**CTS-0175: Introduction to Health Economics and Outcomes Research**

**Spring 2021**

**Course Directors**

Name: James D. Chambers, PhD David D. Kim, PhD

E-mail: [jchambers@tuftsmedicalcenter.org](mailto:jchambers@tuftsmedicalcenter.org) [dkim3@tuftsmedicalcenter.org](mailto:dkim3@tuftsmedicalcenter.org)

Phone: (617) 636-8882 (617) 636-5769

Office hours: by appointment by appointment

**Course Information**

Credit/s: 2.0

Grading Option: A-F

Prerequisites: None

**Course Time and Location:** Weekly asynchronous lecture (45 mins), bi-weekly synchronous session (1 hour), weekly discussion board participation

**Brief Course Description:** This course introduces the fundamentals of Health Economics and Outcomes Research (HEOR). We begin with an overview of the issues addressed by HEOR – including the measurement of health benefits in terms that can be compared across disease domains, and the inclusion of cost impacts across time and over multiple societal sectors that extend beyond health care itself. The first part of the course examines key economic concepts and their relation to health care, including the demand for health care, the structure and consequences of health insurance, and markets for pharmaceutical products. The second part of the course focuses on understanding health economic analysis based on recommendations issued by the Second Panel on Cost Effectiveness in Medicine and Health for the US. The lectures include measuring preferences for health outcomes, estimating costs, simulation modeling, and ethical issues in cost-effectiveness analysis. Finally, through a series of case studies, the course introduces students to important sources of data for the HEOR field.

**Learning Objectives:** At the conclusion of the course, students should understand:

1. Key economic principles and how they related to the US health care settings
2. Key agents in health markets; how US health care markets differ from corresponding markets in other, developed countries, and why health markets, in contrast to other more “typical” markets for goods and services, depend on explicit, external value assessment.
3. Estimation of health benefits in terms of the most common generic measures – the quality adjusted life year (QALY) and similar variants (like the disability adjusted life year, or DALY); what attributes of value may be omitted by these measures; and approaches for eliciting weights used to calculate QALYs.
4. Components of cost associated with health conditions, their care and treatment.
5. HEOR guidance issued by the Second Panel on Cost Effectiveness in Health and Medicine, and how that guidance differs from guidance for other countries.
6. Sources of information for calculating key elements for HEOR.
7. The conceptual foundation of simulation and how health economists use it to evaluate medical technologies and characterize the impact of uncertain assumption on the results.

**Course Texts and Materials:**

The listed textbooks are recommended, but not required. Reading materials for lectures will be assigned and distributed before each lecture through the online platform, TRUNK.

* Phelps, C. E. (2016). Health economics. Routledge
* Neumann, P. J., Sanders, G. D., Russell, L. B., Siegel, J. E., & Ganiats, T. G. (Eds.). (2016). Cost-effectiveness in health and medicine. Oxford University Press.

**Summary of Assignments and Grading:**

**Assignment Grading weight**

Discussion board participation 20%

Problem sets / exercises (3) 30%

Midterm essay 25%

Final essay 25%

Discussion board: Discussion questions will be posted on CANVAS every week.

Homework assignments: Problem sets or mini exercises will be assigned during the semester. Problem sets will be posted to the course website one week in advance of the due date. Assignments should be uploaded to TRUNK on the dates indicated on the course schedule (page 3 of syllabus):

**Academic conduct for homework assignments**: You are encouraged to discuss the concepts and questions for homework assignments together in groups, but the submitted assignment must be entirely in your own words. If you do work in teams, please list the names of students you collaborated with on the top of your submitted assignment. If you have *any doubt* about the integrity of your collaborative process, please see the course instructor. Please see “Academic Conduct” section below for University policies on this important matter.

Midterm essay: To be determined

Final essay: To be determined

**Penalties for late or incomplete assignments:** Late assignments will not be accepted without advance permission of the course instructor.

**Special Circumstances and Accommodations for Students with Disabilities:**

Students seeking accommodations must first consult with Kathryn Lange, the Sackler School’s Disability Officer. Students who anticipate being absent for an extended period or unable to complete coursework in the required time frame should also speak with Dean Lange as soon as possible. Information disclosed is confidential.

**University Policies:**

All students are required to abide by the Tufts University Sexual Harassment Policy (<http://oeo.tufts.edu/policies-and-procedures/sexual-harassment-policy>) and the Information Stewardship Policy (<http://uit.tufts.edu/?pid=786>).

**Academic Conduct:**

Academic integrity, including avoiding plagiarism, is critically important. Each student is responsible for being familiar with the standards and policies outlined in the Sackler School Student Handbook (<http://sackler.tufts.edu/Student-Life/Sackler-Student-Handbook>). Violations of standards of academic conduct will be sanctioned by penalties ranging from grade reduction and failure of a course up to dismissal from the school, depending on the nature and context of any infraction.

**Course and Assignment Schedule:**

| **Week** | **Topic** | **Lecture or assignment synopsis** |
| --- | --- | --- |
| Week 1 | Session 1: PJN – Overview of HEOR | What is HEOR and why important? Course overview. |
| Week 2 | Session 2: JDC – Economics of health care (Part 1) | Key economic concepts and their relevance to health care. Special characteristics of the health care market. |
| Week 3 | Session 3: JDC – Economics of health care (Part 2) | Application of economic concepts to health care. Payment reform; value frameworks; value-based insurance design |
| Week 4 | Session 4: JDC – US health care system vs. systems in other countries | How does US health care compare to health care in other countries? The increasing influence of ‘value’ in US health care |
| Week 5 | Session 5: JDC – Demand for Health Care | Preferences for health and health care. What affects the health care demand? |
| Week 6 | Session 6: DDK – Health Insurance and Affordable Care Act | Understanding the role of health insurance and the Patient Protection and Affordable Care Act (PPACA) in the US |
| Week 7 | Session 7: DDK – Introduction to economic evaluation (Part 1) | The rationale for economic evaluation in health care; types of economic evaluation; using economic evaluation for policy decision |
| Week 8 | Session 8: DDK Introduction to economic evaluation (Part 2) | Decision-analytic models; cost-effectiveness threshold; handling uncertainty in economic evaluation |
| Week 9 | Session 9: TAL – Measuring preferences (Part 1) | Overview of the most common outcome measure in cost-effectiveness analysis – the quality adjusted life year (QALY). Overview of direct methods (e.g. time trade off, standard gamble) for eliciting utility weights used to calculate QALYs. |
| Week 10 | Session 10: TAL – Measuring preferences (Part 2) | Indirect methods (e.g. EQ-5D, SF-6D) for eliciting utility weights used to calculate QALYs.  Overview of the disability adjusted life year (DALY) outcome measure used in cost-effectiveness analyses.  Comparison of QALYs vs. DALYs as outcome measures. |
| Week 11 | Session 11: NVO – Estimating costs | Medicare / Medicaid data, HCUP data, literature-based estimates – use of CEA Registry and PubMed |
| Week 12 | Session 12: JTC – Simulation (Part 1)  HEOR? | Why simulate? What is simulation? What is the difference between population and discrete event simulation? How can simulation be used to identify and quantify important sources of uncertainty? |
| Week 13 | Session 13: JTC – Simulation (Part 2)  HEOR? | Case study – programming Alzheimer’s disease model in Excel; Uncertainty analysis |
| Week 14 | Session 14: DDK – Ethical issues in cost-effectiveness analysis | Discuss distinct ethical and distributional issues that arise in the construction and use of cost effectiveness analysis |

Instructors: Peter J Neumann, PJN; James D. Chambers, JDC; David D. Kim, DDK; Tara A. Lavelle, TAL; Natalia V. Olchanski, NVO; Joshua T. Cohen, JTC

**Class Leaning Objectives:**By the end of each lecture, students will be able to

**SESSION 1: Overview of HEOR**

1. Define HEOR and its importance in coverage, pricing, and reimbursement decisions.
2. Appreciate key economic principles and how they relate to US health care
3. Identify how prescription drug markets differ from other markets
4. Explain why external value assessments of health interventions are needed
5. Define what is meant by value in health care
6. Describe challenges in measuring the value of prescription drugs

**Assigned reading:** Neumann PJ, Cohen JT. Measuring the Value of Prescription Drugs. N Engl J Med. 2015 Dec 31;373(27):2595-7. doi: 10.1056/NEJMp1512009. Epub 2015 Nov 18. PMID: 26580666.

**SESSION 2: Economics of health care (Part 1)**

1. Define key economic concepts
2. Explain the relevance of economic concepts to health care
3. Describe the special characteristics of the health care market
4. Give examples of worrying economic trends in US health care

**SESSION 3: Economics of health care (Part 2)**

1. Summarize current US health care payment reform efforts
2. Explain the application of economic concepts to health care
3. Give examples of US based value frameworks
4. Illustrate the potential benefits of value-based insurance design

**SESSION 4: US health care system vs. systems in other countries**

1. Explain how US health care is financed
2. Distinguish key differences between US health care and health care in other countries
3. Describe key health care system performance metrics
4. Summarize the increasing influence of ‘value’ in US health care

**SESSION 5: Demand for health care**

1. Describe how economics can apply to health and health care
2. Summarize why demand for health is unlike most other goods
3. Distinguish between consumption and production of health
4. Give examples of what factors influence health care demand

**SESSION 6: Health insurance and affordable care act**

1. Explain key terms and concepts in health insurance
2. Identify key characteristics of health care distinct from other sectors/markets
3. Summarize major features in the Patient Protection and Affordable Care Act (PPACA)
4. Discuss the impact of implementing the PPACA on access, quality, and cost of care

**SESSION 7: Introduction to economic evaluation (Part 1)**

1. Give examples of the context and settings where economic evaluation is needed.
2. Distinguish different types of economic evaluation
3. Explain incremental cost-effectiveness ratios and the cost-effectiveness plane
4. Identify challenges in incorporating economic evaluation into health policy decisions
5. Summarize recent development of using economic evaluation in the US health policy

**SESSION 8: Introduction to economic evaluation (Part 2)**

1. Determine best practices for key components in cost-effectiveness analysis: perspective, health outcome measures, costs, time horizon, and discounting
2. Explain when and how to conduct sensitivity and subgroup analyses
3. Calculate incremental cost-effectiveness ratios when comparing multiple interventions or strategies and interpret “extended dominance”
4. Classify health and non-health impacts of the intervention using the impact inventory
5. Distinguish different ways to estimate cost-effectiveness thresholds
6. Navigate additional resources for cost-effectiveness analysis

**SESSION 9: Measuring preferences (Part 1)**

1. Define the quality adjusted life year (QALY) and describe its use in cost-effectiveness analyses
2. Describe utility values and their use in calculating QALYs
3. Explain how to measure utility values using direct elicitation methods

**SESSION 10: Measuring preferences (Part 2)**

1. Explain how to measure utility values using indirect elicitation methods
2. Define the disability adjusted life year (DALY) and describe its use in cost-effectiveness analyses
3. Compare QALYs versus DALYs as outcome measures in cost-effectiveness analyses

**SESSION 11: Estimating costs**

1. Identify the components of cost associated with health conditions and the use of medical technologies for a health-economic model, building on the conceptual framework of economic analysis and HEOR guidance issued by the Second Panel on Cost Effectiveness in Health and Medicine.
2. Differentiate between the cost components included in the Reference case with a societal and healthcare perspective.
3. Compare different approaches for estimating the cost components for a health-economic analysis, including methods and sources of data.

**SESSION 12: Simulation (Part 1)**

1. Understand circumstances that make simulation a more appropriate tool than other common tools (like statistical inference) for making estimates.
2. Be able to describe the basic algorithm that describes how many simulations work.
3. Explain the difference between a population simulation and a discrete event simulation and explain the advantages and limitations for each.
4. Understand the difference between one-way, deterministic sensitivity analysis and probabilistic sensitivity analysis, and explain the advantages and limitations for each.

**SESSION 13: Simulation (Part 2)**

1. Implement a population simulation in Excel.
2. Construct a one-way sensitivity analysis “tornado diagram” using this simulation.
3. Identify the “most important” sources of uncertainty.
4. Describe the algorithm for implementation of an probabilistic uncertainty analysis

**SESSION 14: Ethical issues in cost-effectiveness analysis**

1. Describe key ethical and distributional issues in cost effectiveness analysis
2. Measure health inequality using a range of inequality indices
3. Conduct a simple distributional cost-effectiveness analysis
4. Understand the trade-off between net health benefits and equity