Cost Effectiveness Modelling for Health Technology Assessment

A 5-day practical course

28 April – 02 May 2025 | Edinburgh

Programme

Cost Effectiveness Modelling for Health Technology Assessment

Faculty

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Note on Presenters:

A Main Presenter delivers each Session with the assistance of another member of the Faculty. The Sessions are delivered as either a lecture, or a lecture with applied exercises to be completed and discussed during the session. Each day of the course is made of four sessions, with the exception of the first day, which starts in the afternoon and consists of two sessions.

Learning Objectives

- Understand the concepts and rationale of HTA and types of economic evaluation
- Understand when you would use a decision tree model and how they work
- Understand when you would use a Markov model, how they work and how to use them to inform decision making
- Appreciate the importance of uncertainty in economic evaluations and how this can be assessed
- Be able to generate a probabilistic Markov model in Excel and produce and interpret outputs
- Understand the concept of value of information and calculate this from probabilistic model results
- Learn about key developments and debates in HTA including precision medicine, real-world evidence and the willingness to pay threshold

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Course Schedule

Day 1: Monday 28 April 2025

12:00 – 13:00	***Registration and Lunch***	
13:00 – 14:15	**Session 1:** **Introduction to HTA and Economic Evaluations**	Peter Hall and David Meads
14:15 – 14:30	***Tea & Coffee***	
14:30 – 15:45	**Session 2:** **Economic Evaluations**	David Meads and Peter Hall

Day 2: Tuesday 29 April 2025

09:00 – 09:30	***Registration and coffee***	
09:30 – 10:45	**Session 3:** **Trial-based Economic Evaluations**	Alison Smith and David Meads
10:45 – 11:00	***Tea & Coffee***	
11:00 – 12:15	**Session 4:** **Decision Model-based Economic Evaluations**	David Meads and Alison Smith
12:15 – 13:15	***Lunch***	
13:15 – 14:30	**Session 5:** **Decision-Analytic Models – Decision Tree Models**	Alison Smith and David Meads
14:30 – 14:45	***Tea & Coffee***	
14:45 – 16:00	**Session 6:** **Decision-Analytic Models – Considerations in Diagnostics**	Alison Smith and David Meads

Day 3: Wednesday 30 April 2025

09:00 – 09:30	***Registration and coffee***	
09:30 – 10:45	**Session 7:** **Decision Tree Models – Sensitivity Analysis**	David Meads and Alison Smith
10:45 – 11:00	***Tea & Coffee***	
11:00 – 12:15	**Session 8:** **Decision-Analytic Models – Markov Models**	David Meads and Daniel Howdon
12:15 – 13:15	***Lunch***	
13:15 – 14:30	**Session 9:** **Markov Models – PSA setup 1**	Giovanni Tramonti and Daniel Howdon
14:30 – 14:45	***Tea & Coffee***	
14:45 – 16:00	**Session 10:** **Markov Models – PSA setup 2**	David Meads and Giovanni Tramonti

Day 4: Thursday 01 May 2025

09:00 – 09:30	***Registration and coffee***	
09:30 – 10:45	**Session 11:** **Markov Models – PSA output part 1**	Giovanni Tramonti and David Meads
10:45 – 11:00	***Tea & Coffee***	
11:00 – 12:15	**Session 12:** **Markov Models – PSA output part 2**	David Meads and Daniel Howdon
12:15 – 13:15	***Lunch***	
13:15 – 14:30	**Session 13:** **Decision Uncertainty**	Giovanni Tramonti and Daniel Howdon
14:30 – 14:45	***Tea & Coffee***	
14:45 – 16:00	**Session 14:** **Use of Real-World Evidence for decision-making**	Daniel Howdon and Giovanni Tramonti

Day 5: Friday 02 May 2025

09:00 – 09:30	***Registration and coffee***	
09:30 – 10:45	**Session 15:** **Use of Real-World Evidence for decision-making**	Daniel Howdon and Giovanni Tramonti
10:45 – 11:00	***Tea & Coffee***	
11:00 – 12:15	**Session 16:** **Use of Real-World Evidence for decision-making**	Daniel Howdon and Giovanni Tramonti
12:15 – 13:15	***Lunch***	
13:15 – 14:30	**Session 17:** **Introduction to Modelling in R**	Giovanni Tramonti and Daniel Howdon
14:30 – 14:45	***Tea & Coffee***	
14:45 – 16:00	**Session 18:** **Current methodological debate in HTA**	Daniel Howdon, Peter Hall, and Giovanni Tramonti

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Session Details

Session 1: Introduction to HTA and Economic Evaluations

In this introductory session, participants will gain a fundamental understanding of Health Technology Assessment (HTA) and its role in healthcare decision-making. They will learn about the global context of HTA and how it varies across different healthcare systems. The session will delve into the reference case of the National Institute of Health and Care Excellence (NICE) as a prominent example of HTA. Concepts of reimbursement and cost-effectiveness thresholds will be explored, helping participants grasp the criteria that guide decisions on whether to fund specific healthcare technologies.

Session 2: Economic Evaluations

This session will expand on the various types of economic evaluations commonly used in HTA, such as cost-effectiveness analysis, cost-utility analysis, and cost-benefit analysis. Participants will learn how costs and outcomes are measured, with the consideration of different perspectives, a crucial step for comparing the value of healthcare interventions accurately.

Session 3: Trial-based Economic Evaluations

Building on the previous one, in this teaching session, the fundamentals of clinical trials will be covered, with an emphasis on their importance in economic evaluation. The specific requirements for trials suitable for economic analysis will be explored, and the critical data capture process will be detailed. Essential metrics, such as life years, Quality-Adjusted Life Years (QALYs), and costs, will be taught, and the outputs, including Net Benefit Regression, will be explained. Common issues in analysis will be addressed, and the capture of uncertainty will be discussed, enabling participants to conduct robust economic evaluations based on clinical trial data.

Session 4: Decision Model-based Economic Evaluations

Participants will delve into decision model-based economic evaluations, gaining insights into when and why these models are used. Detailed discussions will cover the data requirements, output generation, and the various types of models available. Decision models play a critical role in extrapolating outcomes beyond the duration of clinical trials, and this session will clarify their importance.

Session 5: Decision-Analytic Models – Decision Tree Models

This session will provide an in-depth exploration of designing decision tree models within the context of healthcare decision-making. Using a diagnostic technology case study, participants will learn how to construct and populate decision tree models. This type of models is among the most common in the field, and serve as invaluable tools for mapping out numerous healthcare scenarios, guiding the decision-making process by depicting various possible pathways, probabilities, and associated outcomes

Session 6: Decision-Analytic Models – Considerations in Diagnostics

In this session, several diagnostic considerations in decision-analytic models will be explored, with a focus on topics such as overdiagnosis, sensitivity and specificity, and the accuracy of diagnostic tests. The potential for overdiagnosis and its impact on healthcare decision-making will be examined and the concepts of sensitivity and specificity will be elaborated upon, emphasizing their role in the evaluation of diagnostic test performance. Furthermore, the process of adding a new clinical pathway to routine patient care will be discussed, providing practical insights into how the effects of diagnostic technologies on patient management strategies can be accounted for.

Session 7: Decision Tree Models – Sensitivity Analysis

This session will focus on the techniques of one-way sensitivity analysis and headroom analysis. Participants will learn how to systematically explore the impact of varying key parameters or assumptions on the outcomes within their decision trees. One-way sensitivity analysis allows for the identification of the most influential factors affecting the model's results, enabling decision-makers to understand the model's robustness. Additionally, headroom analysis will be covered, helping participants assess the financial feasibility of new interventions and pinpointing the range of costs within which a healthcare technology becomes cost-effective.

Session 8: Decision-Analytic Models – Markov Models

In this session, participants will be introduced to Markov models, understanding when and why these models are essential in healthcare decision-making. With a focus on practical application, the session will guide students through the design and setup of Markov models, emphasizing the construction of transition matrices and the computation of traces. The concept of probabilistic sensitivity analysis (PSA) will also be introduced, enabling participants to explore the influence of uncertainty on model outcomes.

Session 9: Markov Models – PSA setup 1

In this focused session, participants will learn setting up Probabilistic Sensitivity Analysis (PSA) in healthcare decision modelling, with a specific emphasis on selecting parameters related to effectiveness and survival. Participants will learn how to incorporate uncertainty surrounding key effectiveness and survival parameters into their models, enabling a more comprehensive exploration of the impact of these uncertainties on the model's results.

Session 10: Markov Models – PSA setup 2

Building on the previous one, this session will expand on the setup of the probabilistic sensitivity analysis by examining how to choose and use parameters relating to cost and utility. By the end of the session, attendees will have the practical skills and knowledge needed to correctly setup a PSA, contributing to a deeper understanding of the robustness and reliability of healthcare decision models when confronted with uncertainties in cost and utility estimations.

Session 11: Markov Models – PSA output part 1

The session will cover the practical aspects of running a PSA. Attendees will explore the diverse range of outputs generated by PSA, providing insights into the distribution of results and their implications for decision-making. The session will address common challenges in PSA, such as interpreting scatterplots and calculating Incremental Cost-Effectiveness Ratios (ICERs).

Session 12: Markov Models – PSA output part 2

This session will focus on additional topics relating to PSA outputs, such as Lambda values and Cost-Effectiveness Acceptability Curves. Attendees will learn how to implement and interpret Lambda values. The session will provide a comprehensive understanding of Cost-Effectiveness Acceptability Curves, enabling participants to assess the likelihood of a healthcare intervention being cost-effective across varying willingness-to-pay thresholds. Additionally, participants will explore the concept of Acceptability Frontiers, which helps decision-makers identify the range of scenarios where interventions are likely to be cost-effective.

Session 13: Decision Uncertainty

This session will address the importance of decision uncertainty in HTA. Participants will explore the potential costs associated with making incorrect decisions and the concept of Value of Information (VOI). Specific VOI components, such as Expected Value of Perfect Information (EVPI), Expected Value of Partial Perfect Information (EVPPI), and Expected Value of Sample Information (EVSI), will be discussed, highlighting their role in decision-making under uncertainty.

Session 14: Use of Real-World Evidence for decision-making

Following the information provided in the previous session, analytical approaches for incorporating RWE into HTA will be explored through case studies and practical examples, emphasizing its growing relevance in evidence-based decision-making.

Session 15: Use of Real-World Evidence for decision-making

This session is a continuation of session 14, with additional examples and exercises relating to the use of RWE in HTA.

Session 16: Use of Real-World Evidence for decision-making

This session is a continuation of session 14 & 15.

Session 17: Introduction to Modelling in R

This session will introduce participants to the use of R Programming Language for modelling in HTA. Participants will learn the basics of using R for modelling purposes, gaining practical skills to apply in their HTA work. The session will cover the advantages and disadvantages of using R for economic evaluations, and it will present useful resources and packages to adapt the model used throughout the course as an example from MS Excel to R.

Session 18: Current methodological debate in HTA

The final session will engage participants in a discussion of ongoing methodological debates within the field of HTA. Topics will include cost-effectiveness thresholds, opportunity cost and budget considerations, spillover effects of healthcare interventions, and the balance between equity and efficiency in healthcare decision-making. Participants will gain insights into the evolving landscape of HTA methodology and the challenges facing decision-makers in today's healthcare systems.