Gates Foundation - Vaccine Economics
Economic Evaluation Module
Decision Tree Analysis Workshop

Scenario: *Haemophilus influenza* Type B (Hib) Conjugate Vaccine in India

Children born in India may now have access to the Hib vaccine, which can prevent complicated outcomes caused by this strain of *influenza* including meningitis and pneumonia. Recent cost-utility analyses by Gupta et al. (2011) and Clark et al. (2013) evaluated these care modalities using population-level decision models. You are asked to simplify these study frameworks for a patient-level cohort analysis with the following updated information. In your simplified model, patients are followed for 1-year or until hospitalization (one year time horizon). The goal is to estimate the costs per DALY of two options for one year: Hib Vaccine during childhood, or no vaccine.

Currently in India, children are susceptible to Hib-borne meningitis or pneumonia at a rate of 2.7%. The Hib vaccine is considered highly efficacious, and reduces the risk of contracting these highly acute conditions by 95%. Those who contract Hib, either with or without the vaccine are 13% likely of being hospitalized. By comparison, the rate of all-cause hospitalization in India is only 3%. Those patients with Hib who are not hospitalized are still expected to seek secondary outpatient care.

Gupta et al. (2011) report that the cost of the Hib vaccine is only $1.50 per patient. Assume that in India, a typical government/payer would cover 80% of this cost, leaving the patient/family responsible for 20% of the remaining vaccine cost. When Hib results in a hospitalization (or any condition, for that matter), the government will pay the majority of this cost, $147, while the patient is responsible for $129. On the other hand, if a patient seeks secondary outpatient care, then they are responsible for $192, while the government only pays $6. The government uses this outpatient payment model to encourage the quarantine of Hib at hospitals and reduce the spread of Hib to other non-vaccinated children; however, children face other individual hazards at hospitals that increase their likelihood of mortality. The societal cost of treating Hib is representative of the sum of both the patient and government/payer costs.

The average utility for a child in India is assumed to be 0.90 DALYs averted based on the general rate of varying degrees of diseases causing chronic or short-term disability. When a child is hospitalized, their utility plummets to only 0.279 DALYs averted. A child that contracts Hib and seeks outpatient care maintains about 0.616 DALYs averted. The life expectancy of those patients not hospitalized is 1.0 year since this model assumes a one-year time horizon. The average life expectancy of those that died in the hospital for any reason was six months (i.e. assumed the "midpoint" average).

Given the scenario and data above, answer the following questions. A cost-utility model has been set up in Excel for you to use with these calculations. Simply put data into parameter value cells marked red, and use the cost and utility results on the sheet to finish calculations.

1. Construct a simple decision tree representing the policy decision and the health states related to that decision.

2. Calculate the difference in cost between the two care options from
    a. the Indian societal perspective
    b. the perspective of the government/payer
    c. the perspective of the patient

    Use as the modality of interest “Hib Vaccine” and “No Vaccine” as the comparator (i.e., cost [Hib Vaccine] - cost [No Vaccine])

3. After calculating the difference in effectiveness (in terms of incremental DALYs), determine if an incremental cost-effectiveness ratio (ICER) should be calculated from the Societal, Government/Payer and Patient perspectives. Please justify whether or not an ICER from these perspectives should be calculated and if so, state the ICER. If not, please state the preferred treatment and why. Show your calculations.

All data you need are given above. Do not consider any costs or outcomes not mentioned above.