SPPH 549/PHAR 560: Advanced Economic Evaluation in Health Care

The University of British Columbia
School of Population and Public Health & Faculty of Pharmaceutical Sciences

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Calendar Entry: 2023/24 Winter Term 2
Credits: 3

General Course Description: This course provides students with the opportunity to gain in-depth and practical skills in conducting economic evaluation of health technologies. In addition, the course considers, in detail, the policy context for the use of economic evaluation, drawing on experiences and evidence from both Canadian and international settings. Finally, current methodological and theoretical debates are presented.

Prerequisites: SPPH 541 or equivalent training (i.e., some introductory training in economic evaluation)

Co-requisites: None

Background: Biomedical science is progressing at a rapid pace and available health care technologies to prevent, treat, or control diseases are becoming more numerous, complex, and expensive. Concordantly, decision makers face the challenge of maximizing the benefit obtained from the dollars spent in treatments, as well as in research. Over recent years, the theoretical and methodological framework underpinning economic evaluations has evolved to cope with such challenges and complexities. This course will cover, in depth, the methodological aspects of economic evaluation applied to health care topics and provide opportunities for practical, hands-on skill development. This course is aimed at those who wish to be able to perform 'production level' economic evaluations suitable for publication in peer-reviewed journals or reports to decision makers at government agencies or in industry.

This course is not introductory. Knowledge of statistics, epidemiology, and some basics of health economics are also required.

Format: The course will be a combination of lecture presentations, interactive practical modeling sessions, group assignments and individual projects. The topics for each session are provided below. Generally, the content of the course can be divided into three sections: (i) in-depth coverage of applied

techniques of conducting economic evaluations; (ii) policy context for use of economic evaluation; and (iii) theory and current methodological debates.

Objectives:
As a result of this course, students will be able to:
- Develop a deep understanding of the available methodologies for conducting economic evaluation of health-care technologies
- Perform economic evaluation analyses, suitable for publication in peer-reviewed journals, using decision modeling
- Evaluate and report on the extent of uncertainty in the analysis results
- Understand the challenges involved in the policy use of economic evaluation and identify strategies for overcoming the barriers, drawing on international experiences
- Take part in informed discussions of some of the key methodological issues currently being debated in the health economics literature

Evaluation:
Participation (20%)
Midterm (40%)
Final assignment (40%)

Students will be assigned a mark for their willingness to participate in class and online discussion and the degree to which their participation enhances discussion in the class.

Version December 3, 2023

Course Outline

Session 1 <SB> **2024/01/11**	**The theoretical basis of economic evaluation in health care** **Key reference:** • Meltzer DO, Basu A, Sculpher MJ (2016) Chapter 2: Theoretical Foundations of Cost-Effectiveness Analysis in Health and Medicine. https://doi.org/10.1093/acprof:oso/9780190492939.003.0002 Pages 39–66 • Hurley J (2010) Health Economics. First Edition. McGraw-Hill Ryerson. Chapter 4 • Russell LB et al. The role of cost-effectiveness analysis in health and medicine. JAMA. 1996; 276 (14): 1172–77. **Objectives**: - To develop an understanding of the theory relevant to economic evaluation in health care - To be able to describe the strengths and weaknesses of economic analysis approaches from the perspective of theoretical underpinnings
Session 2 <SB> **2024/01/18**	**A review of the methods of economic evaluation in health care** **Key references:** • Owens DK, Siegel JE, Sculpher MJ, Salomon JA (2016) Chapter 4: Designing an Economic Evaluation. https://doi.org/10.1093/acprof:oso/9780190492939.003.0002 Pages 75–104 • Drummond MF et al (2015) Methods for the Economic Evaluation of Health Care Programmes. OUP. Fourth Edition. **Objectives**: - To recap and refresh understanding of different approaches to economic evaluation in health care - To be able to identify when each approach should be employed and the benefits associated with each approach
Session 2 (cont.) <SB> **2022/01/18**	**Alternative modelling approaches and model selection** **Key references:** • Brennan A, Chick SE, Davies R. A taxonomy of model structures for economic evaluation of health technologies. Health Econ. 2006 Dec;15(12):1295-310. • Caro JJ, Briggs AH, Siebert U, et al. Modeling good research practices - overview: a report of the ISPOR-SMDM Modeling Good Research Practices Task Force-1. Value Health. 2012;15(5):796-803.

	Objectives: - To develop a thorough understanding of different modeling approaches - To be able to categorize modeling approaches according to cohort/individual, interactive/non-interactive, and discrete/continuous time - To understand the advantages and disadvantages of cohort versus individual models.
Session 3, 4 and 5 \<MS\> **2024/01/25** **2024/02/01** **2024/02/08**	**Model building (with exercises)** This will be a very practical session with presenting a case study and building a model from scratch. **Key references:** • <u>Chapters 2 and 3 of Briggs AH, Claxton K, Sculpher MJ. Decision Modelling for Health Economic Evaluation. Oxford University Press; 2006. 251 p. (ISBN 978-0-19-852662-9)</u> • 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 Sep-Oct;32(5):722-32. **Objectives**: - To create a real-world decision tree and Markov model in Microsoft Excel, and describe the strength and shortcomings of such a choice for modeling platform. - To develop an understanding of a model, input and output parameters, model structure, and the relation between modeling and real-world evidence (evidence synthesis) - To understand the key concepts underlying Markov models (state probabilities, transition matrices, payoffs, time-dependency) - To develop a deep understanding of the first-level, second-level, and modeling uncertainty - To learn key concepts of probability calculations (conditional vs. marginal probabilities, calculating probabilities from rates) - To learn about Monte Carlo simulation - To learn about typical and practical paradigms for evidence synthesis
Session 6 \<SB\> **2024/02/15**	**The use of economic evaluation in policy making: an exploration of conceptual and practical issues, including the search for a cost-effectiveness threshold** **Key references:** • Bryan S, Williams I, McIver S. Seeing the NICE side of cost-effectiveness analysis: a qualitative investigation of the use of

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	CEA in NICE technology appraisals. Health Econ. 2007 Feb; 16 (2): 179-93. • Dakin H, Devlin N, Feng Y, Rice N, O'Neill P, Parkin D. The influence of cost-effectiveness and other factors on NICE decisions. Health Econ. 2015 Oct;24(10):1256-1271. • McCabe C, Claxton K, Culyer AJ. The NICE cost-effectiveness threshold: what it is and what that means. *PharmacoEconomics* 2008;26(9):733-44 **Objectives**: - To develop understanding of alternative approaches to presentation and use of economic evaluations in health care - To be familiar with empirical work on the use of economic analyses to inform policy decision making
Midterm break	
Session 7 \<SB\> 2024/02/29	**Evidence from international experience in the use of economic evaluation** **Key references:** • Clement FM, Harris A, Li JJ, Yong K, Lee KM, Manns BJ. Using effectiveness and cost-effectiveness to make drug coverage decisions: a comparison of Britain, Australia, and Canada. JAMA. 2009 Oct 7;302(13):1437-43. doi: 10.1001/jama.2009.1409. • Husereau, D, Culyer, A.J, Neumann, P et al. How do Economic Evaluations Inform Health Policy Decisions for Treatment and Prevention in Canada and the United States? Appl Health Econ Health Policy 13, 273–279 (2015). https://doi.org/10.1007/s40258-014-0133-6 **Objectives**: - To review international experiences in using economic evaluations in health care - To understand the conceptual and empirical approaches to determining the cost-effectiveness threshold - To appreciate the debates on the appropriateness of a cost-effectiveness threshold
Session 8 \<MS\> 2024/03/07	**Uncertainty, probabilistic [sensitivity] analysis (P[S]A), and Expected Value of Information (EVI)** **Key references:** • Value of Information Analysis for Research Decisions-An Introduction: Report 1 of the ISPOR Value of Information

	Analysis Emerging Good Practices Task Force. Value Health. 2020;23(2):139-150. doi:10.1016/j.jval.2020.01.001 • Value of Information Analytical Methods: Report 2 of the ISPOR Value of Information Analysis Emerging Good Practices Task Force. Value Health. 2020;23(3):277-286. doi:10.1016/j.jval.2020.01.004 **Objectives** - To learn how to estimate and interpret ICER under uncertainty - To learn how to construct and interpret credible intervals for the ICER - To learn how to construct and interpret cost-effectiveness plain and cost-effectiveness acceptability curve (CEAC) - To learn how to do PSA in Excel - To understand the concept and important metrics in EVI - To learn how to calculate EVPI from PSA data
Session 9 **<MS>** **2024/03/14**	**Building a health economics model in R – part 1** **Key references:** • Jalal H, Pechlivanoglou P, Krijkamp E, Alarid-Escudero F, Enns E, Hunink MGM. An Overview of R in Health Decision Sciences. Med Decis Making. 2017 Oct;37(7):735-746. doi: 10.1177/0272989X16686559. Alarid-Escudero F, Krijkamp E, Enns EA, Yang A, Hunink MGM, Pechlivanoglou P, Jalal H. An Introductory Tutorial on Cohort State-Transition Models in R Using a Cost-Effectiveness Analysis Example. Med Decis Making. 2023 Jan;43(1):3-20. doi: 10.1177/0272989X221103163 • Alarid-Escudero F, Krijkamp E, Enns EA, Yang A, Hunink MGM, Pechlivanoglou P, Jalal H. A Tutorial on Time-Dependent Cohort State-Transition Models in R Using a Cost-Effectiveness Analysis Example. Med Decis Making. 2023 Jan;43(1):21-41. doi: 10.1177/0272989X221121747 **Objectives:** - To enumerate the pros and cons of modeling in a programming language versus a spreadsheet platform - To Review the fundamentals of R and its features as they related to decision-analytic modeling - To program state transition for Markov models in R - To develop a basic decision-analytic model in R

Session 10 **<MS>** **2024/03/21**	**Building a health economics model in R – part 2** **Key references:** - Jalal H, Pechlivanoglou P, Krijkamp E, Alarid-Escudero F, Enns E, Hunink MGM. An Overview of R in Health Decision Sciences. Med Decis Making. 2017 Oct;37(7):735-746. doi: 10.1177/0272989X16686559. - Alarid-Escudero F, Krijkamp E, Enns EA, Yang A, Hunink MGM, Pechlivanoglou P, Jalal H. An Introductory Tutorial on Cohort State-Transition Models in R Using a Cost-Effectiveness Analysis Example. Med Decis Making. 2023 Jan;43(1):3-20. doi: 10.1177/0272989X221103163 - Alarid-Escudero F, Krijkamp E, Enns EA, Yang A, Hunink MGM, Pechlivanoglou P, Jalal H. A Tutorial on Time-Dependent Cohort State-Transition Models in R Using a Cost-Effectiveness Analysis Example. Med Decis Making. 2023 Jan;43(1):21-41. doi: 10.1177/0272989X221121747 **Objectives:** - To enumerate the pros and cons of modeling in a programming language versus a spreadsheet platform - To Review the fundamentals of R and its features as they related to decision-analytic modeling - To program state transition for Markov models in R - To develop a basic decision-analytic model in R
Current debates (suggested topics but these will be selected each year to ensure that 'current' debates are reflected in the course)	
Session 11 **<SB>** **2024/03/28**	**Distributional CEA** **Key reference:** Cookson R, Griffin S, Norheim OF, Culyer AJ (Eds). Distributional Cost-Effectiveness Analysis, OUP, 2021. ISBN: 9780198838197
Session 12 **<SB>** **2024/04/4**	**Economic evaluation and Machine Learning** **Key reference:** Padula WV, Kreif N, Vanness DJ, Adamson B, Rueda JD, Felizzi F, Jonsson P, IJzerman MJ, Butte A, Crown W. Machine Learning Methods in Health Economics and Outcomes Research-The PALISADE Checklist: A Good Practices Report of

	an ISPOR Task Force. Value Health. 2022 Jul;25(7):1063-1080. doi: 10.1016/j.jval.2022.03.022. PMID: 35779937.
	Other potential topics
	• **Capabilities theory and its implications for health economic evaluation** • **'Indirect costs' and Productivity measurement and valuation**
Session 13 **<SB and MS>** **2024/04/11**	Wrap up
	<u>Final assignment</u>

Use of generative AI resources

The use of Chat GPT or other generative AI tools is permitted in this course. If you use generative AI to get ideas and/or partial answers for an assignment and/or to generate any text for a draft or final version of any part of an assignment, you must declare that you have used it. You must also add a couple of sentences describing the extent to which it was used, and you must save any generated text from this tool in case it is requested. A TA or the instructor may ask you to provide the generated text in order to help with grading decisions.

Respectful environments

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

SPPH is committed to providing a positive education experience free from discrimination. If you have had an experience in this course where you feel unsafe, have been mistreated or have witnessed mistreatment, please let us know. If you want to raise this beyond the course instructor the School recommends the following. You may contact your academic supervisor, the education manager for your program or the Associate Director-Education. You may also report your concerns to the Faculty of Medicine Office of Respectful Environments, Equity, Diversity & Inclusion (REDI) at https://mistreatmenthelp.med.ubc.ca/. Both SPPH and the REDI Office have procedures in place for recording and acting on reports of mistreatment in the educational environment.