ADVANCED DECISION ANALYSIS
PH 444
Winter 2011

Course Instructor:
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I. Course Description
Study and application of advanced decision-analytic methods useful in medical decision modeling and cost-effectiveness analyses. Included are the probabilistic theory of hazard rates and modeling of age-dependent mortality, Markov modeling, techniques for multi-way sensitivity analysis such as probabilistic sensitivity analysis and information-value analysis, cost-effectiveness modeling, the use of spreadsheets for Markov models. Medical decision-analytic literature is reviewed and theoretical underpinnings of models are explored. A project using decision analysis software is required.

II. Prerequisites
Basic Decision Analysis PUB HLTH 431 or equivalent introduction to decision analysis.

III. Course Objectives
After completion of the course, students should be able to do the following:

- **Markov modeling**
  - Construct a Markov chain transition diagram for a medical treatment problem
  - Use data to estimate incidence rates and convert these to transition probabilities
  - Formulate and solve a Markov chain cohort model in a spreadsheet
  - Discuss a published Markov chain analysis (effectiveness or cost-effectiveness) for a medical treatment problem.

- **Hazard rates and age-dependent mortality models**
  - Specify the mathematical relationship between hazard rates, the survival curve, and the survival time probability density
  - Explain superposition and splitting of independent arrival processes
  - Explain the Gompertz model of human mortality

- Complex model formulation and solution
• Formulate a factored model of a complex medical cost-effectiveness problem.
• Use cohort decomposition to solve a factored cost-effectiveness model
• Construct a stochastic tree transition diagram for a medical treatment problem.
• Convert a stochastic tree diagram to a discrete-time Markov chain transition diagram.

- **Probabilistic sensitivity analysis**
  - Formulate and calculate a probabilistic sensitivity analysis for a medical cost-effectiveness model.
  - Discuss a published probabilistic sensitivity analysis for a medical treatment problem.

- **Cost-effectiveness analysis**
  - Discuss basic issues underlying cost-effectiveness and cost-benefit analysis
  - Discuss a published cost-effectiveness analysis for a medical treatment problem

IV. Teaching Format

  - Class meets weekly. Assigned readings and problems are reviewed and discussed. Software is demonstrated on the instructor’s and students’ notebook computers.
  - Class location is the Chicago campus. But for small enrollments (3 or fewer), classes will meet on the Evanston campus.

V. Student Evaluation

  Students are evaluated based on:

  1. (50%) Satisfactory discussion of readings and assigned problems.
  2. (50%) Satisfactory completion of a final decision analysis project. The problem is generated by the student, and may be either a decision analysis or cost-effectiveness analysis. It may be focused on an individual patient decision or a policy decision.

VI. Readings

  Required textbook:

  *Decision Modelling for Health Economic Evaluation*
  
  Andrew Briggs, Karl Claxton and Mark Sculpher
  
  Oxford University Press (paperback)