

## **902.544B Economic Evaluation in Health Care**

Spring 2019

Day and Time: Tuesday (10:00am-12:50pm)

3-credit hours

Classroom: Room 202, Building 221

Office Hour: Tuesday 2:00-3:00pm (Room 427, Building 221)

### ***Instructor***

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### **Course description**

As technology improves, there are more opportunities in which health might be improved. However, limited resources render it crucial to consider how effectively and efficiently to allocate resources for our national and global societies. Economic evaluation, defined as the comparative analysis of alternative courses of action in terms of both their costs and consequences, is now an accepted method for the appraisal of healthcare interventions in many countries. Furthermore, economic evaluation plays an increasing role in influencing funding decisions and guidance in global health policy such as by the World Health Organization and other international agencies. This course will provide students with an introductory and intermediate knowledge of economic evaluation. It will first introduce the principles and theoretical foundations of economic evaluation and then lead to structured thinking about how to assess health and economic outcomes of an intervention and value them, with a range of methods and tools. Real-world application examples and recent trends in the field will be introduced as well. Throughout the course, students are encouraged to take a critical view of the use of the methods in policymaking, whilst acknowledging the increasing role of economic evaluation in public health and medicine.

### **Learning objectives**

By the end of the course, students will be able to do the following:

- Understand the concepts and principles of economic evaluation
- Describe the role of economic evaluation in public health and medicine
- Understand the steps to conduct different types of economic evaluation
- Describe ethical and distributional concerns with economic evaluation
- Articulate how economic evaluation can contribute to different types of policy questions

## **Prerequisites**

- Microeconomics and 900.513A Health Economics (or equivalent courses)

## **Course format**

- The first half of each session will be spent on lecture, and the second half on additional lecture, in-class exercises and/or class discussion.

## **Course materials**

There are two recommended textbooks for this course, as shown below. For those who are interested in further study or reading, some supplementary (optional) readings for each subject are provided in the detailed Course Schedule section (pp.5-12) of this syllabus.

### Recommended texts:

- Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015. [*Hereafter abbreviated as MEE*]
- Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Cost-effectiveness in Health and Medicine. 2<sup>nd</sup> edition, Oxford, Oxford University Press, 2016. [*Hereafter abbreviated as CHM*]

## **Course requirements**

### Attendance

- Students are expected to attend all classes. In case of unavoidable absence, students should let the instructor know ahead of time.

### Class participation (class discussion and in-class exercises)

- All students are expected to participate in class discussion and in-class exercises.

### Reading assignments

- Students are expected to read all reading materials before attending class.

### Quiz

- The first 5-10 minutes will be spent on reviewing the students' understanding of the reading materials through Quiz questions. (Readings for Quiz questions are marked with \*)

### Critical appraisal of economic evaluation

- Each student will select a published economic evaluation article and will critically appraise the article.
- Each student will prepare a 2-4 page critical assessment of the article, using a template based on the "checklist for assessing economic evaluations (Box 3.1 in the Drummond textbook)."
- Students will submit the critical assessment and the pdf of the article assessed through eTL by 12pm the day before Session 13.
- Students will present their own work during Session 13, using the word file submitted (no need to prepare a separate PPT file for presentation).

Group project (proposal of of economic evaluation on any public health decision problem)

- Students will be assigned to a group (to be composed of 2-4 students) for group project.
- Each group will select for their own proposal a relevant decision problem on economic evaluation.
- Each group will develop an 8-10 page (excluding references) proposal for conducting economic evaluation (cost-effectiveness analysis or cost-benefit analysis) on any public health topic.
- The proposal should be submitted through eTL by June 10, 2019 @6pm.
- The proposal will be presented during class in Session 14.
- More detailed instructions will be provided by the instructor throughout the semester.

Final exams

- In-class (closed-book) final exam will be held in Session 15.

**Student assessment**

- A total of 100 points are possible in this course. Grading will be based on the following performance:
  - Class participation: 5
  - Critical assessment: 5
  - Quiz: 30
  - Group project: 30
  - Final exam: 30
- Final letter grades will be assigned according to the following scale:
  - A = 85-100
  - B = 75-84
  - C = 60-74
  - D = 50-59
  - F = below 50

**At-a-Glance Course Calendar**

| <b>Session<br/>(Date)</b> | <b>Topic</b>                                                                        | <b>Readings</b>        | <b>QUIZ*</b>                        |
|---------------------------|-------------------------------------------------------------------------------------|------------------------|-------------------------------------|
| Session 1<br>(3/5/19)     | Introduction                                                                        | MEE Ch.1               |                                     |
| Session 2<br>(3/12/19)    | Economic evaluation in health and medicine                                          | MEE Ch.2<br>CHM Ch.1   | ○                                   |
| Session 3<br>(3/19/19)    | Principles and theoretical foundations of economic evaluation                       | MEE Ch.4<br>CHM Ch.2   | ○                                   |
| Session 4<br>(3/26/19)    | Cost analysis                                                                       | MEE Ch.7<br>CHM Ch.8   | ○                                   |
| Session 5<br>(4/2/19)     | Cost-effectiveness analysis I<br>(Valuing health outcomes)                          | MEE Ch.5<br>CHM Ch.7   | ○                                   |
| Session 6<br>(4/9/19)     | Cost-effectiveness analysis II<br>(Designing a CEA)                                 | CHM Ch.4               | ○                                   |
| Session 7<br>(4/16/19)    | Cost-benefit analysis                                                               | MEE Ch.6               | ○                                   |
| Session 8<br>(4/23/19)    | Economic evaluation using clinical studies                                          | MEE Ch.8               | ○                                   |
| Session 9<br>(4/30/19)    | Economic evaluation using decision-analytic modeling                                | MEE Ch.9<br>CHM Ch.5   | ○                                   |
| Session 10<br>(5/7/19)    | Evidence synthesis for economic evaluation                                          | MEE Ch.10<br>CHM Ch.9  | ○                                   |
| Session 11<br>(5/14/19)   | Reflecting and handling uncertainty                                                 | MEE Ch.11<br>CHM Ch.11 | ○                                   |
| Session 12<br>(5/21/19)   | Ethical and distributive considerations                                             | CHM Ch.12              | ○                                   |
| Session 13<br>(5/28/19)   | Critical assessment of economic evaluation**<br>(Students' individual presentation) | MEE Ch.3               | Critical appraisal<br>due 5/27@12pm |
| Session 14<br>(6/11/19)   | Presentation of economic evaluation proposal<br>(Students' group presentation)      | --                     | Proposal<br>due 6/10@6pm            |
| Session 15<br>(6/18/19)   | Final exam                                                                          | --                     |                                     |

\* Quiz questions will be from the MEE chapters only, except for Sessions 6 and 12.

\*\* The number of articles to be presented will be determined depending on the finalized class size.

## Detailed Course Schedule

|           |              |        |
|-----------|--------------|--------|
| Session 1 | Introduction | 3/5/19 |
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### Topics:

- Course overview/administration
- Introduction to economic evaluation
- Role of economic evaluation in public health and medicine

### Reading assignments:

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 1. Introduction to economic evaluation. In: *Methods for the economic evaluation of health care programmes*. Oxford, UK: Oxford University Press, Fourth edition, 2015.

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| Session 2 | Economic evaluation in health and medicine | 3/12/19 |
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### Topics:

- Structure and requirements for economic evaluation
- Types of economic evaluations
- Overview of analytic steps in CBA and CEA
- Use of economic evaluation in public health and medicine
- Guidelines for economic evaluations
- Key challenges in CBA and CEA

### Reading assignments:

\*Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 2. Making decisions in health care. In: *Methods for the economic evaluation of health care programmes*. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 1. Using Cost-Effectiveness Analysis in Health and Medicine: Experiences since the Original Panel. In: *Cost-effectiveness in Health and Medicine*. 2<sup>nd</sup> edition, Oxford, Oxford University Press, 2016.

### Supplementary readings (optional):

Sanders GD, Neumann PJ, Basu A, Brock DW, Feeny D, Krahm M, Kuntz KM, Meltzer DO, Owens DK, Prosser LA, Salomon JA, Sculpher MJ, Trikalinos TA, Russell LB, Siegel JE, Ganiats TG. Recommendations for Conduct, Methodological Practices, and Reporting of Cost-effectiveness Analyses: Second Panel on Cost-Effectiveness in Health and Medicine. *JAMA* 2016;316(10):1093-103.

Neumann PJ: Using Cost-Effectiveness Analysis to Improve Health Care. New York: Oxford University Press, 2005.

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| Session 3 | Principles and theoretical foundations of economic evaluation | 3/19/19 |
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**Topics:**

- Principles of cost-benefit analysis (CBA)
- Principles of cost-effectiveness analysis (CEA)
- Theoretical basis for CBA and CEA
- Some methodological implications

**Reading assignments:**

\*Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 4. Principles of economic evaluation. In: Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 2. Theoretical Foundations of Cost-Effectiveness Analysis in Health and Medicine. In: Cost-effectiveness in Health and Medicine. 2nd edition, Oxford, Oxford University Press, 2016.

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| Session 4 | Cost analysis | 3/26/19 |
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**Topics:**

- Definitions and types of costs
- Perspectives of analysis and the scope of resources to be included
- Measuring and valuing resource use
- Discounting
- Handling of inflation

**Reading assignments:**

\*Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 7. Cost analysis. In: Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 8. Estimating Costs and Valuations of Non-Health Benefits in Cost-Effectiveness Analysis. In: Cost-effectiveness in Health and Medicine. 2nd edition, Oxford, Oxford University Press, 2016.

**Supplementary readings (optional):**

Lin DY, Feuer EJ, Etzioni R, Wax Y. Estimating medical costs from incomplete follow-up data. *Biometrics* 1997;53:419-434.

Newell RG, Pizer WA: Discounting the distant future: how much do uncertain rates increase valuations? *Journal of Environmental Economics and Management* 2003; 46:52-71.

Cairns JA, van der Pol MM: Saving future lives: a comparison of three discounting models. *Health Economics* 1997;6:341-350.

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| Session 5 | Cost-effectiveness analysis I (Valuing health outcomes) | 4/2/19 |
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**Topics:**

- Measuring health consequences of health interventions
- Measuring preferences for health states
- QALYs, DALYs, and alternatives

**Reading assignments:**

\*Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 5. Measuring and valuing effects: health gain. In: *Methods for the economic evaluation of health care programmes*. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 7. Valuing Health Outcomes. In: *Cost-effectiveness in Health and Medicine*. 2nd edition, Oxford, Oxford University Press, 2016.

**Supplementary reading (optional):**

Weinstein MC, Manning WG Jr. Theoretical issues in cost-effectiveness analysis. *J Health Econ.* 1997 Feb;16(1):121-8.

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| Session 6 | Cost-effectiveness analysis II (Designing a CEA) | 4/9/19 |
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**Topics:**

- Designing a CEA
- Uses of CEA

**Reading assignments:**

\*Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 4. Designing a Cost-Effectiveness Analysis. In: *Cost-effectiveness in Health and Medicine*. 2nd edition, Oxford, Oxford University Press, 2016.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 3. Recommendations on Perspectives for the Reference Case. In: Cost-effectiveness in Health and Medicine. 2nd edition, Oxford, Oxford University Press, 2016.

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| Session 7 | Cost-benefit analysis | 4/16/19 |
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**Topics:**

- Assigning monetary values to health outcomes
- Willingness-to-pay (WTP)
- Pragmatic measurement issues in WTP
- Critique of human capital approach
- Net benefit vs. benefit-cost ratios

**Reading assignments:**

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 6. Measuring and valuing effects: consumption benefits of health care. In: Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015.

**Supplementary readings (optional):**

Hammitt JK: Valuing mortality risk: theory and practice. *Environmental Science & Technology* 2000;34:1396-1400.

Pauly MV: Valuing health care benefits in money terms. In Sloan FA (ed.), Valuing Health Care: Costs, Benefits, and Effectiveness of Pharmaceuticals and other Medical Technologies. Cambridge: Cambridge University Press, 1995 (pp.99-124).

Hammitt, JK. QALYs versus WTP. *Risk Analysis* 2002;22:985-1001.

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| Session 8 | Economic evaluation using clinical studies | 4/23/19 |
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**Topics:**

- Ideal economic evaluation in a clinical trial
- Issues in designing economic evaluations in clinical trials

**Reading assignments:**

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 8. Using clinical studies as vehicles for economic evaluation. In: Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015.



**Supplementary readings (optional):**

Ramsey SD, Willke RJ, Glick H, Reed SD, Augustovski F, Jonsson B, Briggs A, Sullivan SD. Cost-effectiveness analysis alongside clinical trials II-An ISPOR Good Research Practices Task Force report. *Value Health* 2015;18(2):161-72.

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| Session 9 | Economic evaluation using decision-analytic modeling | 4/30/19 |
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**Topics:**

- Applications of modeling in decision-making in public health
- Different types of decision-analytic models
- Steps required to construct a decision-analytic model
- Challenges in conducting a model-based economic evaluation

**Reading assignments:**

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 9. Economic evaluation using decision-analytic modelling. In: *Methods for the economic evaluation of health care programmes*. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 5. Decision Models in Cost-Effectiveness Analysis. In: *Cost-effectiveness in Health and Medicine*. 2nd edition, Oxford, Oxford University Press, 2016.

**Supplementary readings (optional):**

Weinstein MC. Recent developments in decision-analytic modelling for economic evaluation. *Pharmacoeconomics* 2006; 24(11):1043-53.

Caro JJ, Briggs AH, Siebert U, Kuntz KM; ISPOR-SMDM Modeling Good Research Practices Task Force. Modeling good research practices--overview: a report of the ISPOR-SMDM Modeling Good Research Practices Task Force--1. *Value Health* 2012;15(6):796-803.

Eddy DM, Hollingworth W, Caro JJ, Tsevat J, McDonald KM, Wong JB, et al. Model transparency and validation: a report of the ISPOR-SMDM Modeling Good Research Practices Task Force-7. *Medical Decision Making* 2012;32:733-43.

AHRQ. Research Report – Draft (September 15, 2014). Decision and Simulation Modeling: Review of Existing Guidance, Future Research Needs, and Validity Assessment. <http://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?productid=1965&pageaction=displayproduct>

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| Session 10 | Evidence synthesis for economic evaluation | 5/7/19 |
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**Topics:**

- Defining relevant evidence
- Defining, identifying, and reviewing evidence
- Synthesizing evidence
- Parameter estimation for economic evaluation

**Reading assignments:**

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 10. Identifying, synthesizing, and analyzing evidence for economic evaluation. In: Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 9. Evidence Synthesis for Informing Cost-Effectiveness Analysis. In: Cost-effectiveness in Health and Medicine. 2nd edition, Oxford, Oxford University Press, 2016.

**Supplementary reading (optional):**

Hunink M, Weinstein MC, Wittenberg E, et al. Chapter 8. Finding and summarizing the evidence. In: Decision Making in Health and Medicine: Integrating Evidence and Values. Cambridge University Press; 2014.

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| Session 11 | Reflecting and handling uncertainty | 5/14/19 |
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**Topics:**

- Types of uncertainty in economic evaluation
- Methods to handle uncertainty
- Sensitivity vs. uncertainty analysis
- Probabilistic sensitivity analysis (PSA)

**Reading assignments:**

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 11. Characterizing, reporting, and interpreting uncertainty. In: Methods for the economic evaluation of health care programmes. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 11. Reflecting Uncertainty in Cost-Effectiveness Analysis. In: Cost-effectiveness in Health and Medicine. 2nd edition, Oxford, Oxford University Press, 2016.

**Supplementary readings (optional):**

Stinnett AA, Mullahy J: Net health benefits: a new framework for the analysis of uncertainty in cost-effectiveness analysis. *Medical Decision Making* 1998; 18:S65-S80.

Fenwick E, Claxton K, Sculpher M. Representing uncertainty: the role of cost-effectiveness acceptability curves. *Health Economics* 2001;10:779-87.

Claxton K. The irrelevance of inference: a decision-making approach to the stochastic evaluation of health care technologies. *Journal of health economics* 1999;18(3):341-64.

Briggs AH, Weinstein MC, Fenwick EA, Karnon J, Sculpher MJ, Paltiel AD, et al. Model parameter estimation and uncertainty analysis: a report of the ISPOR-SMDM Modeling Good Research Practices Task Force Working Group-6. *Med Decis Making* 2012;32:722-32.

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| Session 12 | Ethical and distributive considerations | 5/21/19 |
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**Topics:**

- Ethical issues in using the results of economic evaluation for priority setting
- Ethical issues with QALY
- Distributional concerns in economic evaluations

**Reading assignments:**

Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG, eds. Chapter 12. Ethical and Distributive Considerations. In: *Cost-effectiveness in Health and Medicine*. 2nd edition, Oxford, Oxford University Press, 2016.

**Supplementary readings (optional):**

Williams A. QALYS and ethics: a health economist's perspective. *Soc Sci Med* 1996;43(12):1795-804.

Yang YT, Mahon MM. Palliative care for the terminally ill in America: the consideration of QALYs, costs, and ethical issues. *Med Health Care Philos* 2012;15(4):411-6.

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| Session 13 | Critical assessment of economic evaluation | 5/28/19 |
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**Topics:**

- Elements of a sound economic evaluation
- Reference case analysis for CEA
- Reporting economic evaluation studies

- Limitations of economic evaluation techniques

### Reading assignments:

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Chapter 3. Critical assessment of economic evaluation. In: *Methods for the economic evaluation of health care programmes*. Oxford, UK: Oxford University Press, Fourth edition, 2015.

Husereau D, Drummond M, Petrou S, Carswell C, Moher D, Greenberg D, Augustovski F, Briggs AH, Mauskopf J, Loder E; CHEERS Task Force. Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement. *Int J Technol Assess Health Care* 2013;29(2):117-22.

### Supplementary reading (optional):

Philips Z, Bojke L, Sculpher M, Claxton K, Golder S. Good practice guidelines for decision-analytic modelling in health technology assessment: a review and consolidation of quality assessment. *Pharmacoeconomics* 2006; 24(4): 355-71.

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| Session 14 | Presentation of economic evaluation proposals | 6/11/19 |
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### Topics:

- Students' group presentations on proposed economic evaluation studies

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| Session 15 | Final Exam | 6/18/19 |
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