CLRES 2122  
Advanced Methods for Decision and Cost-Effectiveness Analysis  
11/05 – 12/10 (M, Th 3:00 – 5:00)  
Phone contact: 692-4826

Course Objectives:

This course provides familiarity with intermediate methods used in complex decision analysis and cost-effectiveness analysis, and explores methods for utilizing these techniques in real-world settings. Topics to be covered include:

- Incorporating uncertainty into decision analysis models and cost effectiveness models
- Controversies in the application of cost effectiveness analysis
- Incorporation of the costs of future life expectancy

Course Requirements:

- Class participation: 20%
- Class Project: 80%

Course Mechanics:

1.0 credit, 2 hours/session, two sessions per week, for 6 weeks

A textbook is not required for this course. A packet of articles will be provided, and additional readings will be distributed as needed.

There will be no class on either Monday, November 19 or Thursday, November 22.
Session 1  11/05  Overview, Modeling complex problems  Roberts

Concepts and Topics:
This lecture will introduce the problem of biological complexity and decision and cost-effectiveness modeling. The tension between ease of construction and appropriate representation of reality will be discussed through the description of a large modeling effort to determine the optimal timing of end-stage liver disease.
Modeling End Stage Liver Disease and the Optimal Timing of Liver Transplantation

Required Reading: (prior to session)
None

Supplemental Reading:

Session 2  11/08  Advanced sensitivity analysis and Confidence Limits  Roberts

Concepts and Topics:
This session will investigate the characteristics of sensitivity analysis as applied to cost-effectiveness ratios. In the first part of the session, methods for operationalizing estimates for the costs of an intervention will be described. Skewed distributions and extreme outliers often complicate statistically predicting costs. Methods for minimizing the effect of these problems will be presented. Once costs are measured, stochastic sensitivity analysis complicates the development of confidence limits surrounding CE ratios. Several methods for understanding confidence limits surrounding CE ratios will be discussed, including Fieler’s method, bootstrapping and others. Also, different methods for summarizing stochastic model results (ratio of the average or average of the ratio?) will be presented.

Required Reading: (prior to session)


Supplemental Reading:

### Session 3  11/12
**Advanced topics in utility theory and utility assessment**

**Bryce**

**Concepts and Topics:**

Multiattribute utility theory (MAUT) is an approach for determining the utilities associated with decisions having more than one attribute. The two most common functional forms, the additive utility function and the multiplicative utility function, will be discussed. The lecture will also discuss another approach to assessing utilities, the willingness-to-pay method.

**Required Reading:** (prior to session, *choose one*)


### Session 4  11/15
**Controversies in CEA**

**Kraemer**

**Concepts and Topics:**

This session will review several controversial areas in cost-effectiveness analysis: 1) whether to include future costs from unrelated health conditions as a component of the costs of the intervention under study; 2) whether the current methodology for measuring and using QALYs is a fair representation of societal values and preferences; and 3) whether to include time costs (patient and/or family/caregiver time lost during illness or treatment) in the numerator or the denominator of the CE ratio. Examples of each of these issues and potential solutions will be discussed.

**Required Reading:** (prior to session)


- Meltzer D. Accounting for future costs in medical cost-effectiveness analysis. *Journal of Health Economics* 1997;16(1):33-64. (okay to skip Section 2 if you are not mathematically oriented)

**Supplemental Reading:**


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**REMINDER:** No class on 11/19 or 11/22

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Concepts and Topics:
- The Coronary Heart Disease Policy Model
- The Oregon Plan

Required Reading: (prior to session)

Abstracts from eight published papers using the CHD Policy Model, including:


Supplemental Reading:


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**Session 6  11/29**  
Simulation; modeling clinical processes  
Fridsma

Concepts and Topics:

Required Reading: (prior to session)

Readings will be distributed prior to class.

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**Session 7  12/03**  
Monte Carlo Simulation, Discrete Event Simulation  
Roberts

Concepts and Topics:

The purpose of this session is to introduce methods that can be used to create more complex models that represent the level of detail that is required for clinical acceptance and credence. Monte Carlo simulation (or individual microsimulation) can be used to develop models where the actual characteristics of individual patients can be tracked through time, releasing the restrictive “lack of memory assumption” that plagues Markov Models. Several examples will be presented and discussed. Similarly, standard cohort simulation lacks the ability to allow for the interaction between individuals in a particular model. This is an important concept in almost all resource allocation questions. Discrete event simulation, methodology developed in industrial engineering, is a powerful technique that can be applied to many resource allocation problems.

Required Reading: (prior to session)

None

Supplemental Reading:


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**Session 8  12/06**  
Computer lab: Monte Carlo Simulation  
Smith

Concepts and Topics:
In this laboratory, you will use DATA to extend the Markov process that was previously constructed of the HIV screening example and conduct Monte Carlo sensitivity analysis (2\textsuperscript{nd} order Monte Carlo simulation) as well as evaluate the problem as a 1\textsuperscript{st} order Monte Carlo analysis, learning how to keep track of counters and flags in the context of individual simulations

Required Reading: (prior to session)

None. Tutorial will be distributed in class.

Supplemental Reading:

None

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<tr>
<th>Session 9</th>
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<th>Student presentations</th>
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Each work group will present its analysis and findings for the breast cancer practicum. The final report is due at the end of class.