I. Course Description

This course is intended to give students an overview of the theory and applications of cost-benefit analysis, cost-effectiveness analysis, cost-utility analysis and related forms of economic evaluation for interventions in the health care sector. The topics to be covered are: contributions from economic theory, the historical development, comparison of the various forms of decision analysis, measures of costs and related controversies, measures of outcomes focusing on health-related quality of life and quality-adjusted life years, assigning monetary values to outcomes, the value of a human life and of a quality-adjusted life year, discounting, uncertainty in cost-effectiveness analysis, probability sensitivity analysis, Markov models, study design, and standardized reporting of results. Lectures will be also given on the statistical treatments of cost-effectiveness analysis, the current political environment for cost-effectiveness in the US, and the characteristics of cost-effectiveness analyses that are published. Students also will learn a decision-analytic software package, TreeAge Pro, and study a number of classic applications from the literature in depth.

The course occasionally uses conventional microeconomic analytical and statistical tools. While it is not required, it is recommended that students have taken a basic course in microeconomics. Nevertheless, because not all have taken such a course, the first class will be devoted to familiarizing students with the contributions of economic theory to the conduct of economic evaluations.

II. Course Prerequisites

There are no course prerequisites, although a basic course in microeconomic theory is recommended.
III. Learning Objectives

1. The student will be able to understand cost and effectiveness measures; to distinguish among cost-effectiveness, cost-benefit, and cost-utility analyses and know the advantages and disadvantages of each approach; and to understand the various perspectives that can be taken.

2. The student will know the recommendations of the 2nd Panel on Cost-Effectiveness and Medicine.

3. The student will have an appreciation for the controversies in the field: the costs of consumption in additional life years, productivity costs, discounting, etc.

4. The student will learn and be able to apply TreeAge Pro decision analytic software in a series of exercises, at least one of which will ask the student to replicate the analysis of existing studies from the literature.

5. The student will understand and be able to apply Markov analysis and other modeling techniques.

6. The student will be familiar with the statistical issues of cost-effectiveness analysis and be able to conduct a probabilistic sensitivity analysis.

7. The student will become familiar with a number of classic from the cost-effectiveness analyses literature.

IV. Evaluation and Grading

Grades are based on performance on (1) a midterm exam, (2) a final exam, (3) a series of 7 quizzes, and (4) a series of 5 homework assignments using TreeAge Pro software. The midterm and final will each account for 1/3 of the grade, while the quizzes will account for 1/6 and the homework assignments the final 1/6.

The course grade will be determined by the average of the number equivalents of the letter grades you receive on each of the above. When determining the grade for the course, the standard 4-point scale will be used to find the number equivalent of the letter grades. For example if you receive a B+ on the midterm, an A- on the final, an A on the quizzes and an A on your homework, your course grade will be calculated as follows: \((3.33 \times 0.333) + (3.667 \times 0.333) + (4.000 \times 0.0167) + (4.000 \times 0.0167) = 3.667\). Since 3.667 is on the border between an A- and an A, you would receive an A in the course. The cut-off to earn an A is 3.667, to earn an A- is 3.50 and to earn a B+ is 3.333. Other grades would be similarly calculated.

<table>
<thead>
<tr>
<th>Average</th>
<th>Grade</th>
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<tbody>
<tr>
<td>3.667 - 4.000</td>
<td>A</td>
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<tr>
<td>3.500 - 3.667</td>
<td>A-</td>
</tr>
<tr>
<td>3.333 - 3.500</td>
<td>B+</td>
</tr>
<tr>
<td>2.667 - 3.333</td>
<td>B</td>
</tr>
<tr>
<td>2.500 - 2.667</td>
<td>B-</td>
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<tr>
<td>2.333 - 2.500</td>
<td>C+</td>
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<td>Etc.</td>
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The quiz grade is determined by your average score on 6 of 7 quizzes, with the score on your lowest quiz thrown out. Each quiz has two questions and is worth a total of 5 points. The table on the next page shows the letter grades and grade point equivalents for the scores on each of the quizzes.

The grade for the homework assignments will be determined by the average number of points for all 5 assignments, converted into its letter grade.

Because exams and quizzes emphasize the material covered in class, students will find it difficult to be successful in this course without a complete and detailed set of class notes. Indeed, some topics are covered by lecture alone, and students will be responsible for that material, just as they are for material covered in both lecture and the readings.
<table>
<thead>
<tr>
<th>Average points</th>
<th>Grade</th>
<th>Grade points</th>
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</thead>
<tbody>
<tr>
<td>4.500 - 5.000</td>
<td>A</td>
<td>4.000</td>
</tr>
<tr>
<td>4.300 - 4.499</td>
<td>A-</td>
<td>3.667</td>
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<tr>
<td>4.000 - 4.299</td>
<td>A/B</td>
<td>3.500</td>
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<tr>
<td>3.800 - 3.999</td>
<td>B+</td>
<td>3.333</td>
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<tr>
<td>3.500 - 3.799</td>
<td>B</td>
<td>3.000</td>
</tr>
<tr>
<td>3.300 - 3.499</td>
<td>B-</td>
<td>2.667</td>
</tr>
<tr>
<td>3.000 - 3.299</td>
<td>B/C</td>
<td>2.500</td>
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<tr>
<td>2.800 - 2.999</td>
<td>C+</td>
<td>2.333</td>
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<tr>
<td>2.500 - 2.799</td>
<td>C</td>
<td>2.000</td>
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<tr>
<td>Etc.</td>
<td></td>
<td></td>
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</tbody>
</table>

Please note the following:

- If applicable, students may change grading options during the initial registration period or during the first two weeks of the term. **The grading option may not be changed after the second week of the term.**

- An incomplete grade is permitted only in cases of exceptional circumstances and following consultation with the instructor. In such cases, an “I” grade will require a specific written agreement between the instructor and the student specifying the time and manner in which the student will complete the course requirements. Extension for completion of the work will not exceed one year.

V. Scholastic Dishonesty and Plagiarism

Students are responsible for knowing and complying with the University of Minnesota, Board of Regents' policy on student conduct and scholastic dishonesty: [http://www.umn.edu/regents/policies/academic/StudentConduct.html](http://www.umn.edu/regents/policies/academic/StudentConduct.html).

Scholastic dishonesty as defined in the policy and will be reported to the Office of Student Judicial Affairs: [http://www.sja.umn.edu/](http://www.sja.umn.edu/) and will result in a grade of "F" or "N" for the entire course.

Plagiarism is an important element of this policy. It is defined as the presentation of another's writing or ideas as your own. Serious, intentional plagiarism will result in a grade of "F" or "N" for the entire course. For more information on this policy and for a helpful discussion of preventing plagiarism, please consult University policies and procedures regarding academic integrity: [http://cisw.cla.umn.edu/plagiarism/uofmpolicies.html](http://cisw.cla.umn.edu/plagiarism/uofmpolicies.html).

Students are urged to be careful that they properly attribute and cite others' work in their own writing. For guidelines for correctly citing sources, go to [http://tutorial.lib.umn.edu/](http://tutorial.lib.umn.edu/) and click on “Citing Sources”.

In addition, original work is expected in this course. It is unacceptable to hand in assignments for this course for which you receive credit in another course unless by prior agreement with the instructor. Building on a line of work begun in another course or leading to a thesis, dissertation, or final project is acceptable. If you have any questions, consult the instructor.

VI. Course Withdrawal

School of Public Health students may withdraw from a course **through the second week** of the semester without permission. No “W” will appear on the transcript. **After the second week**, students are required to do the following:

- The student must contact and notify their advisor and course instructor informing them of the decision to withdraw from the course.
The student must send an e-mail to the SPH Student Services Center (SSC). The email must provide the student name, ID#, course number, section number, semester, and year with instructions to withdraw the student from the course, and acknowledgement that the instructor and advisor have been contacted.

The advisor and instructor must email the SSC acknowledging the student is canceling the course. All parties must be notified of the student’s intent.

The SSC will complete the process by withdrawing the student from the course after receiving all emails (student, advisor, and instructor). A “W” will be placed and remain on the student transcript for the course.

After discussion with their advisor and notification to the instructor, students may withdraw up until the eighth week of the semester. There is no appeal process.

VII. Course Texts and Readings


4. Required papers are available at the library’s electronic journals or will be distributed directly through the internet.

VIII. Course Outline/Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings (* = optional reading)</th>
</tr>
</thead>
</table>

1/24 Welfare Theory and Extra-Welfarism (Nyman)  
Neumann et al. Ch. 2 (pp. 39-65).  
Drummond et al. Ch. 2 (pp. 19-40).  

1/29 Making Collective Decisions (Nyman)  
Quiz #1  
1/231 Overview of Economic Evaluations (Kuntz)

Neumann et al. Ch 1 (pp. 1-39) and Ch. 4 (pp. 75-82).

Drummond et al. Ch. 1 (pp. 1-18).


2/5 Application 1: Decision Analytic Modeling (Kuntz)

Quiz #2

Neumann et el., Ch. 5 (pp. 105-136).

Drummond et al. first part of Ch. 3 (pp. 41-65) and first part of Ch. 9 (pp. 311-331).


2/7 Perspectives and Designing Cost-Effectiveness Analyses (Nyman)

Neumann et al. Ch. 3 (pp. 67-74) and Ch. 4 (pp. 82-104).

Drummond et al. Ch. 4 (pp. 77-106).


2/12 TreeAge Pro 1: Decision Trees and Cost-Effectiveness Analysis (Wherry)


Please bring a laptop computer to class.

2/14 Assessing Effectiveness in Cost-Effectiveness Analyses (Kuntz)

Neumann et al. Ch. 6 (pp. 137-166).

2/19 Assessing Outcomes in Cost-Utility Analyses (Kuntz)

*Quiz #3*

- Neumann et al., Ch. 7 (pp. 167-200).
- Drummond et al. Ch. 5 (pp. 123-180).


2/21 Important Quality-of-Life Questionnaires (Nyman)

**EuroQol (EQ-5D):**


**Short Form 36 (SF-36) and the SF-6D**


*Bult, Roelf, Maria G. M Hunink, Joel Tsevat, and Milton C. Weinstein. Heterogeneity in the Relationship Between the Time Tradeoff and Short Form-36 for HIV-Infected and Primary Care Patients, *Medical Care* vol. 36, no. 4, April 1998, pp. 523-532.


**Health Utilities Index (HUI3):**


**Quality of Well-Being Index (QWB):**


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**2/26 Application 2: Reflecting Uncertainty in Economic Evaluations (Kuntz)**

**Homework #1 due**

Neumann et al. Ch. 11 (pp. 289-318).

Drummond et al. Ch. 11 (pp. 389-426).


**2/28 TreeAge Pro 2: Sensitivity Analysis (Chantarat)**


TreeAge Pro User’s Manual for 2017, Ch. 16 pp. 188-202, Ch. 19 pp. 254-270, Ch. 20 pp. 271-305

Please bring a laptop computer to class.

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**3/5 Costs and Cost Analyses (Wherry)**

**Quiz #4**

Neumann et al. Ch. 8 (pp. 201-236).

Drummond et al. last part of Ch. 4 (pp.106-122) and Ch. 7 (pp. 219-265).

Probst, Janice C., Sarah B. Laditka, John-Yi Wang, Andrew O. Johnson. Mode of Travel and Actual Distance Traveled for Medical or Dental Care by Rural and Urban Residents. South Carolina Rural Health Research Center: Columbia, SC, 2006.

Cost Issues in Cost Utility Analyses (Nyman)


Cost exercise (Enns)

Homework #2 due

Midterm Exam

Spring Break