

UNIVERSITY
OF MINNESOTA

**School of
Public Health**

Syllabus
Cost-Effectiveness Analysis
in Health Care
PubH 6862
Spring, 2009

Professor: John A. Nyman, PhD
Division of Health Policy and Management

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Guest Instructors: Melissa S. Martinson, PhD, Technomics Research, LLC
Richard R. Wilson, MD, Health Research, LLC
Lindsay Bockstedt, Division of Health Policy and Management

Credits: 3 hours

Meeting Time: Tu and Th, 4:00 - 5:15 pm

Meeting Place: Lecture: 2-101 Nils Hasselmo Hall

I. Course Description

This course is intended to give students an overview of the theory and applications of cost-benefit analysis, cost-effectiveness analysis, and related forms of decision analysis in the health care sector. The topics to be covered are: the theoretical economic basis for this analysis, comparison of the various forms of decision analysis, measures of costs, controversies regarding survival costs, measures of outcomes including health status and health-related quality of life, assigning monetary values to outcomes, the value of a human life and of quality adjusted life years, discounting, uncertainty in cost-effectiveness analysis, Markov Models, study design, and standardized reporting of results. Students also learn TreeAge Pro Healthcare Module, a decision-analytic software, and review a number of classic applications from the literature.

The course occasionally uses conventional microeconomic analytical and statistical tools. While it is not required, it is recommended that students have taken a microeconomics course. Nevertheless, because not all have taken such a course, one lecture is spent at the beginning of the course familiarizing students with basic microeconomic analytical tools.

II. Course Prerequisites

None

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 Panel on Cost-Effectiveness and Medicine.
3. The student will have an appreciation for the controversies in the field: the unrelated survivor consumption, the impact of age, discounting, etc.
4. The student will learn and be able to apply TreeAge Pro decision analytic software in a series of exercises, some of which will ask the student to replicate the analysis of existing studies from the literature.
5. The student will be familiar with the statistical issues of cost-effectiveness analysis and a menu of approaches for evaluating the uncertainty associated with point estimates of the incremental cost-effectiveness ratio.
6. The student will read and become familiar with a number of the important cost-effectiveness analyses from the literature.

IV. Evaluation and Grading

Grades are based on performance on (1) a midterm, (2) a final, (3) a series of 5 quizzes, and (4) a series of 5 programming assignments using TreeAge Pro software. The midterm and final will each account for 1/3 of the grade, while the quizzes and the programming assignments will each account for 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: $(3.333 \times 0.333) + (3.667 \times 0.333) + (4.000 \times .0167) + (4.000 \times .0167) = 3.667$. Since 3.667 is the minimum of the A range, you would receive an A in the course. The cut-off to earn an A- is 3.50, and to earn a B+ is 3.333. Other grades would be similarly calculated.

Average	Grade
3.667 - 4.000	A
3.500 - 3.666	A-
3.333 - 3.499	B+
2.667 - 3.332	B
2.500 - 2.666	B-
2.333 - 2.499	C+
Etc.	

The quiz grade is determined by your average score on 5 weekly quizzes. Each quiz has two questions and is worth a total of 5 points. The following table shows the letter grades and grade point equivalents for the scores on each of the quizzes:

Average points	Grade	Grade points
4.500 - 5.000	A	4.000
4.300 - 4.499	A-	3.667
4.000 - 4.299	A/B	3.500
3.800 - 3.999	B+	3.333
3.500 - 3.799	B	3.000
3.300 - 3.499	B-	2.667
3.000 - 3.299	B/C	2.500
2.800 - 2.999	C+	2.333
2.500 - 2.799	C	2.000
Etc.		

The grade for the programming assignments will be determined by the average letter grade for 5 assignments.

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.

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>.

Scholastic dishonesty as defined in the policy and will be reported to the Office of Student Judicial Affairs: <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>.

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/> 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 Text and Readings

1. Gold, Marthe R., Joanna E. Siegel, Louise B. Russell, and Milton C. Weinstein. *Cost-Effectiveness in Health and Medicine*. New York: Oxford U Press, 1996.
2. Drummond, Michael F. et al. *Methods for the Economic Evaluation of Health Care Programmes, Third Edition*. Oxford: Oxford U Press, 2005.
3. *TreeAge Pro for Healthcare User’s Manual*. Williamstown, MA: TreeAge Software, Inc., 2008, available on line.
4. Required papers available at the library’s electronic journals.

VIII. Course Outline/Schedule

Date Topic Readings (* = optional reading)

1/20 Principles of Microeconomic Theory

Folland, Sherman, Allen C. Goodman, Miron Stano. “Microeconomic Tools for Health Economics,” Chapter 2 in *The Economics of Health and Health Care, Third Edition (or Fourth Edition)* Upper Saddle River, NJ: Pearson Education, Inc., 2001 (or 2004), pp. 20-52, or any similar health text with a chapter on microeconomic background.

1/22 The Welfare Origins: Consumer Surplus

Gold, Ch. 2 (pp. 25-53).

Brent, Robert J. *Applied Cost-Benefit Analysis, Second Edition*. Cheltenham, UK: Edward Elgar, 2006, Ch. 3, pp. 70-81.

*Diecidue, Enrico, and Peter P. Wakker. "On the Intuition of Rank Dependent Utility," *Journal of Risk and Uncertainty* 23(3), 2001, pp. 281-298.

*Misham, E. J. *Introduction to Normative Economics*. New York: Oxford University Press, 1981, Ch. 21 (pp. 158-164).

*Willig, Robert D. "Consumer's Surplus Without Apology," *American Economic Review* vol. 66, no 4, Sept. 1976, pp. 589-597.

*Misham, E. J., and Euston Quah. *Cost-Benefit Analysis: Fifth Edition*. New York: Routledge, 2007.

*Stiglitz, Joseph. *Economics of the Public Sector*. New York: Norton, 2000.

*Rosen, Harvey S. *Public Finance*. Homewood, IL: Irwin, 1992.

1/27 Making Collective Decisions

QUIZ #1

Stokey, Edith and Richard Zeckhauser. "Public Choice: To What Ends?" *A Primer for Policy Analysis*. New York: W. W. Norton, 1978, Chapter 13, pp. 257-290.

1/29 Overview of CEA

Gold et al., Ch. 1 (pp. 3-24).

Drummond et al., Ch. 2 (pp. 7-26).

*Drummond, Michael. "Allocating Resources," *International Journal of Technology Assessment in Health Care* vol. 6, no. 1, 1990, pp. 77-92.

*Eisenberg, John M. "Clinical Economics: A Guide to the Economic Analysis of Clinical Practices," *Journal of the American Medical Association* vol. 262, no. 20, November 24, 1989, pp. 2879-2886.

*Doubilet, Peter, Milton C. Weinstein, Barbara J. McNeil. "Use and Misuse of the Term 'Cost Effective' in Medicine," *New England Journal of Medicine* vol. 314, no. 4, January 23, 1986, pp. 253-256.

*Detsky, Allan S., and I. Gary Naglie. A Clinician's Guide to Cost-Effectiveness Analysis, *Annals of Internal Medicine* vol. 113, no. 2, 15 July 1990, pp. 147-154.

2/3 Cost Analysis and Measuring Costs in CUAs

Gold et al., Ch. 6 (pp. 176-213).

Drummond et al., Ch. 4 (pp. 55-101), note that pp. 73-78 will be covered later in class on discounting.

Finkler, S. "The Distinction between Cost and Charges," *Annals of Internal Medicine* vol. 96, 1982, pp. 102-109.

2/5 Cost Issues in CUAs: Survivor Consumption and Spending in the Last year of Life

QUIZ #2

Meltzer, David. "Accounting for Future Costs in Medical Cost-Effectiveness Analysis," *Journal of Health Economics* vol. 16, no. 1, February 1997, pp. 33-64.

Nyman, John A. "Should the Consumption of Survivors Be Included as a Cost in Cost-Utility Analysis?" *Health Economics* vol. 13, 2004, pp. 417-427.

Liljas, Bengt, Goran S. Karlsson, Nils-Olov Stalhammar. "On future non-medical costs in economic evaluations," *Health Economics* vol. 17, 2008, pp. 579-591.

*Nyman, John A. "The Welfare Implications of Survivor Consumption and Leisure Forgone," Minneapolis: University of Minnesota, July 28, 2008.

*Nyman, John A. "More on Survival Consumption Costs in Cost-Utility Analysis," *Health Economics* vol. 15, no. 3, March 2006, pp. 219-222.

*Garber, Alan M. and Charles E. Phelps. "Economic Foundations of Cost-Effectiveness Analysis," *Journal of Health Economics* vol. 16, no. 1, February 1997, pp. 1-32.

*Van Baal, Pieter H. M., Talitha L. Feenstra, Rudolf T. Hoogenveen, G. Ardine De Wit, Werner B. F. Brouwer. "Unrelated medical care in life years gained and the cost utility of primary prevention: In search of a 'perfect' cost-utility ratio," *Health Economics* vol. 16, 2007, pp. 421-433.

Gandjour, Afschin and Karl Wilhelm Lauterbach. "Does prevention save costs? Considering deferral of the expensive last year of life" *Journal of Health Economics* vol. 24, no. 4, July 2005, pp. 715-724.

*Gandjour, Afschin. "Aging diseases—Do they prevent preventive health care from saving costs?" *Health Economics*, vol. 25, 2009.

2/10 Cost Issues in CUA: Productivity Costs and Extra-Welfarism

Brouwer, Werner B. F., Marc A. Koopmanschap, Frans F. H. Rutten. "Productivity cost measurement through quality of life? A response to the recommendation of the Washington Panel," *Health Economics* vol. 6, 1997, pp. 253-259.

Weinstein, Milton C., Joanna E. Siegel, Alan M. Garber, Joseph Lipscomb, Bryan R. Luce, Willard G. Manning, Jr., George W. Torrance. "Productivity Costs, Time Costs and Health-Related Quality of Life: A Response to the Erasmus Group," *Health Economics* vol. 6, pp. 505-511.

Brouwer, Werner B. F., Marc A. Koopmanschap, Frans F. H. Rutten. "Productivity cost in cost-effectiveness analysis: Numerator or denominator: A further discussion." *Health Economics* vol. 6, 1997, pp. 511-514.

Brouwer, Werner B. F., Anthony J. Cutler, N. Job A. van Exel, Frans F. H. Rutten. "Welfarism vs. Extra-welfarism," *Journal of Health Economics* vol. 27, no. 2, March 2008, pp. 325-338.

2/12 Assessing Effectiveness in CEAs

Gold et al., Ch. 5 (pp. 135-175).

Drummond et al., Ch. 5 (pp. 103-136).

*Johannesson, Magnus, Bengt Jönsson, Göran Karlsson. "Outcome Measurement in Economic Evaluation," *Health Economics* vol. 5, no. 4, Jul-Aug 1996, pp. 279-296.

*Detsky, Allan S. "Evidence of Effectiveness: Evaluating Its Quality," chapter 2 in *Valuing Health Care: Costs, Benefits and Effectiveness of Pharmaceuticals and Other Medical Technologies*, Frank A. Sloan, ed. Cambridge: Cambridge University Press, 1996, pp. 15-30.

2/17 Assessing Outcomes in CUAs

QUIZ #3

Gold et al., Ch. 4 (pp. 82-134).

Drummond et al., Ch. 6 (pp. 137-209).

*Salomon, Joshua A. "Reconsidering the use of rankings in the valuation of health states: a model for estimating cardinal values from ordinal data," *Population Health Metrics* vol. 1, 2003, p. 12.

*Dolan, Paul, Claire Gudex, Paul Kind, and Alan Williams. The Time Trade-off Method: Results from a General Population Study, *Health Economics* 5(2), Mar-Apr 1996, pp. 141-154.

2/19 Important Measures of General Health Status and Quality of Life

EuroQol (EQ-5D):

Kind, Paul, Paul Dolan, Claire Gudex, and Alan Williams. "Variations in population health status: results from a United Kingdom national questionnaire survey," *British Medical Journal* vol. 316, 1998, pp. 736-741.

Shaw, James W., Jeffrey A. Johnson, Stephen Joel Coons. "US Valuation of the EQ-5D Health States: Development and Testing of the D1 Valuation Model," *Medical Care* vol. 43, no. 3, March 2005, pp. 203-220.

*Krabbe, Paul and Tom Weijnen. "Guidelines for analyzing and reporting EQ-5D outcomes," in *The Measurement and Valuation of Health Status Using EQ-5D: A European Perspective*. Richard Brooks, Rosalind Rabin and Frank de Charro, editors. Dordrecht: Kluwer Academic Publishers, 2003. **ER**.

*The EuroQol Group. EuroQol-a new facility for the measurement of health-related quality of life. *Health Policy* 1990;16(3):199-208.

*Dolan P. Modeling valuations for EuroQol health states. *Medical Care* 1997;35(11):1095-108.

*Brooks, Richard, Rosalind Rabin, Frank de Charro. *The Measurement and Valuation of Health Status Using EQ-5D: A European Perspective Evidence from the EuroQol BIO MED Research Programme*. Dordrecht, NL: Kluwer Academic Publishers, 2003.

Health Utilities Index (HUI-III):

Feeny, David, William Furlong, George W. Torrance, Charles H. Goldsmith, Zenglong Zhu, Shoja DePauw, Margaret Denton, and Michael Boyle. "Multiattribute and single attribute utility functions for the Health Utilities Index Mark 3 System," *Medical Care* vol. 40, no. 2, February 2002, pp. 113-128.

*Furlong, William J., David H. Feeny, George W. Torrance, and Ronald D. Barr. "The Health Utilities Index (HUI) system for assessing health-related quality of life in clinical studies," *Ann Med* 2001: 33; 373-84.

*Feeny, David et al. "Multi-Attribute Health Status Classification Systems: Health Utilities Index," *Pharmacoeconomics* vol. 7, no. 6, 1995, pp. 490-502.

*Feeny, David H., George W. Torrance, and William J. Furlong. "Health Utilities Index," in *Quality of Life and Pharmacoeconomics in Clinical Trials, Second Edition*, edited by B. Spilker. Philadelphia: Lippincott-Raven, 1996.

Quality of Well-Being Index (QWB):

Kaplan, Robert M. and John P. Anderson. "The General Health Policy Model: An Integrated Approach," chapter 32 in *Quality of Life and Pharmacoeconomics in Clinical Trials, Second Edition*, B. Spiker, ed. Philadelphia: Lippincott-Raven, 1996, pp. 309-322.

Quality of Well-being Scale–Self Administered (QWB-SA) questionnaire. **You will be provided a copy in class.**

*Kaplan, R.M., Ganiats, T.G, Sieber, W.J. & Anderson, J.P. (1998)The Quality of Well-being Scale: Critical similarities and differences with the SF-36. *International Journal for Quality in Healthcare*. 10 (6), 509-520.

*National Emphysema Treatment Trial Research Group. "Cost Effectiveness of Lung-Volume Reduction Surgery for Patients with Severe Emphysema," *New England Journal of Medicine* 2003 vol. 348, pp. 2092-102.

Other Measures

*McDowell, Ian and Claire Newell. *Measuring Health: A Guide to Rating Scales and Questionnaires, Second Edition*. New York: Oxford, 1996. "General Health Status and Quality of Life," Chapter 9, pp. 380-492.

2/24 Other Important Measures of General Health Status and Quality of Life, Comparing Measures, and Biases in the Three Preference Elicitation Methods

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

Brazier, John, Tim Usherwood, Rosemary Harper, and Kate Thomas. "Deriving a Preference-Based Single Index from the UK SF-36 Health Survey," *Journal of Clinical Epidemiology* vol. 51, no. 11, 1998, pp. 1115-1128.

*Fryback, Dennis G. et al. "Predicting Quality of Well-being Scores from the SF-36: Results from the Beaver Dam Health Outcomes Study," *Medical Decision Making* vol. 17, no. 1, January-March, 1997, pp. 1-9.

*Nichol, Michael B., Nishan Sengupta, Denise R. Globe. "Evaluating Quality-Adjusted Life Years: Estimation of the Health Utility Index (HUI2) from the SF-36," *Medical Decision Making* vol. 21, no. 1, March/April 2001, pp. 105-112.

*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.

*Busschback, Jan J. V., Joseph McDonnell, Marie-Louise Essink-Bot, Ben A. van Hout. "Estimating Parametric Relationships between Health Description and Health Valuation with an Application to the EuroQol EQ-5D," *Journal of Health Economics* vol. 18, no. 5, 1999, pp. 551-571.

Self-reported Health Status

Nyman, John A., Nathan A. Barleen, Bryan E. Dowd, Daniel W. Russell, Stephen Joel Coons, Patrick Sullivan. "Quality-of-Life Weights for the U.S. Population: Self-reported Health Status and Priority Health Conditions," *Medical Care* vol. 45, no. 7, July 2007, pp. 618-628.

Comparative Review of Preference-Weighted Measures of HRQoL

Fryback, Dennis G., Nancy Cross Durham, Mari Palta, Janel Hammer, Jennifer Buechner, Dasha Cherepanov, Shani Herrington, Ron Hays, Robert Kaplan, Theodore G. Ganiats, David Feeny, Paul Kind. "US Norms for Six Generic Health-Related Quality-of-Life Indexes from the National Health Measurement Survey," *Medical Care* vol. 45, no. 12, December 2007, pp. 1162-1170.

*Kopex, Jacek A. and Kevin D. Willison. "A Comparative Review of Four Preference-Weighted Measures of Health-Related Quality of Life," *Journal of Clinical Epidemiology* vol. 56, no. 4, April 2003, pp. 317-325.

Issues of Bias with the SG, TTO and VAS

Bleichrodt, Hans. "A New Explanation for the Difference between Time Trade-Off Utilities and Standard Gamble Utilities," *Health Economics* vol. 11, no. 5, July 2002, pp. 447-456.

*Hornberger, J., D. Redelmeier and J. Petersen. "Variability among methods to assess patients' well-being and consequent effect on a cost-effectiveness analysis," *Journal of Clinical Epidemiology* vol. 45, no. 5, 1992, pp. 505-512.

*Bleichrodt, Hans and Magnus Johannesson. "Standard Gamble, Time Trade-off and Rating Scale: Experimental Results on the Ranking Properties of QALYs," *Journal of Health Economics* vol. 16, 1997, pp. 155-75.

*Martin, A., J, Glasziou, P. P., Simes, R. J., and Lumley, T. "A Comparison of Standard Gamble, Time Trade-off and Adjusted Time Trade-off Scores," *International Journal of Technology Assessment in Health Care* vol. 16, no. 1, 2000, pp. 137-147.

*Johannesson, Magnus, Joseph S. Pliskin, and Milton C. Weinstein. "A Note on QALYs, Time Tradeoff, and Discounting," *Medical Decision Making* vol. 14, no. 2, April-June 1994, pp. 199-193.

2/26 CUA Applied: Oregon Medicaid Program and CEA as Public Policy

QUIZ #4

Bodenheimer, Thomas. "The Oregon Health Plan—Lessons for the Nation." *New England J of Medicine* 337(9) August 29, 1997, pp. 651-5.

Blumstein, James F. "The Oregon Experiment: The Role of Cost-Benefit Analysis in the Allocation of Medicaid Funds," *Social Science and Medicine* vol. 45, no. 4, 1997, pp. 545-54.

Schultz, John W. "Defining Basic Health Benefits: Lessons Learned from the Oregon Health Plan," *Family Medicine* vol. 40, no. 6, 2008, 433-7.

Neumann, Peter J. "Why Don't Americans Use Cost Effectiveness Analysis?" *American Journal of Managed Care* vol. 10, no. 5, May 2004, pp. 308-312.

*Garber, Alan M. "Cost-Effectiveness and Evidence Evaluation as Criteria for Coverage Policy," *Health Affairs* Web Exclusive, 19 May, 2004, pp. W4-284 – W4-296.

*Mitchell, Janet B. "Impact of Oregon's Priority List on Medicaid Beneficiaries," *Medical Care Research and Review* 57(2), June 2000, pp. 216-234.

3/3 Cost-Benefit Analysis and Contingent Valuation

Drummond et al., Ch. 7 (pp. 211-245)

Neumann, Peter J. and Magnus Johannesson. "The willingness to pay for in vitro fertilization: A pilot study using contingent valuation," *Medical Care* vol. 32, 1994, pp. 686-99.

Diamond, Peter and Jerry A. Hausman. "Contingent Valuation: Is Some Number Better than No Number?" *Journal of Economic Perspectives* vol. 8, no. 4, 1984, pp. 45-64.

*Smith, Richard D. "Sensitivity to Scale in Contingent Valuation: The Importance of the Budget Constraint," *Journal of Health Economics* vol. 24, no. 3, May 2005, pp. 515-529.

*Boonen, A, J L Severens, A van Tubergen, R Landewé, G Bonsel, D van der Heijde and S van der Linden. "Willingness of patients with ankylosing spondylitis to pay for inpatient treatment is influenced by the treatment environment and expectations of improvement," *Annals of the Rheumatic Diseases* vol. 64, 2005, pp.1650-1652.

- *Diener, Alan, Bernie OBrien, Amiram Gafni. "Health care contingent valuation studies: a review and classification of the literature," *Health Economics* vol. 7, no. 4, June 1998, pp. 313-326.
- *O'Brien, B. and J. Viramontes. "Willingness to Pay: A Valid and Reliable Measure of Health State Preference?" *Medical Decision Making* vol. 14, no. 3, July/September, 1994, pp. 290-297.
- *Johannesson, Magnus. "The contingent valuation controversy in environmental economics and its relevance to health services research," *Journal of Health Services Research and Policy* vol. 1, 1996, pp. 116-7.
- *Pauly, Mark V. "Valuing Health Care Benefits in Money Terms," in Frank Sloan, editor, *Valuing Health Care*. New York: Cambridge University Press, 1995, pp. 99-124.

3/5 Cost-Benefit Analysis: Value of Human Life and of Quality Adjusted Years of Life

Lindsay Bockstedt, PhD candidate

QUIZ #5

- Viscusi, W. Kip. "The Value of Risks to Life and Health," *Journal of Economic Literature* vol. 31, no. 4, December 1993, pp. 1912-1946.
- Hirth, Richard A, Michael E. Chernew, Edward Miller, A. Mark Fendrick, William G. Weissert. "Willingness to Pay for a Quality-adjusted Life Year: In Search of a Standard," *Medical Decision Making* vol. 20, no. 3, Jul-Sep 2000, pp. 332-342.
- *Viscusi, W. Kip and Joseph E. Aldy. The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World, *Journal of Risk and Uncertainty* vol. 27, no. 1, 2003, pp. 5-76.
- *Johannesson, Magnus and David Meltzer. "Some Reflections on Cost-Effectiveness Analysis," *Health Economics* vol. 7, no. 1, Feb 1998, pp. 1-7.
- *Berwick, D. and M. Weinstein. "What Do Patients Value? Willingness to Pay for Ultrasound in Normal Pregnancy," *Medical Care* vol. 23, no. 7, July 1985, pp. 881-893.

3/10 Discounting Debate

- Gold et al. Ch. 7 (pp. 214-246).
- Drummond et al. Pp. 73-78.
- Brower WBF, Niessen LW, Postma MJ, Rutten FFH. "Need for differential discounting of costs and health effects in cost-effectiveness analysis," *British Medical Journal* vol. 331, 2005, pp. 446-448.
- Claxton, Karl, Mark Sculpher, Anthony Culyer et al. "Discounting and cost-effectiveness in NICE—stepping back to sort out a confusion," *Health Economics* vol. 15, 2006, pp. 1-4.

Keeler, Emmett B. and Shawn Cretin. "Discounting of Life-Saving and Other Nonmonetary Effects," *Management Science* vol. 29, 1983, pp. 300-306.

Weinstein, Milton C. and William B. Stason. "Foundations of Cost-Effectiveness Analysis for Health and Medical Practices," *New England Journal of Medicine* vol. 296, no. 13, March 31, 1977, pp. 716-721.

*Gravelle, Hugh, Werner Brouwer, Louis Niessen, Maarten Postma, Frans Rutten. "Discounting in economic evaluations: Stepping forward towards optimal decision rules," *Health Economics* vol. 16, 2007, pp. 307-317.

*Gravelle, Hugh, and Dave Smith. "Discounting for Health Effects in Cost-Benefit and Cost-Effectiveness Analysis," *Health Economics* vol. 10, no. 7, October 2001, pp. 587-599. **EJ.**

*Parsonage, Michael and Henry Neuburger. "Discounting and Health Benefits," *Health Economics* vol. 1, no. 1, April 1992, pp. 71-76.

*Cairns, John. "Discounting and Health Benefits: Another Perspective," *Health Economics* vol. 1, no. 1, April 1992, pp. 76-79.

*Van Hout, Ben A. "Discounting Costs and Effects: A Reconsideration," *Health Economics* vol. 7, no. 7, November 1998, pp. 581-594.

*Revesz, Richard L. "Environmental Regulation, Cost-Benefit Analysis and Discounting of Human Lives," mimeo, 1999.

Assignments 1-5 using TreeAge distributed before Spring Break.

3/12 **MIDTERM**

Spring Break

3/24 Medical Decision Making

Drummond et al., Ch. 9 (pp. 277-322)

Detsky, Allan, Gary Naglie, Murray D. Krahn, David Naimark, and Donald A. Redelmeier. "Primer on Medical Decision Making," *Medical Decision Making* vol. 17, no. 2, Apr-Jun 1997, pp. 123-159.

*Sonnenberg, Frank A. "Decision Analysis in Disease Management." *Disease Management and Clinical Outcomes* vol. 1, no.1, 1997, pp. 20-34.

3/26 TreeAge Pro 1: Decision Trees

TreeAge Pro for Healthcare Users' Manual.

Ch. 1: Decision Analysis Primer [Gives an overview and then an example of whether to invest \$1,000 in a CD at 5% or in a risky asset.]

Ch. 2: Decision Tree Tutorial [Builds a decision tree for the \$1,000 investment problem.]

Ch. 4: Printing and Presenting Trees and Influence Diagrams

- Ch. 5: Analyzing Decision Trees [Explains rollback, ranking when more than 2 alternatives exist, deterministic decision analysis v. simulations, probability distributions, comparative probability distribution and expected value of perfect information.]
- Ch. 7: Tree Calculation Methods and Preferences [Explains how to change what the rollback calculates, multiple payoffs]
- Ch. 8: Selecting Sub-trees and Multiple Nodes
- Ch. 9: Making Changes to the Tree Structure [Adding and deleting branches, etc.]
- Ch. 10: Annotating the Tree [Labeling branches, etc.]

3/31 Decision-Analytic Models: Markov models

Sonnenberg, Frank A. and J. Robert Beck. "Markov Models in Medical Decision Making: A Practical Guide," *Medical Decision Making* vol. 13, no. 4, Oct-Dec 1993, pp. 322-338.

*Beck, J. Robert and Stephen G. Pauker. "The Markov Process in Medical Prognosis." *Medical Decision Making* vol. 3, no. 4, 1983, pp. 419-458.

*Morris, Stephen. "A Comparison of Economic Modeling and Clinical Trials in the Economic Evaluation of Cholesterol-Modifying Pharmacotherapy" *Health Economics* vol. 6, 1997, pp. 589-601.

4/2 TreeAge Pro 2: Markov Models

ASSIGNMENT #1 DUE

TreeAge Pro for Healthcare Users' Manual.

- Ch. 31: Building and Analyzing Cost-effectiveness Models [Explaining again how to build CEA models, but this time, in health care.]
- Ch. 32: Cost-effectiveness Modeling and Analysis Options [Explaining these in a healthcare context.]
- Ch. 33: Cost-Effectiveness Simulation Reports and Graphs [Explaining how to get results out of your CEA model, again in healthcare.]
- Ch. 34: Building and Analyzing Markov Models [Setting up the model.]
- Ch. 35: Markov Modeling Tools and Techniques [Understanding necessary technicalities like "cycle zero," the half-cycle correction, transition rewards, temporary states, tunnel states, probability/rate conversion functions, etc.]
- Ch. 36: Individual-level Simulation and Markov Models [Understanding trackers and probabilistic sensitivity analysis in a Markov context.]

Johannesson, Magnus, Bengt Jonsson, John Kjekshus, Anders G. Olsson, Terje R. Pederson, Hans Wedel. "Cost Effectiveness of Simvastatin Treatment to Lower Cholesterol Levels in Patients with Coronary Heart Disease," *New England Journal of Medicine* vol. 336, no. 5, January 30, 1997, pp. 332-336.

4/7 Reflecting Uncertainty in CEAs

Gold et al., Ch. 8, pp. 247-255.

Fenwick E, Claxton K, Sculpher M. "Representing uncertainty: The role of cost-effective acceptability curves," *Health Economics* vol. 10, 2001, pp. 779-789.

- *Briggs, Andrew, Paul Fenn. "Confidence intervals or surfaces? Uncertainty on the cost-effectiveness plane," *Health Economics* vol. 7, 1998, pp. 723-40.
- *Lothgren, Mickael and Niklas Zethraeus. "Definition, interpretation and calculation of cost-effectiveness acceptability curves," *Health Economics* vol. 9, 2000, pp. 623-30.
- *Briggs, A., M. Sculpher, and M. Buxton. "Uncertainty in the economic evaluation of health care technologies: the role of sensitivity analysis," *Health Economics*, vol. 3, 1994, pp. 95-104.
- *Doubilet, Peter, Colin B. Begg, Milton C. Weinstein, Peter Braun, and Barbara J. McNeil. "Probabilistic Sensitivity Analysis Using Monte Carlo Simulation." *Medical Decision Making*, vol. 5, no. 2, 1985, pp. 157-177.
- *Castillo, Paul A., Cynthia S. Palmer, Michael T. Halpern, Evi J. Hatziandreu, and Bernard J. Gersh. "Cost-Effectiveness of Thrombolytic Therapy for Acute Myocardial Infarction." *Annals of Pharmacotherapy* vol. 31, 1997, pp. 596-603.
- *Briggs, Andrew and Mark Sculpher. "Sensitivity Analysis in Economic Evaluation: A Review of Published Studies," *Health Economics* vol. 4, 1995, pp. 355-371.
- *Taylor, Jennifer L., Martin Zagari, Karen Murphy, and James W. Freston. "Pharmacoeconomic Comparison of Treatments for the Eradication of *Helicobacter pylori*." *Archives of Internal Medicine* vol. 157, 1997, pp. 87-97.

4/9 TreeAge Pro 3: Sensitivity Analysis

ASSIGNMENT #2 DUE

TreeAge Pro for Healthcare Users' Manual.

Ch. 12: Introduction to Variables and Sensitivity Analysis [Defining variables for sensitivity analysis, performing one-way sensitivity analysis, understanding the sensitivity analysis graph.]

Ch. 13: Working with Variables [Figuring out different ways to express the uncertainty.]

Ch. 15: More Sensitivity Analysis Tools [Becoming acquainted with two-way sensitivity and threshold analysis]

4/14 Reporting Standards for Cost-Effectiveness Studies

Gold et al., Ch. 9 (pp. 276-311).

Gold et al., Appendix A (pp. 304-311).

Drummond et al., Ch. 10 (pp. 323-364).

*Chiou, Chiun-Fang, Joel W. Hay, Joel F. Wallace, Bernard S. Bloom, Peter J. Neumann, Sean D. Sullivan, HSing-Ting Yu, Emmett B. Keeler, James M. Henning, Joshua J. Ofman. "Development and validation of a grading system for the quality of cost-effectiveness studies," *Medical Care* vol. 41, no. 1, January 2003, pp. 32-44.

4/16 TreeAge Pro 4: Statistical Sensitivity Analysis

ASSIGNMENT #3 DUE

TreeAge Pro for Healthcare Users' Manual.

Ch. 16: Monte Carlo Simulations, Distributions and Probabilistic Sensitivity Analysis [Using simulations to determine distribution and sensitivity analysis with a distribution.]

Ch. 17: Distribution Functions, Options, and Types [How to access and apply different distributions for the probability sensitivity analysis.]

Ch. 18: Creating and Using Tables [How to create and use tables]

Claxton, Karl, Mark Sculpher, Chris McCabe, Andrew Briggs, Ron Akehurst, martin Buxton, John Brazier, Tony O'Hagan. "Probabilistic sensitivity analysis for NICE technology assessment: not an optional extra," *Health Economics* vol. 14, no. 4, 2005, pp. 339-347.

4/21 Stochastic CEAs and the Statistical Evaluation of ICERs

Melissa S. Martinson, Ph.D.

Drummond Ch. 8. (pp.247-276)

Halpern EF, Weinstein MC, Hunink MGM, et al. "Representing Both First- and Second-Order Uncertainties by Monte Carlo Simulation for Groups of Patients," *Medical Decision Making* vol. 20, no. 3, 2000, pp. 314-322.

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*Briggs, Andrew H., David E. Wonderling, and Christopher Z. Mooney. "Pulling Cost-Effectiveness Analysis up by its Bootstraps: A Non-Parametric Approach to Confidence Interval Estimation," *Health Economics* vol. 6, 1997, pp. 327-340.

*Campbell, Marion and David Torgerson. "Confidence intervals for cost-effectiveness ratios: the use of 'bootstrapping'." *Journal of Health Services Research and Policy* vol. 2, no. 4, 1997, pp. 253-255.

*Obenchain, Robert L., Catherine A. Melfi, Thomas W. Croghan and Don P. Beusching. "Bootstrap Analyses of Cost Effectiveness in Antidepressant Pharmacotherapy." *Pharmacoeconomics*, vol. 11, no. 5, 1997, pp. 464-472.

*O'Brien, Bernie J., Michael F. Drummond, Roberta J. LaBelle, and Andrew Willan. 1994. "In Search of Power and Significance: Issues in the Design and Analysis of Stochastic Cost-Effectiveness Studies in Health Care." *Medical Care* vol. 32, no. 2, 1994, pp.150-163.

*Davey, P., B. Lynch, M. Malek, et al. "Cost-effectiveness of Single Dose Cefotaxime Plus Metronidazole Compared with Three Doses Each of Cefuroxime Plus

Metronidazole for the Prevention of Wound Infection after Colorectal Surgery." *Journal of Antimicrobial Chemotherapy* vol. 30, no. 6, 1992, pp. 855-864.

4/23 Do Not Believe Everything That You Read

Richard R. Wilson, M.D.

ASSIGNMENT #4 DUE

American College of Physicians. "Information on Cost-Effectiveness: An Essential Product of a National Comparative Effectiveness Program," *Annals of Internal Medicine* vol. 148, no. 12, 17 June 2008, pp. 956-961.

Als-Nielsen, Bodil, Wendong Chen, Chrisitan Cluud, Lise L. Kjaergard. "Association of Funding and Conclusions in Randomized Drug Trials: A Reflection of Treatment Effect or Adverse Events?" *Journal of the American Medical Association*, vol. 290, no. 7, August 20, 2003, pp. 921-928.

Turner, Erick H., Annette M. Matthews, Eftihia Linardatos, Robert A. Tell, Robert. "Selective Publication of Antidepressant Trials and Its Influence on Apparent Efficacy," *New England Journal of Medicine* vol. 358, January 17, 2008, pp. 252-260.

4/28 State, National and International CEA Policy

Minnesota's Institute for Clinical Systems Improvement (ICSI). Technology Assessment Reports. Read one report as an example, available on the web at: http://www.icsi.org/guidelines_and_more/technology_assessment_reports/technology_assessment_reports_-_active/

Emmanuel, Ezekiel, Victor R. Fuchs, Alan M. Garber. "Essential Elements of a Technology and Outcomes Assessment Initiative," *JAMA* vol. 298, no. 11, September 19, 2007, pp. 1323-1325.

Mahar, Maggie. "Comparative vs. Cost-Effectiveness," *Taking Note Blog* June 24, 2008. Available at: <http://takingnote.tcf.org/2008/06/comparative-vs.html>.

Mahar, Maggie. "Making Use of Comparative Effectiveness Research," *Taking Note Blog* December 5, 2008. Available at: <http://takingnote.tcf.org/2008/12/making-use-of-comparative-effectiveness-research.html>.

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Tufts Medical Center, Institute for Clinical Research and Health Policy Studies, CEA Registry, Center for the Evaluation of Value and Risk in Health, Peter J. Neumann. (This used to be at Harvard Center for Risk Assessment but moved to Tufts). Check out the CEA Registry at <https://research.tufts-nemc.org/cear/Default.aspx>. Try a search using their program.

United Kingdom's National Institute for Clinical Excellence (NICE). *Guide to the Methods of Technology Appraisal*, June, 2008. Skim the guide, available on the web at:

<http://www.nice.org.uk/aboutnice/howwework/devnicetech/technologyappraisalprocessguides/guidetothemethodsoftechnologyappraisal.jsp?domedia=1&mid=B52851A3-19B9-E0B5-D48284D172BD8459>

Check out the NICE website: <http://www.nice.org.uk>.

Check out NICE's guidance policies: <http://www.nice.org.uk/guidance/index.jsp>.

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*Gold et al., Ch. 3 (pp. 54-81).

*Gold, Marthe R., Peter Franks, Kristine I. McCoy, and Dennis G. Fryback. "Toward Consistency in Cost-Utility Analysis: Using National Measures to Create Condition-Specific Values," *Medical Care* vol. 36, no. 6, June 1998, pp. 778-792.

4/30 Applications I

Gold et al. "Appendix B: Cost-Effectiveness of Strategies to Prevent Neural Tube Defects," pp. 313-348.

*Gold et al. "Appendix C: The Cost-Effectiveness of Dietary and Pharmacologic Therapy for Cholesterol Reduction in Adults," pp. 349-391.

5/5 Applications II

ASSIGNMENT #5 DUE

Stason, W. and M. Weinstein. "Allocation of Resources to Manage Hypertension," *New England Journal of Medicine* vol. 296, no. 13, March 31, 1977, pp. 732-739.

Brown, Kaye and Colin Burrows. "The Sixth Stool Guaiac Test: \$47 Million that Never Was," *Journal of Health Economics* vol. 9, no. 4, 1990, pp. 375-512.

5/7 Applications III and Review

Nyman, John A., Nathan A. Barleen, Phatta Kirdurang. "The QALYs Lost from Non-fatal Motor Vehicle Accident Injuries," *Medical Decision Making* vol. 28, no. 6, November/December 2008, pp. 819-828.

Nyman, John A., Nathan A. Barleen, Bryan E. Dowd. "A Return-on-Investment Analysis of the Health Promotion Program at the University of Minnesota," *Journal of Occupational and Environmental Medicine* vol. 51, no. 1, January 2009, pp. 54-65.

*Nyman, John A., Melissa Martinson, et al., "Cost Effectiveness of Gemfibrozil for Coronary Patient with Low Levels of High Density Lipoprotein Cholesterol: The

VA-HDL Intervention Trial,” *Archives of Internal Medicine* vol. 162, no. 2, January 28, 2002, pp. 177-182.

*Frazier, A. Lindsay, Graham A. Colditz, Charles S. Fuchs, Karen M. Kuntz. “Cost-effectiveness of Screening for Colorectal Cancer in the General Population,” *JAMA*. Vol. 284, no. 15, October 18, 2000, pp. 1954-1961.

5/12 **FINAL EXAM** 4:00 - 6:00 pm, regular classroom

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have a documented disability (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact Disability Services to have a confidential discussion of their individual needs for accommodations. Disability Services is located in Suite 180 McNamara Alumni Center, 200 Oak Street. Staff can be reached by calling 612/626-1333 (voice or TTY).”

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