

**SPPH 514: Decision Analysis in Health Care**

**Instructor:** Nick Bansback, Assistant Professor  
Room 289, 2206 East Mall  
School of Population and Public Health  
University of British Columbia  
604-822-5753  
nick.bansback@ubc.ca

**Office hours:** By Appointment (Fridays)

**Pre-requisites:** SPPH400 Statistics for Health Research &  
SPPH502 Epidemiological Methods I

**Course overview:**

The purpose of this course is to learn the methods and real-world application of decision analysis to improve individual and population level health from the perspectives of the health professionals, policy makers and patients. It will be most relevant to students that have projects relating to clinical or policy decisions, or persons that make routine medical decisions.

**Course description:**

Most fields of health research focus on producing new knowledge through better evidence and the development and testing of new treatments strategies. Decision-analysis explores how people make choices and how better choices can be made through a better understanding of uncertainty, complexity, and competing values. As such, decision-analysis provides key insights for disseminating knowledge that can lead to important improvements in population and public health.

In health care, as in other aspects of life, individuals have to make choices: health professionals must decide which treatment is most appropriate for their patients; policy-makers must decide which services should be used; and patients who must decide whether to follow advice from health professionals and policy makers. This course will teach principles and practical tools that can assist in these types of decisions.

The first half of the course will focus on normative decision making theories –i.e. standards for how people should make decisions. The second half of the course will focus on descriptive decision making theories – seeking to explain how people actually make decisions and how these deviate from normative theories often leading to poor choices. The course will finish by promoting prescriptive decision making theories. Through the use of decision tools and a better understanding of human limitations, prescriptive decision theories provide a guide as to how health professionals, their patients, and health care policymakers can make good decisions in practice.

Each week, the first half of the class will include interactive lecture content providing theory on a specific topic. Reading the required material will be important for students to fully understanding the lecture content and to ensure beneficial participation in the class discussions. The second half of each class will use a problem-based learning approach to apply knowledge to real-world scenario. This will include computer exercises where students will have exposure to decision analysis software and hypothetical scenarios that will encourage students to evaluate the evidence, value the outcomes, and make decisions. No prior software experience will be necessary.

**Learning objectives:**

By the end of this course, students should:

1. Understand the principles of how individuals should make good decisions, and why they often fail to do so.
2. Be able to confidently read and critique the literature referring to decision making.
3. Have had opportunities to reflect on the implications of decision theory and analysis on their own work or research interests.
4. Be able to conduct a decision-analysis for a health care problem relevant to the student's interest.

**Required readings**

A series of papers will be made available from UBC library ejournals to read prior to specified classes. It is important that students read each of these papers prior to the class.

The following textbook is recommended: Myriam Hunink, M.G., Glasziou, P.P., Siegel, J.E., Weeks, J.C., Pliskin, J.S., Elstein, A.S. & Weinstein, M.C. (2001). *Decision making in health and medicine: Integrating evidence and values*. Cambridge: Cambridge University Press. This has been placed on reserve at Woodward Library.

I also recommend: Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux. This is a popular book (New York Times Top Fifty bestseller in 2012) which summarizes a number of technical and scientific papers in an entertaining and relatively easy way.

**Brief course outline**

<b>Week</b>	<b>Topic(s)</b>
Week 1:	<i>Course introduction:</i> This class will discuss the course expectations and format including assignments and evaluation plan. It will then introduce an overview of decision analysis in health through considering common day to day decisions.
Week 2	<i>Understanding uncertainty:</i> This class will introduce probabilities, risk and imprecision – how these influence decisions and how they can be obtained from evidence. The way uncertainty is often misconstrued by patients and public will be covered along with exercises to understand how best to communicate uncertainty.
Week 3	<i>Measuring values:</i> How values can be understood from measuring preferences for trade-offs will be the focus of this class. Multiple methods will be described for health professionals wanting to elicit patient values, and policy makers wanting to elicit population values.
Week 4	<i>Choosing the best option:</i> With an understanding of the evidence, uncertainty and values, this class will describe how best to incorporate this information to make optimal decisions. Exercises using decision trees and multi criteria approaches will be used. Real-world applications used by drug safety agencies will be described.
Week 5	<i>When to screen and test:</i> Diagnostic tests have specific characteristics that can complicate decision making. This class will focus on who to screen, when to screen, and how to deal with multiple tests.
Week 6	<i>[Guest lecture] Decision Analysis in Practice.</i> <ul style="list-style-type: none"> <li>a) <i>Shared decision making:</i> Patient centred care is a fast growing topic that will have an influence across the health care system. It influences health professionals who are encouraged to understand each patient's values and determine individualized treatment plans, and policy makers who will be faced with greater patient choice in the system.</li> <li>b) <i>Clinical Decision support:</i> With the increasing use of electronic medical records, the potential for clinical decision support tools based on principles of decision analysis is enormous. Various tools have already been successfully implemented and proven to be effective.</li> </ul>
Week 7	<i>Student Presentations:</i> Each student should identify a decision analysis from the peer reviewed literature. They will present on: What clinical situation or controversy is the subject of this article? A brief summary of the facts presented in the article and the appropriateness of their use. What are the strengths and weaknesses of the article? If the study was to be re-designed, what be changed? To what populations can the article be generalized, if this is an issue? Could the article's conclusions be applied to clinical practice or public policy? How? Were any plausible strategies left out of the analysis?
Week 8	<i>Introduction to cost-effectiveness analysis:</i> This class will discuss briefly how costs can be incorporated into the decision analysis frameworks already

	covered. We will consider how health professionals and policy makers should use CEA with real examples from the literature.
Week 9	<i>Interpreting results of decision analysis:</i> This class will cover how to understand how confident you can be in results of decision analysis. It will also discuss ways of presenting the results – from nomograms for health professionals, to acceptability curves for policy makers.
Week 10	<i>How individuals really make decisions:</i> Recent research has explored how and why individuals actually make decisions. This class will provide an overview to the descriptive theories of decision making.
Week 11	<i>Common biases and heuristics:</i> Biases and heuristics can often lead to individuals to making decision errors. This class will introduce some of the most common errors and consider how we have been influenced by them in the past. Various case studies will demonstrate the power of biases and heuristics.
Week 12	<i>Prescriptive decision making:</i> With an understanding of the normative (weeks 1 to 5) and descriptive theories (weeks 10 and 11), this class will conclude the course by providing practical ways to make decisions in clinical practice and at the policy level.
Week 13	<i>Student presentations:</i> Each student should identify an important decision problem in one of their areas of expertise or interest, review any relevant literature, and explain how they are going to use decision analysis to improve health or health care in that situation. Through class discussion, the intent is that this will inform the topic and methods for each students final assignment

**Student Evaluation:**

Students will be evaluated on three areas of activity: in-class participation; a midterm paper; and a final assignment.

**In-class Participation (20% of grade)**

- Students will be expected to participate actively in class discussions and are encouraged to apply concepts and issues being presented in relation to their own research interests.
- Students will be expected to prepare for (and participate in) a variety of exercises that focus on applying course concepts to their own research interests, presenting these in class, and providing constructive peer feedback. Some weeks this will involve quizzes (which will not be graded)

**Student Presentations (30% of grade)**

- Students will be asked to give two 10 minute presentations with additional time for questions and answers. The first presentation (week 7) will be on a decision analysis study that they have chosen from the peer reviewed literature. The second presentation (week 12) will be about a cognitive bias that they have been allocated to study.

**Final assignment (50% of grade)**

- For the final paper, each student should identify an important decision problem in one of their areas of expertise, review any relevant literature, and suggest how decision making could be improved, based on the material covered in the course. A one-page proposal of the decision problem must be posted in the last week of the course, and the paper itself will be due 4 weeks after the end of the course. Papers should be no more than 8 single-spaced pages, with 1-inch margins and 12 point fonts.

**Synergy with other SPPH courses:**

For students who have already completed SPPH541: Health Services Research II: Economic Evaluation, there will be some overlap in the material presented, particularly in week 8. For students who have not completed SPPH541, this session will provide an overview of this course. In general, this course will not discuss economic costs, and as such has been designed to be complementary to other courses within SPPH.

**Course history:**

SPPH514 has been on the course books for many years, but had previously focused on clinical decision analysis, and normative decision making theories. In 2013, the course has been expanded to consider a broader perspective (while still incorporating core topics on clinical judgment), and more recent understanding of why humans often make poor decisions.

**Detailed Course schedule**

<b>Week</b>	<b>Topic(s)</b>
Week 1:	<p><i>Course introduction</i></p> <ul style="list-style-type: none"> <li>• Discussion of course expectations and format; discussion of assignments and evaluation plan; question and answer session</li> <li>• Introduction to decision making and uncertainty, and the types of decisions the course will cover</li> <li>• The PROACTIVE approach to decision analysis</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. <u>Chapter 1</u></li> <li>2. Keeney, R. L. (2004). Making better decision makers. Decision Analysis,1(4), 193-204.</li> </ol>
Week 2	<p><i>Understanding uncertainty</i></p> <ul style="list-style-type: none"> <li>• Overview of the types of uncertainty that influence decisions</li> <li>• Attitudes towards uncertainty – in particular risk and time</li> <li>• Working with probabilities</li> <li>• Communicating uncertainty</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. <u>Chapter 2</u></li> <li>2. Han, P. K., Klein, W. M., &amp; Arora, N. K. (2011). Varieties of Uncertainty in Health Care A Conceptual Taxonomy. Medical Decision Making, 31(6), 828-838.</li> <li>3. Gigerenzer, G., Gaissmaier, W., Kurz-Milcke, E., Schwartz, L. M., &amp; Woloshin, S. (2007). Helping doctors and patients make sense of health statistics. Psychological science in the public interest, 8(2), 53-96.</li> <li>4. Fagerlin A, Zikmund-Fisher BJ, Ubel PA. Helping patients decide: ten steps to better risk communication. J Natl Cancer Inst. 2011 Oct 5;103(19):1436-43.</li> </ol>
Week 3	<p><i>Measuring values</i></p> <ul style="list-style-type: none"> <li>• How value is defined from consumer theory</li> <li>• Methods for measuring values for different perspectives: from standard gamble and Quality adjusted life years (QALYs), to SMARTER, discrete choice and the Analytic Hierarchy Process</li> <li>• Whose values should be used?</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. <u>Chapter 4</u></li> <li>2. Bowling, A., &amp; Ebrahim, S. (2001). Measuring patients' preferences for treatment and perceptions of risk. Quality in Health Care,10(suppl 1), i2-i</li> <li>3. Naglie G, Krahn MD, Naimark D, Redelmeier DA, Detsky AS. Primer on medical decision analysis: Part 3--Estimating probabilities and utilities. Med Decis Making. 1997 Apr-Jun;17(2):136-41.</li> <li>4. Mullen, P. M. (2001). Public involvement in health care priority setting: an overview of methods for eliciting values. Health Expectations, 2(4), 222-</li> </ol>

	234
Week 4	<p><i>Choosing the best option</i></p> <ul style="list-style-type: none"> <li>• The use of Multi Criteria Decision Analysis (MCDA) approaches</li> <li>• Decision trees and Markov models</li> <li>• Decision aids</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. <i>Chapter 3</i></li> <li>2. Elwyn G; Decision Analysis in Patient Care. Lancet 2001; 358:571-574.</li> <li>3. Detsky AS; Primer on Medical Decision Analysis: Part 2-Building a Tree. Med Decis Making 1997; 17(2):126-135.</li> <li>4. Thokala P, Duenas A. Multiple criteria decision analysis for health technology assessment. Value Health. 2012 Dec;15(8):1172-81</li> <li>5. Lynd L, Najafzadeh M, Colley L, Byrne MF, Willan AR, Sculpher MJ, Hauber, B. Using the incremental net benefit framework for quantitative benefit–risk analysis in regulatory decision-making—a case study of alosetron in irritable bowel syndrome. Value in Health, 13(4), 411-417</li> </ol>
Week 5	<p><i>Diagnostic tests</i></p> <ul style="list-style-type: none"> <li>• Signal detection</li> <li>• Bayesian reasoning</li> <li>• Working with multiple tests</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. <i>Chapter 5</i></li> <li>2. Sackett, D. L. (1992). A primer on the precision and accuracy of the clinical examination. JAMA, 267(19): 2638-2644.</li> <li>3. Deeks JJ, Altman DG. Diagnostic tests 4: likelihood ratios. BMJ. 2004;329:168-169.</li> <li>4. Moons KG, van Es GA, Deckers JW, Habbema JD, Grobbee DE. Limitations of sensitivity, specificity, likelihood ratio, and bayes' theorem in assessing diagnostic probabilities: a clinical example. Epidemiology. 1997;8:12-17</li> </ol>
Week 6	<p><i>Shared decision making [GUEST LECTURE]</i></p> <ul style="list-style-type: none"> <li>• The case for shared decision making (SDM)</li> <li>• SDM in practice</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Mulley, A. G., Trimble, C., &amp; Elwyn, G. (2012). Stop the silent misdiagnosis: patients' preferences matter. BMJ, 345.</li> <li>2. Towle, A., &amp; Godolphin, W. (1999). Framework for teaching and learning informed shared decision making. BMJ: British Medical Journal, 319(7212), 766.</li> </ol> <p><i>Clinical Decision Support [GUEST LECTURE]</i></p> <ul style="list-style-type: none"> <li>• How decision analysis can be included in clinical decision support systems</li> <li>• Examples of CDS benefits</li> </ul> <ol style="list-style-type: none"> <li>3. Eddy D. Evidence-Based Medicine: A Unified Approach. Health affairs. 24(1), 9-17.</li> </ol>

	<p>4. Garg AX., Adhikari NK, McDonald H, Rosas-Arellano MP., Devereaux PJ, Beyene J, Haynes, RB. Effects of computerized clinical decision support systems on practitioner performance and patient outcomes. JAMA 2005; 293(10), 1223-123</p>
Week 7	<p><i>Student Presentations</i></p> <ul style="list-style-type: none"> <li>• Each student should identify a decision analysis from the peer reviewed literature. They will present on: What clinical situation or controversy is the subject of this article? A brief summary of the facts presented in the article and the appropriateness of their use. What are the strengths and weaknesses of the article? If the study was to be re-designed, what be changed? To what populations can the article be generalized, if this is an issue? Could the article's conclusions be applied to clinical practice or public policy? How? Were any plausible strategies left out of the analysis?</li> </ul>
Week 8	<p><i>Introduction to Cost-effectiveness analysis</i></p> <ul style="list-style-type: none"> <li>• Incorporating costs into decision analysis and dealing with ratios</li> <li>• Types of incremental cost-effectiveness</li> <li>• Time horizon and discounting</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. Chapter 9</li> <li>2. Detsky A; A Clinician's Guide to Cost-Effectiveness Analysis. Annals of Internal Medicine 1990; 113(2):147-154.</li> <li>3. Bell, C. M., Urbach, D. R., Ray, J. G., Bayoumi, A., Rosen, A. B., Greenberg, D., &amp; Neumann, P. J. (2006). Bias in published cost effectiveness studies: systematic review. BMJ, 332(7543), 699-703</li> </ol>
Week 9	<p><i>Interpreting results of decision analysis.</i></p> <ul style="list-style-type: none"> <li>• The role of sensitivity analysis</li> <li>• Whether to make a decision or obtain further evidence – expected value of information</li> <li>• Visual presentation of results</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Hunink and Glasziou. Decision making in health and medicine. <u>Chapter 6 and Chapter 11</u></li> <li>2. Krahn MD, Naglie G, Naimark D, Redelmeier DA, Detsky AS. Primer on medical decision analysis: Part 4--Analyzing the model and interpreting the results. Med Decis Making. 1997 Apr-Jun;17(2):142-51</li> <li>3. Dolan JG, Qian F, Veazie PJ. How well do commonly used data presentation formats support comparative effectiveness evaluations? Med Decis Making. 2012 Nov;32(6):840-50</li> </ol>
Week 10	<p><i>How people really make decisions</i></p> <ul style="list-style-type: none"> <li>• Descriptive decision theories: an introduction to prospect theory</li> <li>• The role of behavioural economics in understanding decisions</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Kahneman, D. (2002). Maps of bounded rationality: A perspective on</li> </ol>

	<p>intuitive judgment and choice. Nobel prize lecture, 8, 351-401.</p> <p>2. Ubel, P. A. (2002). Is Information Always a Good Thing?: Helping Patients Make " Good" Decisions. <i>Medical care</i>,40(9), V-39.</p>
Week 11	<p><i>Common biases and heuristics</i></p> <ul style="list-style-type: none"> <li>• Understand when heuristics can help or harm</li> <li>• Review the most common biases and heuristics that influence health care decisions</li> </ul> <p><u>Key Readings</u></p> <p>1. Redelmeier, D. A., Rozin, P., &amp; Kahneman, D. (1993). Understanding patients' decisions. <i>JAMA: the journal of the American Medical Association</i>, 270(1), 72-76.</p> <p>2. Croskerry, P. (2003). The importance of cognitive errors in diagnosis and strategies to minimize them. <i>Academic Medicine</i>, 78(8), 775.</p>
Week 12	<p><i>Prescriptive decision making</i></p> <ul style="list-style-type: none"> <li>• How to use and communicate decision analysis with an understanding of both normative and descriptive decision theories</li> <li>• Debiasing information and the use of nudges</li> </ul> <p><u>Key Readings</u></p> <ol style="list-style-type: none"> <li>1. Redelmeier DA; Guidelines for Verbal Presentations of Medical Decision Analyses. <i>Med Decis Making</i> 1997; 17(2):228-230.</li> <li>2. Thaler, R. H., &amp; Sunstein, C. R. (2003). Libertarian paternalism. <i>The American Economic Review</i>, 93(2), 175-179.</li> <li>3. Loewenstein, G., Asch, D. A., Friedman, J. Y., Melichar, L. A., &amp; Volpp, K. G. (2012). Can behavioural economics make us healthier?. <i>BMJ (Clinical research ed.)</i>, 344, e3482.</li> </ol>
Week 13	<p><i>Student presentations</i></p> <ul style="list-style-type: none"> <li>• Each student should identify an important decision problem in one of their areas of expertise or interest, review any relevant literature, and explain how they are going to use decision analysis to improve health or health care in that situation. Through class discussion, the intent is that this will inform the topic and methods for each students final assignment</li> </ul>