Course Title: Cost-effectiveness in Public Health and Medicine

Course Number: QNME 0545J

Course Location: MSB, Room TBN, Newark Campus

Course Date & Time: Mondays, 5:30 – 8:30 p.m.

Course Instructor: Anushua Sinha, MD MPH
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Office Hours: By appointment only: Mondays 4:15 p.m. – 5:15 p.m.


Additional/Supplemental Readings/Resources: Optional references, many of which are available on reserve at the George F. Smith library are:


There is no required software for the course. As an optional software package, students will may consider purchasing licenses for TreeAge Pro (approximately $45 for students), a package frequently used in healthcare-related cost-effectiveness analysis.

Course Description: What is the value of implementing a screening program, adopting a new health technology, or instituting a new preventive health program? How do the costs compare to the benefits? Where are our resources best invested? Public health practitioners, clinicians and policymakers need practical tools for real world decision making. This course will introduce students to the related fields of decision analysis and cost-effectiveness analysis in public health and medicine.
Selected Department Competencies Addressed: Each Department identifies competencies for each degree offered. The competencies addressed in this course for the MPH, for the Department of Quantitative Methods include:

- Describe important epidemiologic challenges on the local, national, and international level;
- Conceptualize public health or clinical research questions using quantitative methods;
- Identify the principles and limitations of public health screening programs; and
- Conceptualize public health or clinical research questions using advanced quantitative method techniques.

Please visit the Department webpages on the School of Public Health’s website at http://sph.rutgers.edu/ for additional competencies addressed by this course for other degrees and departments.

Course Objectives: By the completion of this course, students will be able to

General objective:

To teach public health and clinical professionals the core skills necessary to interpret and conduct basic decision analysis, including cost-effectiveness analysis.

Specific objectives:

1. Describe rationale for public health and clinical decision analysis and its limitations;
2. Formulate and diagram decision problems as decision trees;
3. Average out and fold back decision trees to calculate the expected values of competing alternative strategies;
4. Conduct one-way sensitivity analysis and threshold analyses
5. Estimate post-test probabilities of disease;
6. Be able to apply “off the shelf” utilities to estimate quality-adjusted life years;
7. Understand basic principles of costing analyses, including discounting and inflation adjustment;
8. Integrate costs and health benefits into decision trees to conduct cost-effectiveness analyses;
9. Understand the use of incremental cost-effectiveness analysis in choosing between policy strategies and among various priorities.

Course Requirements and Grading:

Requirements:

1. Class attendance and participation;
2. Problem sets assigned as homework;
3. A midterm quiz;
4. A final examination.

Students are encouraged to work together in groups on the weekly problem sets, but the midterm quiz and final exam are to be completed independently.

It is expected that students will keep up with the weekly readings and be prepared for class discussion based on those readings.
Because problem sets are reviewed in class, they may not be turned in past 5:30 p.m. on the day they are due – no exceptions.

**Grading:**
Final grades will be based 25% on the problem sets, 25% on the midterm quiz, 40% on the final exam, and 10% on class attendance and participation.

**Course Schedule:**

**Session 1 (1/28/13): Overview** (Problem set 1 distributed)

- Scope of course (methods covered, learning objectives, roadmap, logistics)
- Making rational decisions: alternatives
- Limitations of decision analysis
- Identifying and bounding decision problems
- Elements of a decision analysis
- In-class problems: Hunink et al, exercises 1.2, 2.3, 2.4
- Preview problem set 1

To do for class: No required assignments.


**Session 2 (2/4/13): Decision Trees I** (Problem set 2 distributed)

- Review identifying and bounding decision problems; review elements of a decision analysis
- Operational steps in decision analysis
- In-class problems: Hunink et al, exercises 3.1, 3.2, 3.3, 3.4
- Review problem set 1
- Preview problem set 2

To do for class:
*Problem set 1 due prior to start of class*

*Reading assignment:* Hunink et al, Chapters 1 – 3


**Session 3 (2/11/13): Decision Trees II** (Problem set 3 distributed)
- Review operational steps in decision analysis
- Principles of sensitivity and threshold analysis
- In-class problems: Hunink et al, exercises 3.3 and 3.4.
- Review problem set 2
- Preview problem set 3

To do for class:
*Problem set 2 due prior to start of class*

*Reading assignment:* Hunink et al, Chapter 3


**Session 4 (2/18/13): Evaluating test information I** (Problem set 4 distributed)
- Review characteristics of imperfect tests (sensitivity, specificity)
- Probability revision using 2x2 table method
- In-class problems: Hunink et al, exercises 5.1, 5.2, 5.3, 5.4
- Review problem set 3
- Preview homework assignment 4

To do for class:
*Problem set 3 due prior to start of class*

*Reading assignment:* Hunink et al, chapter 5


Session 5 (2/25/13): Evaluating test information II (Problem set 5 distributed)
— Review probability revision using 2x2 table method
— Probability revision using Bayes’ formula, likelihood ratios, and tree inversion
— In-class problems: Hunink et al, exercises 6.1, 6.2, 6.4
— Review homework assignment 4
— Preview problem set 5

To do for class:
Problem set 4 due prior to start of class

Reading assignment: Hunink et al, chapter 6

[Optional review session to be scheduled with students]

Session 6 (3/4/13): Midterm quiz – NO CLASS MEETING

Session 7 (3/11/13): Multiple tests I (Problem set 6 distributed)
— Characteristics of test systems
— Review of conditional probability
— Calculating sensitivity for test systems
— Calculating specificity for test systems
— In-class problems: HIV, cancer screening
— Review problem set 5

To do for class:
Problem set 5 due prior to start of class

Reading assignment: Hunink et al, chapter 7, sections 7.1, 7.2 and 7.6

Session 8 (3/25/13): From values to utilities (Problem set 7 distributed)
Review categorization of values
— What is a utility?
— Methods for utility elicitation: The Standard Gamble
— Methods for utility elicitation: Time-trade off
— Multi-attribute utilities: example of the Health Utility Index
— In-class problems: Hunink et al, exercises 4.1, 4.2, 4.5

To do for class:
Problem set 6 due prior to start of class

Reading assignment: Hunink et al, chapter 4, sections 4.1, 4.2, and 4.4


Session 9 (4/01/13): From utilities to quality-adjusted life years
— Calculating life expectancy
— Using survival curves to estimates survival probabilities
— Quality-adjusted life years: a preference weighted measure of health outcome
— Assumptions in using QALYs
— Three steps to estimating QALYs
— In-class problem: Hunink et al, exercise 4.5

To do for class:
Reading assignment: Hunink et al, sections 4.4 through 4.16


— Types of health economic analysis
— The (incremental) cost-effectiveness ratio
— Cost-effectiveness criteria
— Analytic perspective
— Example: Prevention of neural tube defects
— Review problem set 7/8
— Preview problem set 9

To do for class:

*Problem set 7/8 due prior to start of class*

*Reading assignment:* Hunink et al, chapter 9, sections 9.1 through 9.5


Torrance GW, Siegel JE, Luce BR. “Framing and designing the cost-effectiveness analysis.” Chapter 3 in Gold et al, 1996.


**Session 11 (4/15/13): Cost-effectiveness analysis II: Shopping spree and competing choice problems**

— Shopping spree problem
— Competing choice problem
— Dominance and extended dominance
— Competing choice within shopping spree problem
— In-class problem: Hunink et al, exercise 9.4

To do for class:

*Reading assignment:* Hunink et al, chapter 9, sections 9.6 through 9.10

**Session 12 (4/22/13): Cost-effectiveness analysis III: Measuring and adjusting costs**

(Problem set 10 distributed)

— Identifying costs
— Measuring costs
— Valuing costs
— Costs versus transfers
— Review problem set 9
— Preview problem set 10

To do for class:

*Problem set 9 due prior to start of class*


**Session 13 (4/29/13): Cost-effectiveness analysis IV: Adjusting costs and analyzing the model** (Problem set 11 distributed)

- Discounting
- Inflation adjustment
- Incorporating costs and QALYs into a decision tree
- In-class problems: Hunink et al, exercise 9.1
- Review problem set 10
- Preview problem set 11 (review of a published cost-effectiveness analysis — see suggested references at end of syllabus) NO PROBLEM SET 11

To do for class:

*Problem set 10 due prior to start of class*

**Reading assignment:** review Hunink et al, chapter 9, section 9.5


**Session 14 (5/06/13): Sensitivity analysis revisited**

- Types of uncertainty and variability
- 1-way, 2-way, multi-way sensitivity analysis revisited
— Scenario analysis
— Probabilistic sensitivity analysis (PSA)
— Presentation of results from PSA: Cost-effectiveness acceptability curve
— Final exam distributed

To do for class:
Reading assignment: Hunink et al, chapter 11

[Optional review session to be scheduled with students]

Session 15 (5/13/13): Final examination – NO CLASS MEETING

Additional opportunities, beyond this semester:

Scientific conferences
Annual Meeting of the Society for Medical Decision Making
October 2013, Baltimore MD

Excellent short courses at the introductory through advanced levels are offered during this conference by leaders in the field. URL: http://www.smdm.org/

Readings

[Pioneers in the field discuss making good decisions in everyday life.]

[The authors won the 2002 Nobel prize in economics on the basis of their work, challenging basic assumptions regarding rational decision making.]

[Bloom and Canning use a very different economic approach to answering the question of what value for money investment in health represents.]

[Integrates newer statistical methods into an intermediate level textbook.]
School of Public Health Honor Code: The School of Public Health Honor Code is found in the student bulletin (sph.rutgers.edu/academics/catalog/index.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another’s work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the school community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

Policy Concerning Use of Recording Devices and Other Electronic Communications Systems: When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.