

## Abstract

1

### 2 Background

3 Pneumococcus is a bacterium that causes infections such as pneumonia and  
4 meningitis. In Japan, the 23-valent pneumococcal polysaccharide vaccine (PPSV23) and  
5 the 13-valent pneumococcal conjugate vaccine (PCV13) are available for adults to  
6 prevent pneumococcal diseases. Currently, PPSV23 is included in the national  
7 immunization programs, which means that cost-effectiveness analysis is essential. The  
8 following issues are involved in such analysis: (1) a decline in the number of serotypes  
9 covered by PCV13 due to herd immunity after introducing PCV13 to children and (2)  
10 uncertainty about the vaccine efficacy/effectiveness (VE) of PPSV23 and PCV13.

11 Recent studies also showed that the VE of PPSV23 varies depending on the serotype or  
12 host, and that the serotype distribution differed based on the place of residence. The  
13 objectives of this study were (1) to conduct and update cost-effectiveness analysis using  
14 the latest epidemiological data and (2) to conduct stratified analysis by the place of  
15 residence.

### 16 Methods

17 The model included six health status and followed one million people aged 65 years or  
18 older over their lifetime. In the base-case analysis, the same proportion of long-term

19 care facility residents as in the 2015 population census was applied. In the second  
20 analysis, stratified analysis according to the place of residence was conducted. Five  
21 strategies were compared: (1) non-vaccination strategy, (2) PPSV23 single-dose  
22 strategy, (3) PCV13 single-dose strategy, (4) consecutive vaccination with both PCV13  
23 and PPSV23 strategy, and (5) PPSV23 two-dose strategy (initial and booster vaccination  
24 five years later). The analysis was conducted from the healthcare payers' perspective,  
25 and a discount rate of 2% was set for costs and quality-adjusted life-year (QALY). The  
26 incremental cost-effectiveness ratio (ICER) was estimated as an economic outcome.

## 27 **Results**

28 In the base-case analysis, ICER of the non-vaccination strategy against the PPSV23  
29 single-dose, PCV13 single-dose, consecutive vaccination with both PCV13 and  
30 PPSV23, and PPSV23 two-dose strategies was 6.5, 5.4, 8.8, and 7.0 million JPY/QALY,  
31 respectively. The PCV13 single-dose strategy was the most cost-effective, but  
32 sensitivity analysis showed that the results changed depending on the VE value of  
33 PCV13 or PPSV23. In the stratified analysis, on the other hand, the PPSV23 single-dose  
34 strategy was the most cost-effective among long-term care facility residents.

## 35 **Conclusions**

36 This study suggested that the PCV13 single-dose strategy was the most cost-effective

37 and that it was better to change the vaccine policy depending on the place of residence.

38 However, uncertainty about the effect of VE on the results, and further epidemiological

39 studies are essential.