SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF MINNESOTA

PUBH 6717, SECTION 001

Decision Analysis for Health Care
Fall 2019

COURSE & CONTACT INFORMATION

Credits: 2 units
Meeting Day(s): Fridays
Meeting Time: 1:00pm – 2:50pm
Meeting Place: Mayo 1250

Instructor: Eva A. Enns, PhD
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Office Phone: 612-626-4581
Office Location: 15-219, Phillips-Wangensteen Bldg

TA: Zoe Kao
Email: kaoxx085@umn.edu

Office Hours: Wednesdays 3:00-4:30pm or by appointment
Location: 15-220 Phillips-Wangensteen Bldg (HPM conference room)

COURSE DESCRIPTION

This course will introduce students to the methods and growing range of applications of decision analysis and cost-effectiveness analysis in health care, public health, technology assessment, medical decision making, and health resource allocation.

COURSE PREREQUISITES

There are no formal pre-requisites. Students should have a basic familiarity with probability concepts, including calculation of expected values and an understanding of marginal, joint, and conditional probabilities.

COURSE GOALS & OBJECTIVES

- Be able to formulate and solve a decision analysis problem by specifying the decision objective, relevant variables, sources of uncertainty, and tradeoffs.
- Be able to integrate evidence into a decision analytic framework to inform a clinical, public health policy, and/or programmatic decision.
- Be able to correctly interpret the results of a decision analysis and understand the uses and limitations of these methods in decision making at individual, organizational, and policy levels.
- Gain an appreciation of how decision analytic methods can be applied to the evaluation of public health programs and policies.
- Learn the basic principles and mechanics underlying incremental cost-effectiveness analysis.
- Gain foundational skills needed to pursue more advanced coursework in decision analysis and cost-effectiveness analysis.

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Method of Instruction

Class sessions will be a combination of lecture and in-class group activities. Class attendance and participation is expected and a component of the final grade. Practice problems (and solutions) will be posted for each week. Students should review the practice problem questions in preparation for lecture; following lecture, students should work through the practice problems to solidify course concepts and review problem solutions. Students will have the opportunity to discuss practice problems and course concepts in depth

with the instructor or TA during (optional) weekly office hours. There will be a midterm and final exam, as well as a final project, which will consist of an outline of a decision analysis applied to an issue selected by the student. Components of the final project will be submitted for feedback throughout the semester prior to submission of a final project report.

Course Workload Expectations
PUBH 6717 is a 2.0 credit course. The University expects that for each credit, you will spend a minimum of three hours per week attending class or comparable online activity, reading, studying, completing assignments, etc. over the course of a 15-week term. Thus, this course requires approximately 90 hours of effort spread over the course of the term in order to earn an average grade.

Communication
We encourage you to interact with the teaching team in office hours, which we will use to interactively work through the practice problems, review class concepts and/or discuss class project ideas, depending on the interests of those who attend. The instructor is also available to meet by appointment. Clarifying questions can be submitted to the instructor via email (eenns@umn.edu) and will receive a response within 24 hours, Monday – Friday. Questions submitted after 4:30pm Central Time on Fridays may not be answered until 9:00am Monday. Please plan accordingly.

Learning Community Expectations
School of Public Health courses ask students to discuss frameworks, theory, policy, and more, often in the context of past and current events and policy debates. We do not come to our courses with identical backgrounds and experiences and building on what we already know about collaborating, listening, and engaging is critical to successful professional, academic, and scientific engagement with topics. In this course, students are expected to engage with each other in respectful and thoughtful ways.

In group discussion, this can mean:

- Respecting the identities and experiences of your classmates.
- Avoiding broad statements and generalizations.
- Using respectful tone and language.

Like other work in the course, all student to student communication is covered by the Student Conduct Code (https://z.umn.edu/studentconduct).

COURSE TEXT & READINGS

Required readings are posted on the course website. Additional papers related to specific lecture topics will also be posted on the course for students who may be interested in learning more about a particular topic. ***An optional textbook is also available***. Past students have generally found the textbook helpful; if you learn well through reading a textbook or if you plan to continue your studies in the area of decision analysis, I highly recommend acquiring the textbook. Relevant sections are highlighted in the syllabus each week.

Optional textbook:

- Hunink MGM, et al. Decision Making in Health and Medicine: Integrating Evidence and Values. Cambridge, UK: Cambridge University Press. **2nd edition (2014) or 1st edition (2001)**.

EVALUATION & GRADING

Final grades are determine by performance on the following:

1. Midterm exam (20% of the total grade)
2. Final exam (40% of the total grade)
3. Final project (30% of the total grade)
4. Class participation (10% of the total grade)

Midterm and Final exams
Both the midterm and final exams will be take-home assignments that should be completed independently. You will have one week to complete these exams. Exams should be uploaded electronically by the deadline listed in the course schedule.

Final project
Throughout the course, you will be asked to reflect on a policy question of interest and formulate it in terms of the decision analytic framework. The final written assignment will be the culmination of your findings. It should be less than 5 pages (1.5 line spacing) and will include:

- a description of the policy problem and the decision(s) to be made
- an outline of a decision tree

- a summary of the data that would be required to conduct the analysis
- commentary on the feasibility of conducting the decision analysis and/or the applicability of decision analysis to the policy question

The final project report should be submitted electronically by the deadline listed in the course schedule.

Electronic Submission of Assignments
All assignments (midterm and final exams, project components) should be uploaded electronically as a .pdf file to the course website by the deadline (date & time). You may prepare assignments electronically or you may upload a scanned or photographed copy of hand-written assignments. Please preview any scanned documents before submission to ensure fidelity and completeness.

Grading Scale
The University uses plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following, and you can expect the grade lines to be drawn as follows:

% In Class	Grade	GPA
93 - 100%	A	4.000
90 - 92%	A-	3.667
87 - 89%	B+	3.333
83 - 86%	B	3.000
80 - 82%	B-	2.667
77 - 79%	C+	2.333
73 - 76%	C	2.000
70 - 72%	C-	1.667
67 - 69%	D+	1.333
63 - 66%	D	1.000
< 62%	F	

- A = achievement that is outstanding relative to the level necessary to meet course requirements.
- B = achievement that is significantly above the level necessary to meet course requirements.
- C = achievement that meets the course requirements in every respect.
- D = achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F = failure because work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (Incomplete).
- S = achievement that is satisfactory, which is equivalent to a C- or better
- N = achievement that is not satisfactory and signifies that the work was either 1) completed but at a level that is not worthy of credit, or 2) not completed and there was no agreement between the instructor and student that the student would receive an I (Incomplete).

Evaluation/Grading Policy	Evaluation/Grading Policy Description
Scholastic Dishonesty, Plagiarism, Cheating, etc.	You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis (As defined in the Student Conduct Code). For additional information, please see https://z.umn.edu/dishonesty The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: https://z.umn.edu/integrity. If you have additional questions, please clarify with your instructor. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam. Indiana University offers a clear description of plagiarism and an online quiz to check your understanding (http://z.umn.edu/iuplagiarism).
Late Assignments	Extensions should be negotiated prior to the deadline, ideally as soon as a delay is anticipated.
Attendance Requirements	Class attendance is required and evaluated as part of your participation grade. However, reasonable exceptions will be made, including for illness, emergencies, family obligations, or professional obligations. Please inform the instruction as soon as possible about anticipated absences.
Extra Credit	Not available.

SPH AND UNIVERSITY POLICIES & RESOURCES

The School of Public Health maintains up-to-date information about resources available to students, as well as formal course policies, on our website at www.sph.umn.edu/student-policies/. Students are expected to read and understand all policy information available at this link and are encouraged to make use of the resources available.

The University of Minnesota has official policies, including but not limited to the following:

- Grade definitions
- Scholastic dishonesty
- Makeup work for legitimate absences
- Student conduct code
- Sexual harassment, sexual assault, stalking and relationship violence
- Equity, diversity, equal employment opportunity, and affirmative action
- Disability services
- Academic freedom and responsibility

Resources available for students include:

- Confidential mental health services
- Disability accommodations
- Housing and financial instability resources
- Technology help
- Academic support

COURSE OUTLINE/WEEKLY SCHEDULE

Week	Topic	Readings	Activities/Assignments
Week 1: September 6	**Introduction and Review** • Introduction to decision analysis • Motivational cases • Elements of decision problems • Probability review	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 1	
Week 2: September 13	**Structuring a Decision Problem** • Decision making under uncertainty • Building a decision tree • Sequence of events and defining outcomes • Analysis of a decision tree	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapters 1, 2, and 3	
Week 3: September 20	**Imperfect Diagnostic Tests** • Sensitivity and specificity • Likelihood ratios • Bayes' Theorem • Prior and posterior probabilities	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapters 5 and 6	**Due today: Project component 1** • Outline three real-world policy questions in a decision analytic framework
Week 4: September 27	**Non-dichotomous Tests** • Likelihood ratios and odds ratios • Odds form of Bayes' Theorem • Receiver operating characteristic (ROC) curves • Choosing a positivity criterion	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 7	
Week 5: October 4	**Value of Information** • Expected value of perfect information • Gross and net value of information • Value of imperfect information	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 5, 6, and 7 (review)	**Due today: Project component 2** • Construct a decision-tree and list necessary inputs for your chosen topic
Week 6: October 11	**Sensitivity Analysis** • Estimating model parameters • One-way, two-way, and probabilistic sensitivity analysis • Threshold analysis	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 8; 1st edition: Chapter 11: sections 11.1, 11.2, 11.3.6, 11.3.8 or 2nd edition: Chapter 12: sections 12.1, 12.2, 12.5, 12.6	
Week 7: October 18	**Midterm Review** • Conceptual review Practice midterm questions		**Midterm exam** • Posted on Canvas at 5pm today

Week	Topic	Readings	Activities/Assignments
Week 8: October 25	**Preferences and Utilities** • Eliciting utilities • Rating scales • Standard gamble • Time trade-off • Quality-adjusted life-years (QALYs)	**Required Reading:** • Feeny, D. et al., (2002). Multiattribute and Single-Attribute Utility Functions for the Health Utilities Index Mark 3 System, *Medical Care*, 40(2) **Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 4	**Due today: Midterm exam** • Submit via Canvas by 12pm
Week 9: November 1	**Cost-Effectiveness Analysis** • Shopping spree problem • Competing choice problem • Dominance and extended dominance	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 9: sections 9.1-9.4	
Week 10: November 8	**Applications of Cost-Effectiveness** • Applied examples • Cost-effectiveness in policy making • Cost-effectiveness thresholds	**Required Reading:** • Hutton et al. Cost-effectiveness of screening and vaccinating Asian and Pacific Islander adults for hepatitis B, *Ann Intern Med*. 2007; 147(7) • Bendavid et al. Cost-effectiveness of HIV monitoring strategies in resource-limited settings: a Southern African analysis, *Arch Intern Med*. 2008; 168(17) **Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, 1st edition: Chapter 9: sections 9.6-9.10 or 2nd edition: Chapter 9: sections 9.6-9.12	**In class today:** • Peer feedback on project topics
Week 11: November 15	**Time Preferences** • Discounting and present value • Calculating discounted life-expectancy and quality-adjusted life-expectancy • Event rates vs. probabilities • Hazard ratios vs. relative risks	**Required Reading:** • Fleurence, R. & Hollenbeak, C. Rates and Probabilities in Economic Modelling. *Pharmacoeconomics*. 2007; 25(1) **Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 9: section 9.5; Chapter 10: section 10.1	**Due today: Project component 3** • Revision of project topic based on peer feedback • Numeric estimates for three parameters
Week 12: November 22	**Dynamic Modeling** • Markov models • Transition matrices • Age-dependence • History dependence	• **Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, Chapter 10	
Week 13: November 29	**THANKSGIVING BREAK** • No class		

Week	Topic	Readings	Activities/Assignments
Week 14: December 6	**Stochastic Simulation Modeling** • Simulation basics • Stochastic cohort models • Microsimulation models • Final exam review	**Optional Reading:** • Hunink et al., *Decision Making in Health and Medicine*, 1st edition: Chapter 11: sections 11.3.3-11.3.5 or 2nd edition: Chapter 12: sections 12.3.3-12.3.5	**Final exam** • Posted on Canvas at 5pm today
Week 15: December 13	**END OF SEMESTER** • No class		**Due today:** • **Final exam** • **Final project report** • Submit both via Canvas by 12pm

CEPH COMPETENCIES

Competency	Learning Objectives	Assessment Strategies
4. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software as appropriate	Be able to formulate and solve a decision analysis problem by specifying the decision objective, relevant variables, sources of uncertainty, and tradeoffs. Be able to integrate evidence into a decision analytic framework to inform a clinical, public health policy, or programmatic decision.	Midterm exam, final exam, final project
5. Interpret results of data analysis for public health research, policy or practice	Be able to correctly interpret the results of a decision analysis and understand the uses and limitations of these methods in decision making at individual, organizational, and policy levels.	Midterm exam, final exam
11. Select methods to evaluate public health programs or policies	Gain an appreciation of how decision analytic methods can be applied to the evaluation of public health programs and policies. Be able to correctly interpret the results of a decision analysis and understand the uses and limitations of these methods in decision making at individual, organizational, and policy levels.	Midterm exam, final exam, final project (especially component 1)
15. Evaluate policies for their impact on public health and health equity	Be able to integrate evidence into a decision analytic framework to inform a clinical, public health policy, or programmatic decision. Learn the basic principles and mechanics underlying incremental cost-effectiveness analysis.	Midterm exam, final exam, final project
22. Apply systems thinking tools to a public health issue	Be able to formulate and solve a decision analysis problem by specifying the decision objective, relevant variables, sources of uncertainty, and tradeoffs. Be able to integrate evidence into a decision analytic framework to inform a clinical, public health policy, and/or programmatic decision.	Midterm exam, final exam, final project