

# **Teaching Vaccine Economics Everywhere**

## **Syllabus**

### **Economic Evaluation Module**

The demand and cost of health services is steadily increasing due to population growth, rising income and expectations, higher demand for care, and new technologies. Due to limited resources available, expenditures in health must be balanced against other needs such as infrastructure, education, and social welfare. We face decisions about allocation of funds to different population segments (e.g. young versus elderly) or different types of programs (e.g. prevention versus treatment, acute versus chronic disease), and programs with great benefit for a few versus modest benefit for many (e.g. organ transplant versus cataract surgery).

#### **Course Description**

This course will enable students to have a solid introduction to the theory, methods, and application of economic evaluation in health care with a specific focus on decision analysis and cost-effectiveness analysis. alternative approaches of modeling research questions for these fields. Approaches include calculation of costs and effectiveness measures using standard modeling methods. Compares outputs as a result of decision tree and Markov modeling and introduces sensitivity analysis.

#### **Required Readings**

1. Gupta, Madhu, et al. "Cost-effectiveness of Haemophilus influenzae type b (Hib) vaccine introduction in the universal immunization schedule in Haryana State, India." *Health policy and planning* 28.1 (2012): 51-61.
2. Clark, Andrew D., et al. "Impact and cost-effectiveness of Haemophilus influenzae type b conjugate vaccination in India." *The Journal of pediatrics* 163.1 (2013): S60-S72.

#### **Recommended Readings**

1. Drummond, Michael F., et al. *Methods for the economic evaluation of health care programmes*. Oxford university press, 2015.
2. Sanders, Gillian D., et al. "Recommendations for conduct, methodological practices, and reporting of cost-effectiveness analyses: second panel on cost-effectiveness in health and medicine." *Jama* 316.10 (2016): 1093-1103.
3. World Health Organization. "WHO guide for standardization of economic evaluations of immunization programmes." (2008).
4. Briggs, Andrew H., Karl Claxton, and Mark J. Sculpher. *Decision modelling for health economic evaluation*. Oxford University Press, USA, 2006.

#### **Session 1: Overview of Decision Analysis and Cost-Effectiveness (1 Hour)**

##### Learning Objectives:

1. Define Basic Concepts of Economic Evaluation
2. Understand different Methods and Tools of Economic Evaluation

## COMPONENTS:

- i. Understanding “Value”
- ii. Discuss importance of economic evaluation of vaccines in low-resource context (policy uses of CEA for new vaccine introduction)
  - a. Historical perspective
  - b. Current perspective
- iii. Measures of Value
  - a. Costs
  - b. Endpoints
  - c. Outcomes
- iv. Defining Methods of Value Analysis
  - a. Cost Finding
  - b. Cost-minimization
  - c. Cost/Burden of Illness – Infectious/Deleterious Diseases
  - d. Cost-Consequence
  - e. Cost-Effectiveness
  - f. Cost-Benefit
- v. Why perform an economic evaluation of a vaccine or immunization program
- vi. What is an “ICER”?
  - a. Cost-effectiveness plane
  - b. Interpreting the ICER
- vii. Defining Uncertainty of Value
  - a. Sensitivity Analysis
  - b. Value of Information
- viii. Translating Value into Resource Allocation
  - a. Introduction to Budget Impact Analysis (BIA)
  - b. Introduction to Return on Investment (ROI)

## **Session 2: Defining the Scope of a Cost-effectiveness Analysis I (1 Hour)**

### Learning Objectives:

1. To define the scope of an economic evaluation
2. To understand how to frame comparators for your audience based on a target population
3. What are the alternatives to a vaccine program?

## COMPONENTS:

- i. Formulating Study Objectives
- ii. Specifying Comparators
- iii. Defining Cohorts/Patients

## EXERCISES

- Quiz: “Economic Evaluation Study Design”

## **Session 3: Defining the Scope of a Cost-effectiveness Analysis II (1 Hour)**

### Learning Objectives:

1. To define the perspectives impacted by a vaccine program
2. To understand how to frame the time horizon of a vaccine program
3. To consider the impact of vaccines on different stakeholders at different time points

### COMPONENTS

#### i. Perspectives / Stakeholders

- a. Patient
- b. Providers, Hospitals, Healthcare Delivery Systems
- c. Payers: Commercial/Private and Public
- d. Government, Government Health Systems, Government Payers
- e. NGOs
- f. Second Panel CEA complete Perspectives
  1. "Health Sector" – Patient, Payer and Provider
  2. Societal – Patient, Payer, Provider, Caregiver, Government and indirects

#### ii. Time

- a. Time Horizon
  1. Annual/Cyclical
  2. Short-term (e.g. episode of care; episode of disease)
  3. Long-term (e.g. 5-year survival)
  4. Lifetime
- b. Incremental Units of Time

### **Session 4: Study Design Components of Economic Evaluation (1 hour)**

### Learning Objectives:

1. To differentiate between uses of decision tree and Markov model
2. To identify study designs that contribute to better cost, effectiveness and probability parameter estimates
3. To understand the process of probability extraction from high-quality sources

### COMPONENTS:

- i. Decision Analysis
  - a. Decision tree
  - b. Markov Model
- ii. Probabilities and Rates
  - a. Are all probabilities the same?
  - b. Probability and Rate Extraction
  - c. Probabilities for Decision Analysis
  - d. Converting rates to probabilities
- iii. Clinical Study Designs
  - a. RCT
  - b. Observational

- c. Case-control
- d. Quasi-experimental
- e. Other

**Session 5: Measuring and Valuing Costs (4 Hours)**

COMPONENTS:

- i. Costs - theory and definitions
  - a. Economist's definition
  - b. Types of costs
- ii. Costs in cost-effectiveness analysis
  - a. General approach
  - b. Which costs to include?
  - c. Perspective of the analysis
- iii. Cost of vaccine programs
  - a. General approach
  - b. Which costs to include?
- iv. Adjustments to costs
  - a. Inflation
  - b. Discounting
  - c. Currency

**Session 6: Measuring and Valuing Health Outcomes (1 Hour)**

Learning Objectives: To describe measurement of health gains in terms of health state preference & natural units

COMPONENTS:

- i. Defining Patient Preferences
  - a. Measuring health
  - b. Valuing health
- ii. Instruments of Effectiveness Measurement
  - a. VAS
  - b. TTO
  - c. SG
- iii. Health Utility Measures
- iv. Applying to Economic Evaluation
  - a. DALYs
  - b. QALYs
  - c. Discounting Outcomes

**Session 7: Reporting and Interpreting Results of Economic Evaluation (2 Hours)**

Learning Objectives:

- i. To provide background on the rationale and importance of Decision Analysis (DA) and Cost-effectiveness Analysis (CEA)
- ii. To explain the theoretical foundations DA/CEA

COMPONENTS:

- i. Understanding a CEA Plane
- ii. Willingness-to-Pay Threshold
- iii. ICER calculation, incremental ratios and dominance
- iv. Interpreting ICER/ICUR
  - a. Perspective
  - b. Time Horizon
- v. Reporting Quality of Analysis
  - a. Impact Inventory (Second Panel)
  - b. CHEERS Checklist
  - c. QHES Assessment Instrument

**Session 8: Introduction to Decision Tree Modeling (4 Hours)**

Materials: Decision Tree Exercise and Video

COMPONENTS

- i. Review Reference Case Decision Trees
- ii. Develop a Decision Model in Microsoft Excel
  - a. Construct Tree
  - b. Input Parameters
  - c. Calculating Weighted Outcomes
  - d. Interpreting Results
  - e. Univariate Sensitivity Analyses