Advanced concepts in Cost-Effectiveness and Cost-Benefit Analysis,
HS426f

Instructor: Wu Zeng

March 13, 2019

Email: wuzengcn@brandeis.edu
Office Hours: By appointment
Office: Heller Building 274
Classroom: Schneider & Family Building G2
Meeting time: Thursday afternoon 2:00-4:50 PM

Teaching Assistant: Boniface Ochigbo, Email: ochigbo@brandeis.edu
Executive Assistant: Clare Hurley, Email: churley@brandeis.edu; Tel: 1-781-736-3983
TA session meeting time: To Be Determined

Prerequisite: HS 422F or HS 237F

Overview: This module provides students with advanced techniques to conduct or critically review cost-effectiveness and cost-benefit studies, both in the US and internationally. Students will learn how to initiate a research question, design a study, obtain and analyze relevant data, and present results. The module will examine theoretical underpinnings and operational techniques, illustrated by one or more real-world applications.

This module is built on introductory course of the cost-effectiveness analysis (CEA). One major purpose of this module is to provide students with hands-on experience in applying the software of TreeAge, one of most widely used software programs in conducting cost-effectiveness and benefit analysis, from establishing a basic decision model, to conducting Markov modelling, and to performing sensitivities analysis. The use of software of TreeAge substantially extends researchers capacities in modelling complicate health interventions resulting in long-term impact.

Evaluation: Students will be evaluated on a written paper (60% weight), three homework assignments (30% weight) and class participation (10% weight).

The written paper will require students to apply methods of cost-effectiveness or cost-benefit analysis to a problem or question of the students choice. The analysis should be based on real data where available, supplemented as needed with expert assumptions, discussed for plausibility. The paper may be set in any country and address any environmental, social or health program, policy, or system-level question. Students are encouraged to write a joint paper with one or two classmates, but may work individually if they prefer. The paper should include a title page with the names of author(s), an abstract, references, and at least one table or figure. The paper should demonstrate your ability to use TreeAge to conduct cost-effectiveness analysis. References should follow any standard style of the authors’ choice. The text should be double spaced with 1-inch margins and 12-point type. Tables and figures may use any desired spacing and consistent format. The paper should be carefully checked for spelling, grammar, and consistency of style. The maximum length depends on the group size—10 pages for a single author, and 15 pages for two authors (excluding title page, abstract, preface, table of contents, references, and any appendix materials).

Students may build on a prior paper, but the paper for this module must contain substantial advances or extensions. Papers will be judged on the strength of the data and analysis presented, as well as the clarity and organization of the paper. The due date for the final paper will be announced later.

Disability: Any student with a documented disability on record at Brandeis University who wishes to have a reasonable accommodation made for him or her in this class should contact the instructor immediately.
**Software purchase:** It is required to purchase the software of TreeAge Pro Healthcare for this class. Students could purchase the software with student course license, which is valid for 6 months, at $55 at https://www.treeage.com/shop/.

**Textbook:**


**Session 1. Economics modelling: cost and effectiveness measures and decision tree modelling, March 14, 2019**

**Objective:** This section will quickly review what covered in module 1, and then focus on cost analysis and modelling effectiveness with QALYs and DALYs. This session will discuss economic modeling in cost-benefit, cost-effectiveness, cost-utility analysis and their use in policy development, and introduce the decision tree modelling to help researchers organize their thoughts and identify parameters for the analysis.

**Required readings**

3. Drummond, Chapter 9 (Part on decision tree modelling), Economic evaluation using decision analytic modeling.
4. Chapters 1-6 from TreeAge Pro 2019 User’s manual

**TA session:** Overview of TreeAge and build a decision tree

**Session 2. Cost-effectiveness analysis using TreeAge for decision tree modelling and case studies, March 21, 2019**

**Objective:** TreeAge is a software program that is widely used in cost-effectiveness analysis. This session will also use TreeAge to construct a decision tree and conduct a cost-effectiveness analysis, and present a case study on malaria control.

**Required readings**

1. Chapters 9, 11, 33 from TreeAge Pro 2019 Users manual.

**TA session:** Conduct a cost-effectiveness analysis using decision tree modelling with TreeAge and homework

**Session 3. Markov model and construction of Markov models using TreeAge, March 28, 2019**

**Objective:** Markov model is very powerful to model the long term impact and for repeated events. The session will discuss the concept of Markov model and use excel to simulate a Markov calculation. Then TreeAge will be used to develop a Markov model.

**Required readings**

1. Drummond, Chapter 9 (Part on Markov model), Economic evaluation using decision analytic modeling

3. Chapter 36 and 37 from TreeAge Pro Manual

**TA session:** Building a Markov model with constant transition probability using TreeAge and conduct a cost-effectiveness analysis

- **Session 4. Case studies of Markov modelling, April 4, 2019**

  *Objective:* This session will build on session 3 to introduce new concepts of variables using TreeAge and simulate a case published in an article with TreeAge, and discuss a paper on cost-effectiveness analysis of vaccination.

  *Required readings:*


**TA session:** Building a Markov model with variable transition probability using TreeAge and conduct a cost-effectiveness analysis and homework

- **Session 5: Introduction to sensitivity analysis, recent development of cost-effectiveness analysis, and class presentation, April 11, 2019**

  *Objective:* The first half of the session provides concept of sensitivity analysis and information on recent development of cost-effectiveness analysis. The second half of the session allows students to present their research topics for their final project.

  *Required readings:*

  2. Drummond, Chapter 11, Economic evaluation using decision analytic modeling.
  6. Chapters 16 and 19 of TreeAge Pro 2019 User’s Manual

**TA session:** Conduct deterministic sensitivity analysis (one-way and two-way) and generate Tornado diagrams.

- **Session 6: Sensitivity analyses and Monte Carlo simulation, April 18, 2019**

  *Objective:* This session addresses the development and use of simple mathematical models to address multiple sources of information, and using them for sensitivity analyses.

  *Required readings:*

  2. Drummond, Chapter 11, Economic evaluation using decision analytic modeling.
  6. Chapters 16 and 19 of TreeAge Pro 2019 User’s Manual
4. Chapter 20 of TreeAge Pro 2019 User’s Manual

**TA session:** Conduct Monte Carlo simulation and probabilistic sensitivity analysis and homework

- **Session 7:** No class, exam