

Cost-Utility Analysis of Pre-Exposure Prophylaxis Rabies Vaccination in Children in Thailand

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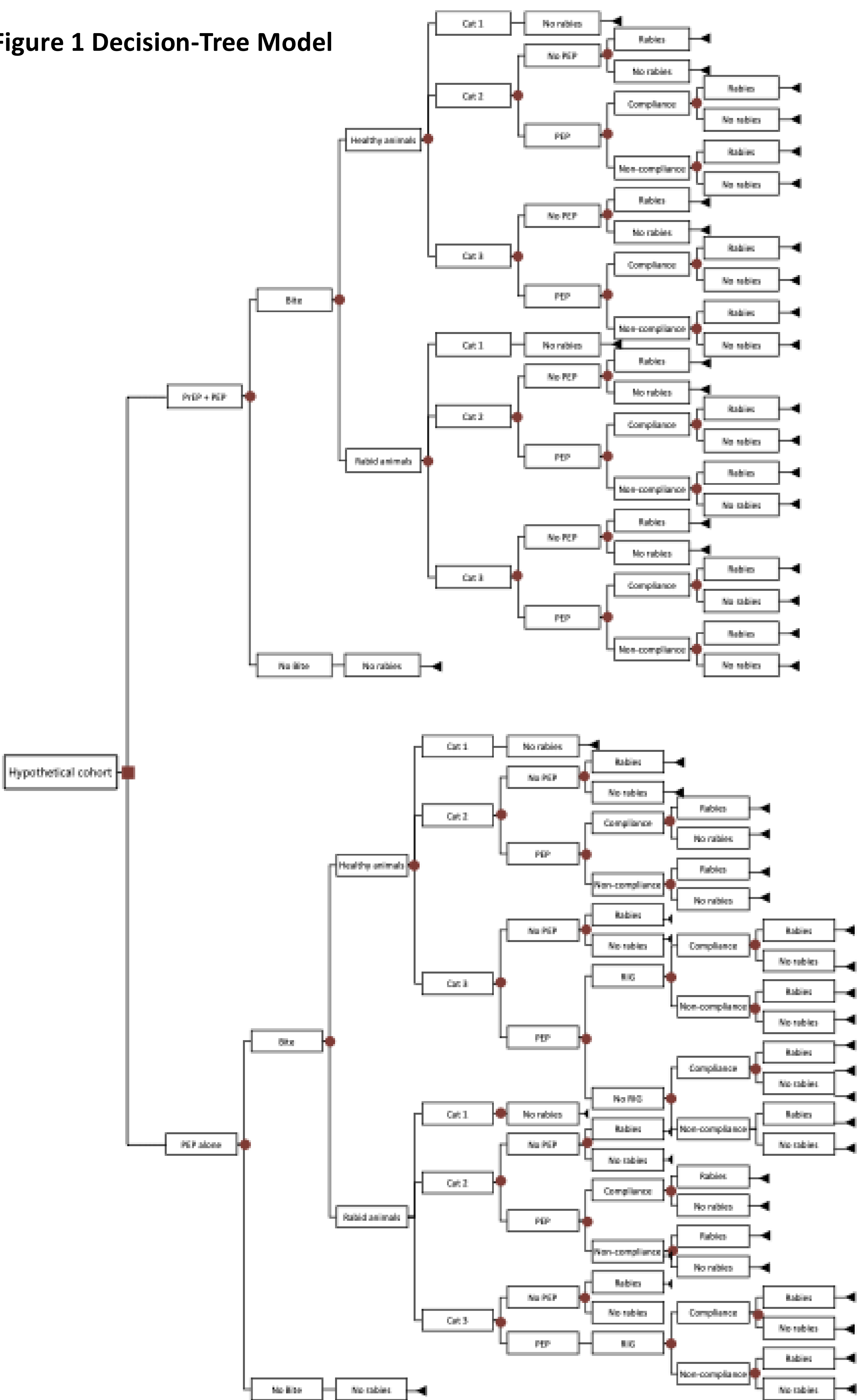
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BACKGROUND

- Rabies is a life-threatening zoonotic infection that cause approximately 59,000 human deaths and USD 8.6 billion in losses each year globally.
- Thailand is endemic and WHO-classified high-risk, with animal and human rabies cases every year.
- Rabies is preventable: Post-exposure prophylaxis (PEP) rabies vaccine with rabies immunoglobulin (RIG) in category III exposure, or Pre-exposure prophylaxis (PrEP) rabies vaccine, which removes the need for RIG after a category III bite.
- Children are the high-risk group: about 40% of cases are aged under 15 years, with more severe bites, shorter incubation, and immunoglobulin treatment failure.
- Therefore, PrEP rabies vaccine is recommended for children in endemic area. However, PrEP rabies vaccine is not listed in the Thailand's National Immunization Program (NIP), and there is no economic evaluation of PrEP rabies vaccine in Thailand context.
- Objective:** To analyze the cost-utility of PrEP+PEP vs PEP alone in 5-year-old Thai children.

Figure 1 Decision-Tree Model



METHODS

- Population:** 5-year-old Thai children
- Interventions and Comparators:** Eight strategies classified by route of administration (intradermal [ID] or intramuscular [IM]) and vaccine product (purified chick embryo cell vaccine [PCEC], 1 mL/vial or chromatographically purified Vero cell vaccine [CPRV] and purified Vero cell rabies vaccine [PVRV], 0.5 mL/vial), resulting in four PEP alone strategies and four PrEP+PEP strategies.
- Outcomes:** Costs, Quality-adjusted life years (QALYs), and Incremental Cost-Effectiveness Ratio (ICER) against Thailand's willingness-to-pay (WTP) threshold of THB 160,000 (USD 4,532.6); Costs and outcomes were discounted at 3% annually.
- Model:** Decision-tree model
- Perspective:** Societal perspective
- Timeframe:** 20 years

RESULTS

- Cost-utility analysis:**
 - Compared with PEP alone (ID using PCEC), PrEP+PEP (ID using PCEC) was cost-effective, increasing the cost by THB 1,377 (USD 39.0) per child (THB 2,033 vs 656) while reducing QALY loss from 0.1012 to 0.0676 (gain of 0.0336 QALYs), resulting in an ICER of THB 40,977 (USD 1,160.8) per QALY.
 - All other strategies were dominated due to higher cost with no added QALY benefit.
- One-way sensitivity analysis:**
 - Annual bite incidence was the key driver: ICER ranged from cost-saving to not cost-effective (ICER of THB 454,265 (USD 12,868.7) per QALY).

CONCLUSION

PrEP+PEP ID using PCEC is a cost-effective rabies prevention strategy for Thai children, reducing both reliance on equine rabies immunoglobulin, vaccine volume used, and disease-related QALY losses. These findings support integrating PrEP into Thailand's National Immunization Program for children in high rabies-risk areas, advancing the 2030 rabies elimination goal of the World Health Organization.

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