

**THE WHARTON SCHOOL  
University of Pennsylvania**

**COST-BENEFIT AND COST-EFFECTIVENESS ANALYSIS**

**HCMG 901/301**

**Fall 2009**

**Thursdays 3:00-5:30, CPC Auditorium**

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## **OVERVIEW**

This seminar-style course provides an introduction to the use of cost-benefit and cost-effectiveness analysis in health care. We examine both the underlying theory and the practical application of these techniques, using studies from the literature and issues discussed by students in class. The focus is on applications in health care, which differ from those used in contexts of public decision-making. A key focus will be on the extent to which this type of analysis assembles information which decision-makers do or should find helpful, especially in the context of public and private insurance.

## **COURSE FORMAT AND REQUIREMENTS**

Class participation. The class format is lecture/discussion. We will take a break at about 4:15. Students are expected to read the required readings before each session and come prepared to participate in class discussion.

Short midterm paper. Students will be asked to write a short (10 page) paper critiquing and commenting upon the relevance of the methods and the conclusions of the published studies on the cost effectiveness of screening for Abdominal Aortic Aneurysm. Critiques should concentrate on the fundamental ideas in cost-benefit and cost-effectiveness analysis. They

should also deal both with the extent to which they provide useful information for relevant decision-makers and. the extent to which these studies meet the criteria proposed by the Consensus Conference on Guidelines on Economic Modeling in Health Technology Assessment (*Pharmacoeconomics*, May 2000) and the checklist provided in Chapter 3 of the Drummond book. **Due date October 15** (30%).

Three-quarter quiz. This is a closed book, in-class test, administered after completion of the formal analysis material. It will cover the main principles and methods that have been covered in the readings and lectures (30%). **The quiz will be November 12.**

Term project. Each student will develop a term project in the form of a decision-maker's question and a CB or CE analysis which would answer it (on a topic of your choice, subject to approval). **An outline of the topic and proposed approach will be due on October 29.** The term project will be presented orally, with written supplementation (40%) on the last day of class: **December 10.**

## CLASS OUTLINE AND READINGS

Below is a list of required and supplementary textbooks. A coursepack of additional required reading (journal articles, etc.) is available for order online through [www.study.net](http://www.study.net). You may choose to download electronic copies of the files, or request a hard-copy coursepack. Readings that are optional are indicated in the reading list with an asterisk; they may be referred to in class.

### Required Texts (available at Penn Bookstore)

Drummond, Michael E., Mark Sculpher, Bernie O'Brien, Greg Stoddart, and George W. Torrance. Methods for the Economic Evaluation of Health Care Programmes, 3rd ed., 2005.

Neumann, Peter. Using Cost Effectiveness Analysis to Improve Health Care. Oxford University Press, 2005.

Brent RJ. Cost-Benefit Analysis and Health Care Evaluations. Edward Elgar. 2003.

### Additional Texts (available at Penn Bookstore)

Gold, Martha. Cost Effectiveness in Health and Medicine. Oxford University Press, 1996.

### Basic Cost-Benefit Texts (not required)

Boardman AE, Greenberg DH, Vining AR, Weimer DL. Cost-Benefit Analysis: Concepts and Practice. Third Edition. Pearson Education, Inc. 2006.

Other course materials will be posted throughout the semester to the course e-room on webCafé at <https://webcafe.wharton.upenn.edu/eRoom/hcmg/901-fa09-1>. ***Please note: Non-Wharton students will need a Wharton ID to access the web page.*** Wharton IDs can be obtained by going to Wharton Computer Consulting in Room F35, Jon M. Huntsman Hall, or by applying online at <http://apps.wharton.upenn.edu/accounts/class/index.cfm>.

Session 1: **Introduction to Concepts (MP)**  
September 10

**Key Concepts**

- **CEA and CBA**
- **Incremental analysis**
- **Decision analysis**
- **Value-based medicine and value-based pricing (first look)**

Drummond et al., Chapters 1-2.

Neumann, Chapter 1.

Eisenberg, “Clinical Economics: A Guide to the Economic Analysis of Clinical Practices,” *Journal of the American Medical Association*, November 24, 1989.

Stokey and Zeckhauser, A Primer for Public Policy, Chapter 9.

Garber, “Cost Effectiveness and Evidence Evaluations as Criteria for Coverage Policy,” *Health Affairs Web Exclusive*, May 19, 2004.

Session 2: **Welfare Economic and Other Foundations of Cost-benefit and Cost-Effectiveness Analysis (MP)**  
September 17

- **Efficiency; market failure**
- **First theorem of welfare economics**
- **Private vs. social measurement of cost and benefit**
- **Equity vs. efficiency**
- **Consumers’ surplus; opportunity cost; transfer payments**
- **External effects; altruism**

Chapman RH, Neumann PJ, “Web Site Offers Comprehensive List of Cost-Utility Ratios in Health and Medicine,” Paper for *Risk in Perspective* Series of the Harvard Center of Risk Analysis, November 2000; 8(8).

Borenstein, S, “Youth Fare Better than Elderly in Bush Administration’s Cost-Benefit Analyses,” *Knight-Ridder Tribune Business News*,

December 19, 2002.

Weinstein M, “From Cost-Effectiveness Ratios to Resource Allocation: Where to Draw the Line?” (in Sloan).

Weisbrod, Test and Stein, “Alternatives to Mental Hospital Treatment,” *Arch Gen Psychiatry* (1980).

Davis MM, “Varicella Vaccine, Cost-effectiveness Analyses, and Vaccination Policy,” Editorial in *JAMA* 294, no. 7 (August 17, 2005).

Session 3:  
September 24

## **Welfare Economics II (MP); CE analysis Example (DP)**

*Welfare Economics II: Remaining readings from Session 2*

### **Examples of CE Analysis**

- ***Important!!* Read these five articles and be prepared to discuss (and eventually write about) how they illustrate (or confuse) methods and models in CE and CB analysis!!**

Kolata G, “Aneurysm Tests Urged in Older Men Who Smoked,” *New York Times*, February 1, 2005.

Lee TY et al., “The Cost-Effectiveness of a ‘Quick-Screen’ Program for Abdominal Aortic Aneurysms,” 2002.

Frame PS, Fryback DG, and Patterson C, “Screening for Abdominal Aortic Aneurysm in Men Ages 60-80 Years: A Cost-Effectiveness Analysis,” *Annals of Internal Medicine* 119, no. 5 (1993): 411-416.

Multicentre Aneurysm Screening Study Group, “Multicentre Aneurysm Screening Study (MASS): Cost Effectiveness Analysis of Screening for Abdominal Aortic Aneurysms Based on Four Year Results from Randomised Controlled Trial,” *BMJ* 325 (16 November 2002).

Kim LG, et al., “A Sustained Mortality Benefit from Screening for Abdominal Aortic Aneurysm,” *Annals of Internal Medicine*. 2007 May 15; 146(10):699-706.

### **Part II: Key Concepts**

Drummond et al., Chapter 3.

Drummond, Table 2, from “Allocating Resources,” *International Journal of Technology Assessment in Health Care* (1990).

Consensus Conference Statement, “Decision Analytic Modeling in the Economic Evaluation of Health Technologies: A Consensus Statement,” *Pharmacoeconomics* (May 2000): 443-444.

Session 4: **Introduction to CE Analysis and Decision Analysis (HG)**  
October 1

**Key Concepts**

- **Introduction to CE Analysis: What question does it answer?**
- **What is Quality of Life (QOL)**
- **How does QOL relate to other quality measures?**
- **Instruments for measuring QOL (validity, reliability, etc.)**
- **Examples of QOL studies**

Glick, Doshi, Sonnad, Polsky. Chapter 7, “Comparing Cost and Effect: Point Estimates for Cost-Effectiveness Ratios and Net Monetary Benefit,” *Economic Evaluation in Clinical Trials* (2007).

Drummond et al., Chapter 5.

Stinnett and Mullahy. “Net Health Benefits: A New Framework for the Analysis of Uncertainty in Cost-Effectiveness Analysis,” *Medical Decision Making* 18, suppl. (1998): S68-S80.

Session 5: **QALYs, QOL\* and Cost-utility Approaches (HG)**  
October 8

**Key Concepts**

- **Values vs. Utilities**
- **Methods of measuring preferences (other than willingness to pay)**
- **Defining and measuring QALY weights**
- **Healthy Year Equivalents: the controversy**
- **Disability-adjusted life years**

\*Guyatt, Feeny and Patrick, “Measuring Health-related Quality of Life,” *Annals of Internal Medicine* 118 (1993): 622-629.

\*Fitzpatrick, Fletcher, Gore, Jones, Spiegelhalter and Cox, “Quality of Life Measure in Health Care I: Applicants and Issues in Assessment,” *British Medical Journal* 305 (1992): 1074-1077.

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\* May be skipped.

\*Fitzpatrick, Fletcher, Gore, Jones, Spiegelhalter and Cox, “Quality of Life Measure in Health Care II: Design Analysis and Interpretation,” *British Medical Journal* 305 (1992): 1145-1146.

Medical Outcomes Trust, “Scientific Advisory Committee Instrument Review Criteria,” *Medical Outcomes Trust Bulletin* (September 1995): I-IV.

Glick, Doshi, Sonnad, Polsky, Chapter 4, "Assessing Quality-Adjusted Life Years," *Economic Evaluation in Clinical Trials*, 2007.

McNeil et al., “Speech and Survival: Tradeoffs between Quantity and Quality of Life with Laryngeal Cancer,” *New England Journal of Medicine* (1981).

Nord, Richardson, and Macarounas-Kirchmann, “Social Evaluation of Health Care versus Personal Evaluation of Health States,” *International Journal of Technology Assessment in Health Care* (1993): 463-478.

Bala MV, Zarkin G, “Are QALY’s an Appropriate Measure for Valuing Morbidity in Acute Diseases?” *Health Economics* (March 2000).

Loomes and McKenzie, “The Use of QALYs in Health Care Decisionmaking,” *Social Science and Medicine* (1989).

Keeney and Raiffa, Decisions with Multiple Objectives: Preferences and Value Tradeoffs, Chapters 3 and 5.

Session 6: **QALYs, QOL\* and Cost-utility Approaches II (HG); Statistical Issues in CEA and CBA I (HG)**  
October 15

#### ***SHORT PAPER DUE***

*QALYs, QOL and Cost-utility Approaches: Finish readings from Session 6*

#### **Statistical Issues in CEA and CBA**

##### **Key Concepts**

- **Implementation**
- **Analysis**
- **Validity**

Thompson S, Barber J, “How Should Cost Data in Pragmatic Randomised Trials Be Analysed,” *BMJ* 320 (2000): 1197-1200.

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\* May be skipped.

Glick, Doshi, Sonnad, Polsky, Chapter 8, "Understanding Sampling Uncertainty: The Concepts," *Economic Evaluation in Clinical Trials*, Forthcoming.

Glick, Doshi, Sonnad, Polsky, Chapter 9, "Sampling Uncertainty: Calculation, Sample Size and Power, and Decision Criteria," *Economic Evaluation in Clinical Trials*, Forthcoming.

Session 7:  
October 22      **Statistical Issues II (HG)**

Session 8:  
October 29      **Intro. to Cost Measurement: Theory and Practice (DP);**

**Key Concepts**

- **Opportunity cost; sunk costs, overhead costs; marginal costs**
- **Allocation of joint and/or overhead costs**
- **Approaches to cost estimation**
- **Discounting**

Drummond et al., Chapter 4, "Cost Analysis" (pp. 69-73).

Brent. Chapter 2. "Cost minimization and the definition of 'cost'"

Brent. Chapter 3. "Types of costs and their measurement"

Brent. Chapter 4. "External cost"

Bridges and Jacobs, "Obtaining Estimates of Marginal Cost by DRG," *Health Care Financial Management* (1986).

Glick, Doshi, Sonnad, Polsky, Chapter 3, "Valuing Medical Service Use," *Economic Evaluation in Clinical Trials*, Forthcoming.

Clement FM., et al., The Impact of Using Different Costing Methods on the Results of an Economic Evaluation of Cardiac Care: Microcosting vs. Cross-costing Approaches. *Health Economics* 18: 377-388 (2009)

Keeler and Cretin, "Discounting of Lifesaving and Other Interventions," *Management Science* (1983): 300-306.

Session 9:  
November 5      **Measuring Benefits in Money (DP)**

**Key Concepts**

- **Approaches to valuing health in monetary terms (Ch. 7 / Ch 11)**
  - **Human Capital (Linnerooth)**

- **Revealed prices in market (Viscusi)**
- **Direct measures / contingent valuation (O'Brien)**
- **Contingent Valuation: empirical issues (Brent, Ch 12)**
- **Measurement (Hanley, Smith, Olsen)**
- **Validity (Philips, Brookshire, Jacobs)**
- **Application (Lee)**

Drummond et al., Chapter 7, “Cost-benefit Analysis.”

Brent. Chapter 11. “Cost-benefit Analysis and the Human Capital Approach.”

Linnerooth, “The Value of Human Life: a Review of the Models,” *Economic Inquiry* (1979).

Viscusi WK and Aldy JE, “The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World,” *Journal of Risk and Uncertainty* 27, no. 1 (August 2003): 5-76.

Hammit JK and Treich N. “Statistical Vs. Identified Lives in Benefit-Cost Analysis.” *J Risk Uncertainty* (2007) 35:45–66.

O'Brien B, Gafni A, “When Do the ‘Dollars’ Make Sense? Toward a Conceptual Framework for Contingent Valuation Studies in Health Care,” *Medical Decision Making* 16 (1996): 288-299.

Klose, T, “The Contingent Valuation Method in Health Care,” *Health Policy* 47 (1999) 97-123.

Brent. Chapter 12. “Cost Benefit Analysis and Willingness to Pay.”

Ryan M., Watson V. “Comparing Welfare Estimates from Payment Car Contingent Valuation and Discrete Choice Experiments.” *Health Economics* 18 (2009):389-401.

Smith RD. Sach TH. “Contingent Valuation: (Still) on the Road to Nowhere?” *Health Economics* 18 (2009):863-866.

Session10:  
November 12

## **Can CB and CE Be Linked? (DP)**

### ***QUIZ***

### **Key Concepts**

- Economic Foundations of CEA (Garber, Garber and Phelps, Meltzer)
- Debate: CEA vs. CBA (Lee, and Brouwer)



Garber AM, “Advances in Cost-Effectiveness Analysis of Health Interventions,” Handbook of Health Economics, Vol. 1A, Chapter 4. (Focus on pages 198-204.)

Garber and Phelps, “Economic Foundations of Cost-effectiveness Analysis,” *Journal of Health Economics* (1997): 1-32.

Meltzer, “Accounting for Future Costs,” *Journal of Health Economics* (1997): 33-64.

Lee RH. “Future cost in cost effectiveness analysis.” *Journal of Health Economics* 27 (2008): 809-818.

Brouwer WF, Koopmanschap M, “On the Economic Foundation of CEA: Ladies and Gentlemen, Take your Positions,” *Journal of Health Economics* (July 2000).

Session 11:  
November 19

### **Willingness to Pay for a Quality Adjusted Life Year (Polsky and Kevin Haninger)**

#### **Can a willingness to pay for a QALY bridge the gap between CEA and CBA?**

Johannesson M, Meltzer D, “Some Reflections on Cost-Effectiveness Analysis,” *Health Economics* 7 (1998): 1-7.

Hirth RA, Chernew ME, Miller E, Fendrick M, Weissert WG, “Willingness to Pay for a Quality-Adjusted Life Year: In Search of a Standard,” *Medical Decision Making* 20, no. 3 (July-Sep. 2000): 332-342.

Braithwaite RS, et al., “What Does the Value of Modern Medicine Say About the \$50,000 per Quality-Adjusted Life-Year Decision Rule?” *Medical Care* 46(4), April 2008, pp 349-356.

Haninger K. Hammitt JK. “Willingness to Pay for Quality-Adjusted Life Years: Empirical Inconsistency between Cost-Effectiveness Analysis and Economic Welfare Theory” Manuscript. 2007.

Session 12:  
December 3

### **Policy Uses of CBI/CE Analysis and Value-based Insurance *Readings to be added.***

Session 13:  
December 10

### **Student Presentations**