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POLICY BRIEF

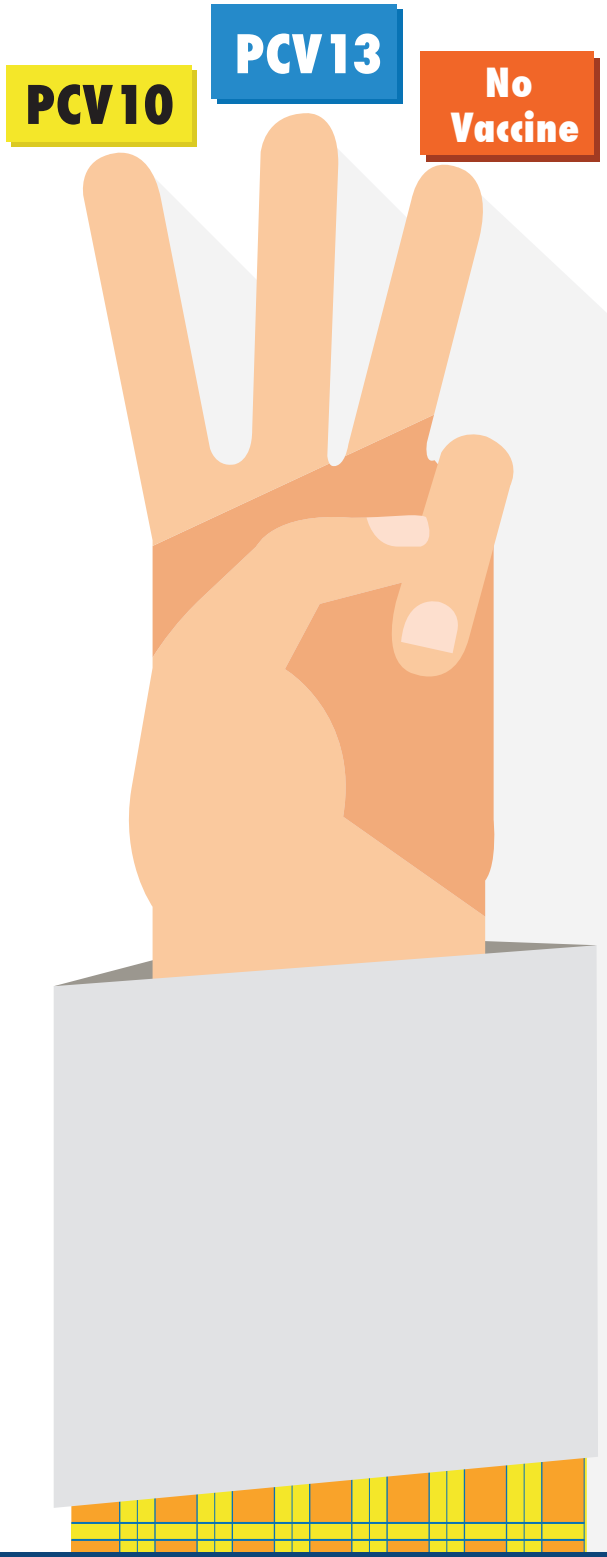
Is it worthwhile to introduce Pneumococcal Conjugate Vaccine into the routine immunization services?

In Bhutan, respiratory infections are some of the major causes of morbidity and mortality in children. Pneumonia, an infection of the lungs[1], is among the top 10 common causes of children's death in the country.[2]

Not only does it impose costs on society that may not be immediately visible (e.g. productivity loss from absenteeism in the long-term), it also entails funding high treatment costs for the Royal Government of Bhutan (RGOB). Bhutan's Ministry of Health (MoH) recommended to introduce the pneumococcal conjugate vaccine (PCV) to help prevent pneumonia and other associated diseases in children aged less than 5 years.

However, cost-effectiveness and vaccine efficacy in Bhutanese context needs to be determined. To address this, the Essential Medicines and Technology Division (EMTD) collaborated with the Health Intervention and Technology Assessment Program (HITAP) to conduct an in-depth study assessing the value-for-money of PCVs.

The findings from this study could guide the MoH on whether to invest in and these vaccine or not.

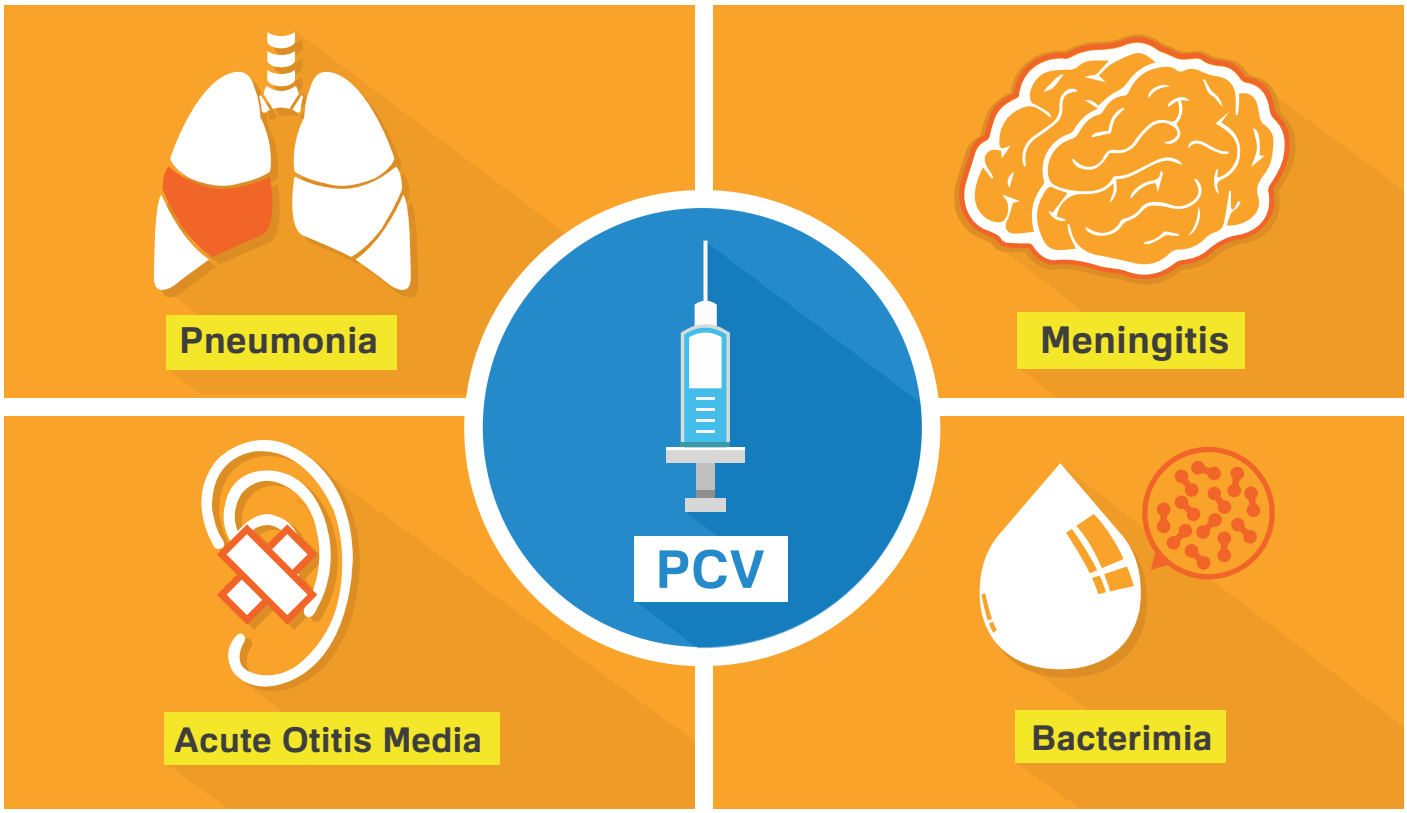


[1] Pneumonia is the infection of one or both sides of the lungs that causes the air sacs or alveoli of the lungs to fill up with fluid or pus. *https://www.nhlbi.nih.gov/health/health-topics/topics/pnu*

[2] Annual health bulletin 2016, Bhutan *www.health.gov.bt*

Rationale

In Bhutan, a total of 10,891 people were reported to be sick and 325 lives were claimed due to pneumonia in the past 5 years – of which 30% were children[2] The RGOB invests a significant amount of resources to treating this disease and associate diseases such as otitis media (swelling of the middle ear), meningitis (swelling of the protective membrane covering the brain and the spinal cord), and bacteremia (presence of bacteria in the blood). To address this, MoH guided by the Vaccine Preventable Diseases Program (VPDP) and National Committee for Immunization Practices (which is the national technical advisory committee for immunization services), decided to introduce PCV that has been proven to be cost-effective in countries like Singapore and the Philippines. However, there are two vaccine options available in the market, namely PCV10 and PCV 13. These vaccines cover different strains and apparently the less expensive one yields less health benefits. Therefore, the High-Level Committee of the MoH directed the EMTD to gather evidence and conduct an economic evaluation for the same. The National Health Policy 2012 also states the need for a thorough examination and comparison of potential costs and benefits of new health technologies being introduced.



Economic evaluation details

Economic evaluation is the process of measuring and valuating the inputs and outcomes of alternative choices. The economic evaluation method chosen for this study was a cost-utility analysis (CUA) using a Markov Model from a government perspective with a life-time time-horizon and a one-way and probabilistic sensitivity analysis to determine uncertainty. The CUA used quality-adjusted life years (QALYs) as a tool to measure the burden of pneumonia, with 1 QALY taken to mean one year of perfect health. QALY is one of the main determinants in assessing value-for-money. The results are projected in terms of Incremental Cost Effectiveness Ratio (ICER) per QALY gained which indicates the worth of PCV for every year of perfect health gained by pneumonia and associated diseases patients in comparison to no vaccine at all. The ICER also compares the worth of PCV10 and PCV13 against each other. The study uses an ICER threshold of Nu. 176,000 ($2719 which is one time the Gross Domestic Product (GDP) per capita)[3] used to determine what vaccine cost is acceptable for every year of perfect health gained.

[3] World Health Organization. World Health Organization, cost-effectiveness thresholds. 2012. Available from: http://www.who.int/choice/costs/CER_thresholds/en/index.html

Key Findings

- PCV provides a very good value-for-money compared to no vaccine at the suggested threshold value of Nu. 176,000 per QALY gained.
- Compared to No vaccination, implementing PCV 10 and PCV 13 would prevent an estimated of 2,003 and 2,916 episodes of pneumococcal disease in the vaccinated population,
- Moreover, 214 and 261 episodes of pneumococcal disease would be prevented in the unvaccinated populations due to herd protection.
- It was also estimated that 28 and 42 pneumococcal deaths would be averted by introducing PCV10 and PCV13, respectively.
- At the suggested threshold value, the maximum price of vaccine to be cost-effective is Nu. 562 for PCV13 and Nu. 513 for PCV10.

Policy Options and Cost-effectiveness

Policy Option	ICER per QALY gained (Nu.)	Pneumocccal deaths prevented	Episodes of pneumococcal diseases prevented
PCV10 vs No Vaccine	Cost-effective at 2347	28	2003 in vaccinated population 214 in unvaccinated population
PCV13 vs No Vaccine	Cost-effective at 2621	42	2916 in vaccinated population 261 in unvaccinated population
PCV13 Vs PCV 10	Cost-effective at 5656	14 More than PCV10	913 more than PCV10 in vaccinated population 47 more than PCV10 in unvaccinated population

Budget Impact Analysis

The RGoB remains major contributor to the immunization program with 76% of the total expenditure[4].The budget analysis over 5 years period considering the inclusion of PCV10 or 13 in the Immunization services was conducted. The analysis indicate that in No PCV situation, Nu. 206.41 Million Is expected to be spent in next five years as the treatment cost of Pneumonia and associated diseases. However, the treatment cost is expected to decline by 8.5% and 13.6% respectively for PCV-10 and PCV-13 if introduced. A total budgetary allocation of Nu. 245M for PCV10 & Nu. 244M for PCV13 is anticipated in the next 5 years.

Table: Five-year budget impact in million (Nu)

Intervention	No vaccine	PCV10	PCV13
[a] Treatment Cost	206.41	187.4	179.5
[b] Savings on treatment	0	19	26.91
[c] Cost of vaccines	0	57.4	64.5
[d] Net investment(c-b)	0	38.4	37.59

[4] http://www.nationalplanningcycles.org/sites/default/files/country_docs/Bhutan/cmyp2014-2018.pdf

Policy Recommendations

- At the suggested threshold level of one GDP per capita equivalent to Nu.176,000($2719), both PCV options are cost-effective in the Bhutanese context and have good value-for-money.
- Although PCV10 costs less than PCV13, PCV13 will be able to save more lives and costs in the long-run.
- Both PCV options could be considered for introduction at the current price and at the suggested threshold as the net investment on these vaccines is lower than the total economic cost of the vaccine.

Acknowledgement

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