

**ECONOMIC EVALUATION OF A UNIVERSAL
CHILDHOOD PNEUMOCOCCAL CONJUGATE VACCINATION
STRATEGY IN IRELAND:**

Cost-effectiveness of the 10 valent and 13 valent vaccines



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Report Prepared by
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for
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Summary

In 2008, the seven valent pneumococcal conjugate vaccine (PCV7; Prevenar™) was introduced as part of the National Childhood Immunisation Programme in Ireland. Evidence demonstrates that a PCV7 vaccination programme results in a significant reduction in severe invasive pneumococcal disease (IPD) in both vaccinated and unvaccinated (via herd protection) populations. In Europe, while programmes have led to an overall reduction in IPD, herd effects have been offset by replacement with disease caused by non-vaccine serotypes (NVTs). Two new vaccines with extended serotype coverage have been licensed; a ten valent vaccine (PCV10; Synflorix™) and a thirteen valent vaccine (PCV13; Prevenar™). In December 2010 PCV13 replaced PCV7 as part of the National Childhood Immunisation Programme.

The ten valent PCV (Synflorix™; PCV10) includes serotypes 1, 5 and 7F in addition to the serotypes contained in the PCV7 vaccine. The PCV10 vaccine has a novel protein D carrier protein which may also elicit protection against non-typable *Haemophilus influenzae* (NTHi). PCV10 is indicated for active immunisation against invasive disease and acute otitis media caused by *Streptococcus pneumoniae* in infants and children from 6 weeks up to 2 years of age.

The thirteen valent PCV (Prevenar™ PCV13), includes serotypes 1, 3, 5, 6A, 7F and 19A, in addition to the seven serotypes in the PCV7 vaccine. PCV13 contains the same carrier protein as PCV7 (CRM₁₉₇). It is indicated for active immunisation for the prevention of invasive disease, pneumonia and acute otitis media caused by *Streptococcus pneumoniae* in infants and children from 6 weeks to 5 years of age. It is also indicated for the prevention of invasive pneumococcal disease caused by *Streptococcus pneumoniae* in adults age 50 years and older.

Following a request from the HSE we conducted an economic evaluation to determine the cost-effectiveness of a universal childhood pneumococcal conjugate vaccination strategy using a 2 + 1 vaccine schedule in the Irish

healthcare setting. The PCV7, PCV10 and PCV13 vaccines were compared to “no vaccination” in the base case analysis. We also compared the cost-effectiveness of PCV10 versus PCV13. The evaluation was conducted from the perspective of the Health Service Executive (HSE). The economic model used was an adaptation of an independently developed analytic cohort model, which was used for the evaluation of the cost-effectiveness of pneumococcal conjugate vaccination in the Netherlands. The model was adapted for the Irish setting by incorporating local cost, resource and epidemiological data.

The analytic time frame was five years and long term effects of invasive pneumococcal disease were extrapolated over the full lifetime of the individuals in the cohort. The model considered the major outcomes for which clinical trial data are available regarding vaccine efficacy including invasive pneumococcal disease (meningitis, septicaemia and pneumonia), all-cause pneumonia and all-cause otitis media. The impact of herd protection was incorporated. Health outcomes were measured as quality adjusted life years (QALYs) and the cost-effectiveness results are presented as costs per QALY gained. The cost per life year gained (LYG) was also considered in this evaluation.

Under base case assumptions the incremental cost effectiveness ratios (ICERs) for PCV7, PCV10 and PCV13 versus no vaccination were €41,762/QALY, €16,803/QALY and €18,408/QALY. The greatest health gain would be achieved with PCV13. The ICER for PCV13 versus PCV10 was €22,179/QALY. Inclusion of the additional benefit of PCV10 against acute otitis media caused by NTHi results in a reduction in the ICER from €16,803/QALY to €14,312/QALY. If cross protection of PCV7 and PCV10 against serotype 6A is assumed the ICERs fall to €38,768/QALY and €15,816/QALY respectively.

If the analysis is based on a serotype distribution reflecting current 2011 data the greatest health gain is achieved with PCV13. When compared with PCV10 the model predicts that PCV13 has greater efficacy in preventing an additional 58 cases of IPD and 7,870 cases of NIPD each year. Furthermore PCV13 is more cost-effective than PCV10 with an ICER of €22,855/QALY. In fact PCV10 would not be considered cost-effective under this scenario as the ICER of €51,802/QALY is outside the range usually considered by the HSE i.e. €20,000/QALY to €45,000/QALY.

This cost-effectiveness analysis using an analytical cohort model indicates that vaccination with PCV13 is the most cost-effective option for childhood pneumococcal vaccination in the Irish healthcare setting if the analysis is based on a serotype distribution reflecting 2011 data.