

Population-based estimates of the effectiveness of pneumococcal vaccination in Australia

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Objectives

Australia's Childhood Immunisation Register (ACIR) is one of only a handful of national immunisation registers world-wide. We have, for the first time, linked the ACIR to other health datasets to measure the real-world impact of Australia's immunisation program. In this study, we aimed to assess the population-based effectiveness of the 3-dose infant pneumococcal vaccination program (due at 2, 4, and 6 months) against invasive pneumococcal disease caused by the 7 vaccine specific serotypes. The 7-valent pneumococcal conjugate vaccine (PCV7) has been available since 2001 and a funded universal program started in 2005 (with a switch to 13-valent PCV in 2011).

Approach

Vaccination records from ACIR, death records, and invasive pneumococcal disease notifications for 2001-2013 were individually linked for 1.37 million children born in 2001-2012 in two Australian states (Western Australia and New South Wales). A Cox proportional hazards model (adjusting for sex, Indigenous status and year of birth) was used to estimate the hazard ratio for invasive pneumococcal disease in vaccinated compared to unvaccinated children less than 2 years old. The per cent of disease prevented by vaccination, or vaccine effectiveness, was calculated as $(1 - \text{adjusted hazard ratio}) \times 100\%$.

Results

From 2005, vaccination coverage with dose 3 of the pneumococcal vaccine was steady at 91% in eligible cohorts. Between 2001 and 2013, there were 468 notifications of invasive pneumococcal disease caused by the 7 vaccine specific serotypes during 2.66

million person years of observation; only 39 (8.3%) of these cases occurred after the universal program was implemented. Vaccine effectiveness against invasive pneumococcal disease caused by the 7 vaccine specific serotypes for 1, 2 and 3 doses of the pneumococcal vaccine was 68% (95%CI: 44-89%), 93% (81-97%), and 92% (95%CI: 86-93%), respectively.

Conclusion

This is the first study to link Australia's national immunisation register and measure population-based vaccine effectiveness. The study provides robust evidence of the effectiveness of at least 2 doses of pneumococcal vaccine against vaccine serotype specific infection using a 3 dose infant schedule.

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