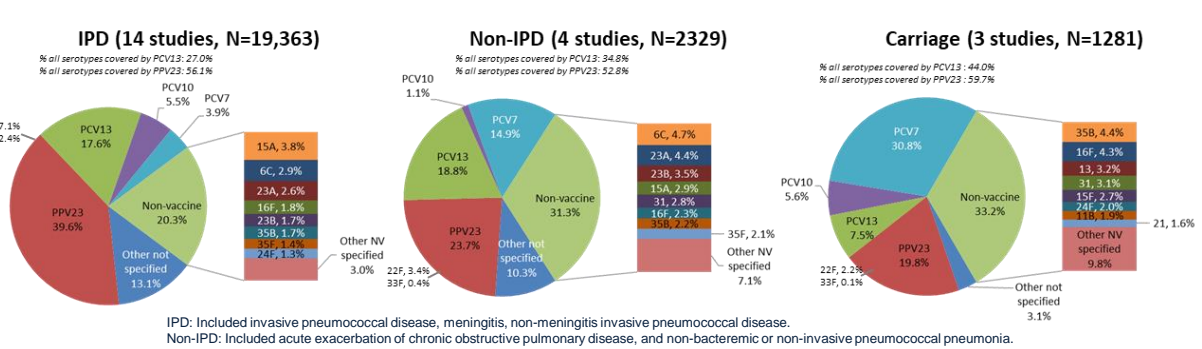


Figure 2. Pooled pneumococcal serotype distribution among adults ≥65 years (6 studies, N=9662)^a



- Figure 3** illustrates differences in serotype distribution between populations with IPD, non-IPD and carriage
 - In IPD studies, the most common serotypes were 8 (11.1%), 3 (10.0%) and 22F (7.1%)
 - In non-IPD studies, the most common serotypes included 3 (12.2%), 19F (8.1%) and 11A (7.8%)
 - The most common serotypes among carriage studies included 19F (15.5%), 9V (4.8%) and 35B (4.4%)
 - Non-vaccine serotypes were common among all pneumococcal presentations (IPD: 20.3%, non-IPD: 31.3% and carriage: 33.2%)

Figure 3. Pooled pneumococcal serotype distribution among adults ≥18 years with IPD, non-IPD or carriage



CONCLUSIONS

- Globally, the most common serotypes reported were 3, 8 and 22F
- Serotype distribution varies by geographic region and syndrome
- After pediatric PCV adoption in various countries, several vaccine and non-vaccine serotypes remain responsible for a significant burden of disease among adults
- There was no major difference in serotype distribution among the subset of studies in adults ≥ 65 years
- Study limitations include small sample sizes and studies included in the analysis that are from various time periods and geographic areas using data of nonuniform granularity
- Future research is needed to understand the impact of infant vaccine programs on the differences in serotype distribution by region among adults

References
1. Kandasamy R et al. J Infect Dis 2019; 2. Kovacs E et al. Vaccine 2019; 3. Quirk SJ et al. J Clin Microbiol 2019; 4. Richter L et al. PLoS One 2019; 5. Fenoll A et al. Vaccine 2018; 6. Horacio AN et al. PLoS ONE 2018; 7. Ladhani SN et al. Lancet Infect Dis 2018; 8. Lataza Zamalloa P et al. Enferm Infect Microbiol Clin 2018; 9. Maraki S et al. Infect Chemother 2018; 10. Regev-Yochay G et al. Emerg Infect Dis 2018; 11. Shoji H et al. Infect Drug Resist 2018; 12. Southern J et al. PLoS One 2018; 13. Corcoran M et al. Epidemiol Infect 2017; 14. Takeda H et al. J Glob Infect Dis. 2019; 15. Ganaie F et al. Travel Med Infect Dis 2018; 16. Kim JH et al. Int J Infect Dis 2018; 17. Ubukata K et al. Emerg Infect Dis 2018; 18. Demczuk WHB et al. Vaccine 2018; 19. Brandileone MC et al. Vaccine 2018; 20. Christophe BL et al. J Med Microbiol 2018; 21. Usuf E et al. Clin Microbiol Infect 2018; 22. Ktari S et al. Int J Infect Dis 2017.