

School of Public Health

Syllabus and Course Information



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

PubH 6862

Cost-Effectiveness Analysis in Health Care

Spring 2019 (First Half)

Credits: 3 hours
Meeting Days: Tu, Th
Meeting Time: 1:00 – 2:15 pm
Meeting Place: W2120 Weaver Densford Hall

Professors: John A. Nyman, PhD
Office Addresses: 15-219 Phillips-Wangensteen Bldg
Office Phones: 612 303 4932
E-mails: nyman001@umn.edu
Office Hours: By appointment

Karen M. Kuntz, ScD
D360 Mayo Bldg
612 625 9333
kmkuntz@umn.edu
By appointment

Teaching Assistant: Kael Wherry
Email: wher0013@umn.edu
Office Hours (starting 2/7): Th 3:30-5p
Office Hour Venue: HMP Conference Room, 15-220 Phillips-Wangensteen Bldg

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: $(3.333 \times 0.333) + (3.667 \times 0.333) + (4.000 \times .0167) + (4.000 \times .0167) = 3.667$. 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.

Average	Grade
3.667 - 4.000	A
3.500 - 3.667	A-
3.333 - 3.500	B+
2.667 - 3.333	B
2.500 - 2.667	B-
2.333 - 2.500	C+
Etc.	

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.

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.		

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 Texts and Readings

1. Neumann, Peter J., Gillian D. Sanders, Louise B. Russell, Joanna E. Siegel, Theodore G. Ganiats, editors. *Cost-Effectiveness in Health and Medicine, Second Edition*. New York: Oxford U Press, 2017.
2. Drummond, Michael F. et al. *Methods for the Economic Evaluation of Health Care Programmes, Fourth Edition*. Oxford: Oxford U Press, 2015.
3. *TreeAge Pro for Healthcare User's Manual*. Williamstown, MA: TreeAge Software, Inc., 2017, available on line.
4. Required papers are available at the library's electronic journals or will be distributed directly through the internet.

VIII. Course Outline/Schedule

Date Topic Readings (* = optional reading)

1/22 Economic Foundations (Nyman)

*Dixit, Avinash. *Microeconomics: A Very Short Introduction* (Oxford University Press, 2014)

*<https://www.khanacademy.org/economics-finance-domain/microeconomics>.

*Folland, Sherman, Allen C. Goodman, Miron Stano. "Microeconomic Tools for Health Economics," Chapter 2 in *The Economics of Health and Health Care, 6th Edition*. Upper Saddle River, NJ: Pearson Education, Inc., 2010, pp. 20-52.

1/24 Welfare Theory and Extra-Welfarism (Nyman)

Neumann et al. Ch. 2 (pp. 39-65).

Drummond et al. Ch. 2 (pp. 19-40).

Brouwer, Werner B. F., Anthony J. Culyer, 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.

*Kahneman, Daniel, Peter P. Wakker and Rakesh Sarin. "Back to Bentham? Exploration of Experienced Utility," *Quarterly J of Economics* vol. 112, no. 2, May 1997, pp. 375-405.

*Misham, E. J., and Euston Quah. *Cost-Benefit Analysis: Fifth Edition*. New York: Routledge, 2007, Ch. 4, pp. 23-31.

*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.

1/29 Making Collective Decisions (Nyman)

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.

*Sen, Amritya. "The Possibility of Social Choice," *American Economic Review* vol. 89, n.3, 1999, pp. 349-378. <http://www.jstor.org/stable/pdfplus/117024.pdf?acceptTC=true>

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).

*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.

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

Quiz #2

Neumann et al., 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).

*Detsky, Allan, et al. "Primer on Medical Decision Making: Part 1, 2, 3 and 4," *Medical Decision Making* vol. 17, no. 2, Apr-Jun 1997, pp. 123-151

*Weinstein, Milton C. "Recent Developments in Decision-Analytic Modeling for Economic Evaluation," *Pharmacoeconomics* vol. 24, no. 11, 2006, pp. 1043-1053.

*Weinstein, Milton C. et al. "Principles of Good Practice for Decision Analytic Modeling in Health-Care Evaluation: Report of the ISPOR Task Force on Good Research Practices—Modeling Studies," *Value in Health* vol. 6, no. 1, 2003, pp. 9-17.

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

*Kuntz, K., M. Weinstein. "Modeling in Economic Evaluations," Chapter 7 in Drummond, M., A. McGuire. *Economic Evaluation in Health Care: Merging Theory with Practice*. Oxford: oxford U Press, 2001

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).

*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.

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

Section 6.2 in TreeAge Pro User's Manual for 2017, pp. 51-67.

Please bring a laptop computer to class.

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

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

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

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).

*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.

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

EuroQol (EQ-5D):

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.

*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.

*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.

*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.

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

Brazier, John, Jennifer Roberts, Mark Deverill. "The Estimation of a Preference-Based Measure of Health from the SF-36," *J of Health Econ* vol. 21, 2002, pp. 271-92.

*Craig, Benjamin A. "Unchained Melody: Revisiting the Estimation of SF-6D Values," *European Journal of health Economics* vol. 17, 2016, pp. 865-73.

*Craig, Benjamin M., A. Simon Pickard, Elly Stolk, John E. Brazier, "US Valuation of the SF-6D," *Medical Decision Making*, vol. 33, August 2013, pp. 793-803.

*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, Jan-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.

Health Utilities Index (HUI3):

*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):

- *Seiber, William J., Erik J. Groessl, Kristin M. David, Theodore G. Ganiats, Robert M. Kaplan. *Quality of Well Being Self-Administered (QWB-SA) Scale User's Manual* 2008. <https://hoap.ucsd.edu/qwb-info/QWB-Manual.pdf>.
- *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.
- *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.

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).

*Briggs, Weinstein, Fenwick, Karmon, Sculpher and Paltiel, "Model parameter estimation and uncertainty analysis: a report of the ISPOR-SMDM Modeling Good Research Practices Task Force Working Group-6," *Med Dec Making* 32(5), 2012, pp. 722-32.

*Claxton K. "The irrelevance of inference: a decision-making approach to the stochastic evaluation of health care technologies," *Journal of Health Economics* vol. 18, 1999, pp. 341-64.

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

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

Briggs AH, Goeree R, Blackhouse G, O'Brien BJ. Probabilistic Analysis of Cost-Effectiveness Models: Choosing between Treatment Strategies for Gastroesophageal Reflux Disease. *Med Decis Making*, 2002 Jul 1, vol. 22, no. 4, pp. 290–308.

Doubilet P, Begg CB, Weinstein MC, Braun P, McNeil BJ. Probabilistic Sensitivity Analysis Using Monte Carlo Simulation: A Practical Approach. *Med Decis Making*. 1985 Jan 1;5(2):157–77.

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.

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.

*Ray, Kristin N, Amalavoyal V Chari John Engberg Marnie Bertolet Ateev Mehrotra Opportunity costs of ambulatory medical care in the United States. *The American journal of managed care*, vol. 21, no 18, 2015, pp.567-574.

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

3/7 Cost Issues in Cost Utility Analyses (Nyman)

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. "Cost Recommendations in the 2nd Edition of *Cost-Effectiveness and Medicine: A Review*," *Medical Decision Making Policy and Practice*, forthcoming.

*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.

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

*Nyman, John A. "Productivity Costs Revisited: Towards a New U.S. Policy," *Health Economics* vol. 21, no. 12, December 2012, pp. 1387-1401.

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

*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.

*Koopmanschap, Marc A., Job N.A. vanExel, Bernard van den Berg, Werner B. F. Brouwer. "An Overview of Methods and Applications to Value Informal Care in Economic Evaluations of Healthcare," *Pharmacoeconomics* vol. 26, no. 4, 2008, pp. 269-280.

*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.

3/12 Cost exercise (Enns)

Homework #2 due

3/14 Midterm Exam

Spring Break