Value of Pediatric Vaccinations: An Economic Evaluation of the Pediatric Vaccination Schedule in the United States

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BACKGROUND

• The introduction and widespread use of pediatric vaccines has resulted in dramatic declines in the morbidity, disability, and mortality caused by infectious diseases1
• Zhou et al. examined the economic impact of the 2001 pediatric vaccination schedule (diphtheria, tetanus, pertussis (DTaP); haemophilus influenzae type b (Hib); poliovirus (Polio); measles, mumps, rubella (MMR); hepatitis B (HepB); and varicella). Vaccinating a birth cohort according to the schedule was estimated to save nearly $10 billion in direct medical costs2
• The 2010 vaccination schedule includes additional vaccines: including adolescent meningococcal, rotavirus, HPV, influenza, and hepatitis A3

OBJECTIVE

• Update the 2001 analysis by using the current vaccination schedule to understand the costs of the vaccination program relative to the costs and quality adjusted life years (QALYs) saved by preventing the covered diseases.

METHODS

Modelling approach:

• An economic analysis was conducted to combine estimates of vaccine-specific costs (vaccine and direct medical costs) and outcomes (QALYs) compared with no vaccination.
• Vaccine-specific estimates were obtained from the literature for:
  - Vaccine costs
  - Incremental direct medical costs per vaccinated person
  - QALYs gained per vaccinated person
• Estimates were obtained from studies that:
  - Evaluated the direct effect of vaccination compared with no vaccination, using a birth cohort approach
  - Discounted costs and outcomes by 3%
• QALY estimates not available from the literature were calculated using a decision tree model (Figure 1)

Figure 1: Decision tree model

RESULTS

Table 2: Incremental costs and QALYs per vaccination schedule

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Δ Costs</th>
<th>Δ QALYs</th>
<th>Δ Costs</th>
<th>Δ QALYs</th>
<th>Δ Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTaP</td>
<td>-$6.462</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>MMR</td>
<td>-$5.374</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Hib</td>
<td>-$3.767</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Polio</td>
<td>-$1.652</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>HepB</td>
<td>-$0.746</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Tetanus</td>
<td>-$1.283</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Varicella</td>
<td>-0.175</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Mumps</td>
<td>-$0.088</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Measles</td>
<td>-$0.174</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Mening</td>
<td>-0.044</td>
<td>/</td>
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</table>

CONCLUSIONS

• The current vaccine schedule saves nearly $14 billion over the lifetime of the 2008 US birth cohort.
• DTaP, MMR, Polio, Hib, HPV and multivalent vaccines are cost-saving.
• Strategies that included multivalent vaccines provide increased cost savings due to lower administration costs

REFERENCES

1 Zhou and Prosser.2 Zhou et al.3 Guris et al.4 Prosser et al.5 Lieu et al.6 Prosser 2006.7 Guris 2007.8 Widdowson et al.9 Prosser et al. 2006.10 Prosser et al.2006.11 Lieu et al.2000.12 Prosser 2006.13 Prosser 2006.14 Widdowson et al.2007.15 Prosser 2006.16 Guris et al. Supplementary data relevant to this article can be found in the online version of the journal. This article has been peer-reviewed and accepted in its original form. It has not yet been copy-edited or typeset.

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