Effectiveness of pneumococcal vaccination in older adults in a Real-World setting: a systematic review and meta-analysis of observational studies using test-negative designs

Evidera | PPD

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Background

- Pneumococcal disease continues to be a major worldwide cause of vaccine-preventable morbidity and mortality, in particular among older adults.
- Pneumococcal vaccination is commonly recommended among older adults above age 65.
- Vaccine effectiveness (VE) of pneumococcal vaccination among older adults in real-world setting is still largely unknown.
- Test-negative design (TND) provides high-quality evidence for estimating VE.

Objectives

- To understand VE of pneumococcal vaccination in older adults in real-world settings.

Methods

- Literature search was performed in PubMed:
  - Observational studies published between January 2010 and April 2023
  - VE of pneumococcal vaccination against pneumococcal disease
  - Studies using TND design
  - Publication in English
  - Independently conducted by two pre-specified investigators.

- Of the 18 articles identified, 7 were included in the meta-analysis (Figure 1).
- Characteristics of individual studies are presented in Table 1.
- Pooled odds ratios (ORs) were estimated using meta-analysis with fixed-effects.
- Results were reported by vaccine type (i.e., 13-valent pneumococcal conjugate vaccine [PCV13] and 23-valent pneumococcal polysaccharide vaccine [PPSV23]).
- Results were further stratified by model type (crude; multivariable-adjusted) and infection type (all; vaccine-serotype).

Figure 1. Flow chart of study selection

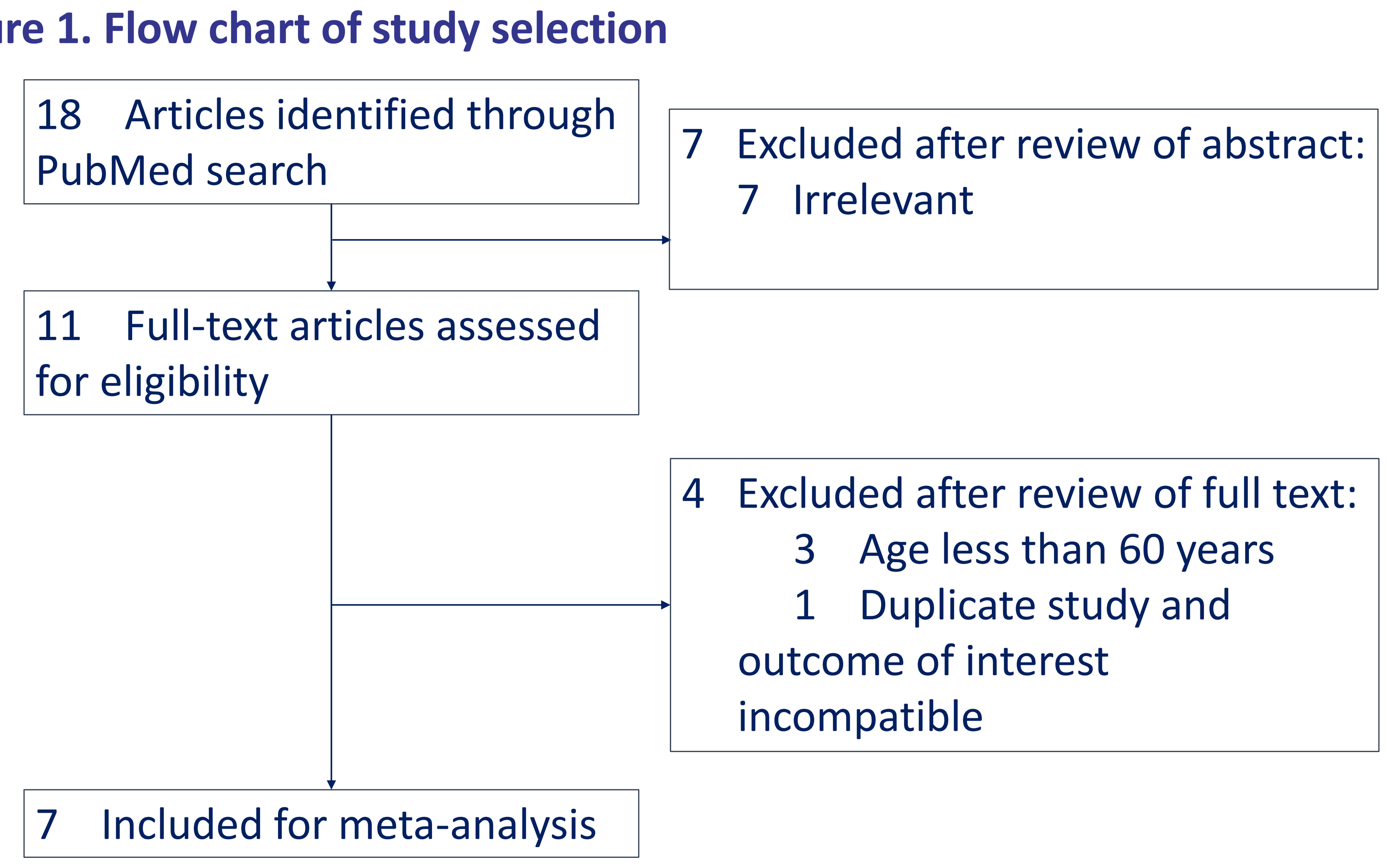


Table 1. Included studies evaluating vaccine effectiveness of pneumococcal vaccination against pneumococcal disease among older adults

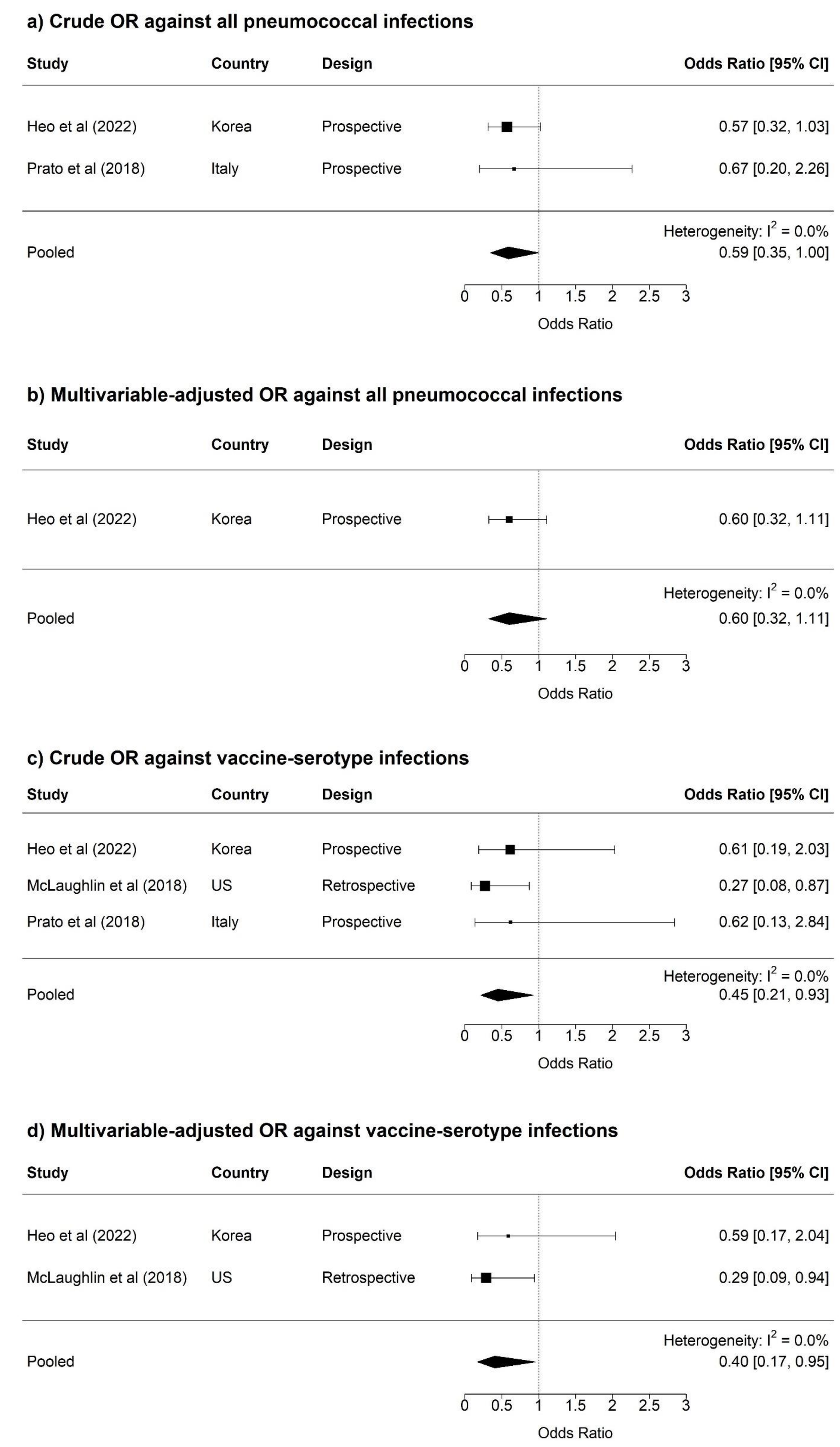
Author (year)	Title	Population	Vaccine type
Heo et al (2022)	Effectiveness of Pneumococcal Vaccination Against Pneumococcal Pneumonia Hospitalization in Older Adults: A Prospective, Test-Negative Study	Korea	PCV13, PPSV23
Sun et al (2021)	Effectiveness of 23-Valent Pneumococcal Polysaccharide Vaccine Against Pneumococcal Diseases Among the Elderly Aged 60 Years or Older: A Matched Test Negative Case-Control Study in Shanghai, China	China	PPSV23
Suzuki et al (2017)	Serotype-specific effectiveness of 23-valent pneumococcal polysaccharide vaccine against pneumococcal pneumonia in adults aged 65 years or older: a multicentre, prospective, test-negative design study	Japan	PPSV23
Chandler et al (2022)	23-Valent Pneumococcal Polysaccharide Vaccination Does Not Prevent Community-Acquired Pneumonia Hospitalizations Due to Vaccine-Type Streptococcus pneumoniae	US	PPSV23
Lawrence et al (2020)	Effectiveness of the 23-valent pneumococcal polysaccharide vaccine against vaccine serotype pneumococcal pneumonia in adults: A case-control test-negative design study	UK	PPSV23
McLaughlin et al (2018)	Effectiveness of 13-Valent Pneumococcal Conjugate Vaccine Against Hospitalization for Community-Acquired Pneumonia in Older US Adults: A Test-Negative Design	US	PCV13
Prato et al (2018)	Effectiveness of the 13-valent pneumococcal conjugate vaccine against adult pneumonia in Italy: a case-control study in a 2-year prospective cohort	Italy	PCV13, PPSV23

Results

VE of PCV13

- Three TND studies reported VE of PCV 13
- Pooled multivariable-adjusted OR against vaccine-serotype infections was 0.40 (95% CI: 0.17-0.95) (Figure 2d)
- Only one study reported multi-variable adjusted OR of PCV13 against all pneumococcal infection, which did not show a significant effect (Figure 2b)
- CIs were wide and no meaningful statistical comparisons could be made
- The heterogeneity is consistently low in all analysis, partly due to small number of studies

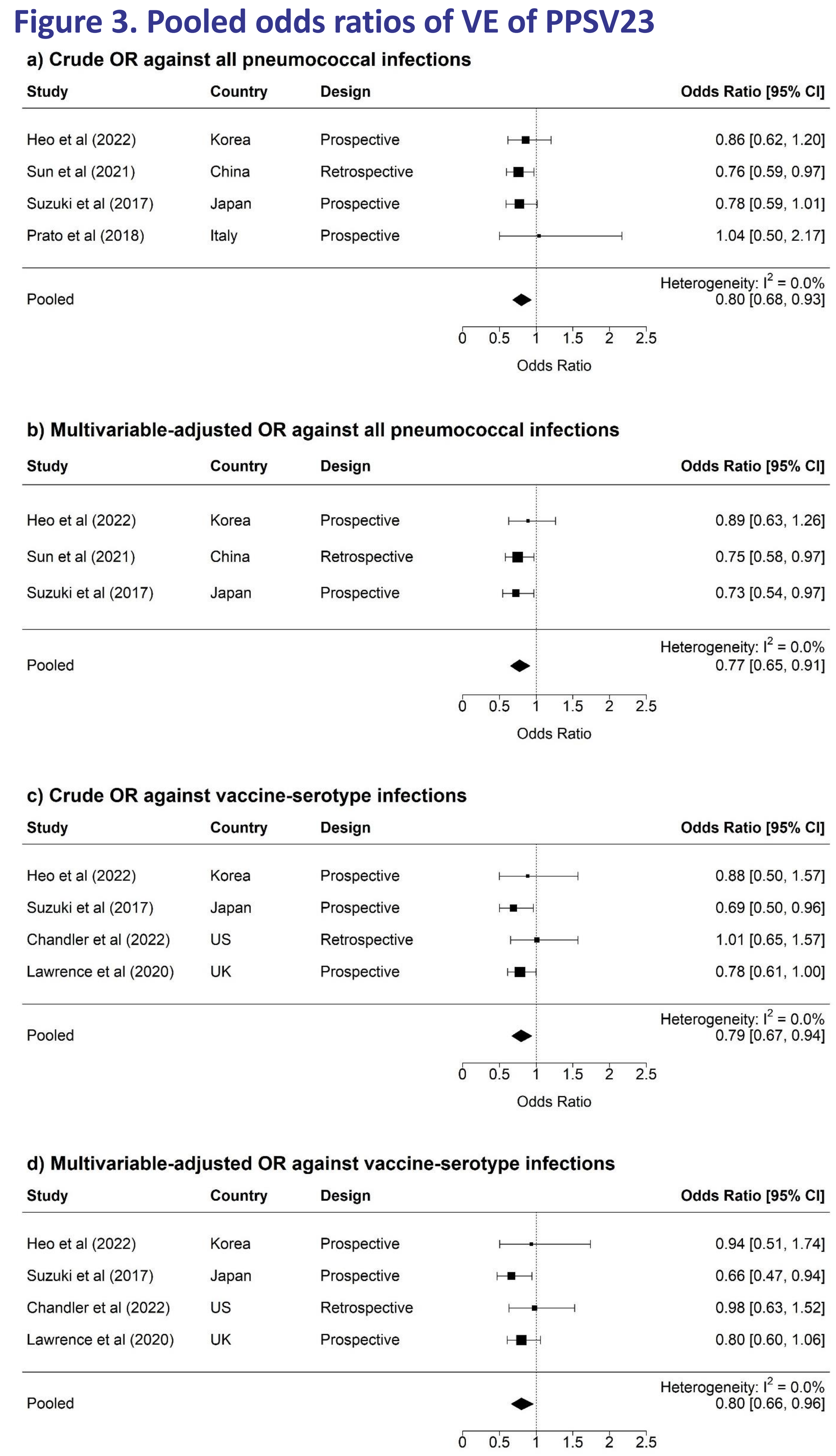
Figure 2. Pooled odds ratios of VE of PCV13



VE of PPSV23

- Six TND studies reported VE of PPSV23
- Pooled multivariable-adjusted OR against vaccine-serotype infections was 0.80 (95% CI: 0.66-0.96) (Figure 3d)
- Similar results for pooled multivariable-adjusted OR against all pneumococcal infections, and pooled crude OR against all and vaccine-serotype infections (Figure 3a-c)

Figure 3. Pooled odds ratios of VE of PPSV23



Conclusions

- The evidence supports the use of both PCV13 and PPSV23 in the prevention of pneumococcal disease in real-world settings.

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