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*Comparative Effectiveness Research/Health Technology Assessment (HTA)*

# Reviewing the Evidence to Inform the Population of Cost-Effectiveness Models within Health Technology Assessments

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ABSTRACT

**Objectives:** Health technology assessments (HTAs) typically require the development of a cost-effectiveness model, which necessitates the identification, selection, and use of other types of information beyond clinical effectiveness evidence to populate the model parameters. The reviewing activity associated with model development should be transparent and reproducible but can result in a tension between being both timely and systematic. Little procedural guidance exists in this area. The purpose of this article was to provide guidance, informed by focus groups, on what might constitute a systematic and transparent approach to reviewing information to populate model parameters. **Methods:** A focus group series was held with HTA experts in the United Kingdom including systematic reviewers, information specialists, and health economic modelers to explore these issues. Framework analysis was used to analyze the qualitative data elicited during focus groups. **Results:** Suggestions included the use of rapid reviewing methods and the need to consider the trade-off between relevance and quality. The need for transparency in the reporting of review methods was emphasized. It was suggested that additional attention should be given to the reporting of parameters deemed to be more important to the model or where the preferred decision regarding the choice of evidence is equivocal. **Discussion:** These recommendations form part of a Technical Support Document produced for the National Institute for Health and Clinical Excellence Decision Support Unit in the United Kingdom. It is intended that these recommendations will help to ensure a more systematic, transparent, and reproducible process for the review of model parameters within HTA.

*Keywords:* cost-effectiveness modeling, evidence-based decision making, health technology assessment, model parameters, systematic review methods.



## Introduction

Health technology assessment (HTA) reports used to inform evidence-based decisions concerning the use of health care interventions typically involve the development of a systematic review of clinical effectiveness and the development of a cost-effectiveness model. By its very nature, the development of the model requires information beyond clinical efficacy such as health utilities, resource use, and costs. In addition, the model structure requires the use of evidence to inform judgments concerning the plausibility of relationships between intermediate and final end points, as well as other information to determine what is relevant for inclusion in the model. The way in which this evidence is used can have a fundamental impact on results of the model and ultimately the decision outcome [1]. The main groups of information needs are illustrated in Figure 1. It should be noted that the five categories presented are not mutually exclusive and there will be overlap between them. The information needs represented here include both soft contextual information and harder experimental or nonexperimental evidence.

A number of issues need to be considered when reviewing evidence to inform the specification and population of cost-effectiveness models. These include the timelines for HTA, which may be restrictive, because decisions on technologies are often needed as near to the time of licensing as possible and often before clinical effectiveness has been established. There is also a need for methods that are systematic, transparent, and reproducible to minimize the risk of bias and therefore produce more robust results. If model results are to be considered credible, researchers need to be transparent about how the model was developed and why certain inputs should be considered reliable. Sources of evidence may vary widely between models. These sources include randomized controlled trials, observational evidence and other clinical studies, registry databases, elicitation of expert clinical judgment, existing cost-effectiveness models, routine data sources, and health valuation studies. Previous work by Coyle et al. [2] looked at the most common data elements within models (clinical effect sizes, baseline clinical data, resource use, unit costs, and utilities) and developed a hierarchy of data sources for these. For clinical effect size, the authors recommend the highest level of evidence to be meta-analysis of randomized controlled trials with direct comparison between comparator therapies and the lowest ranking evidence to be expert opinion. For another evidence

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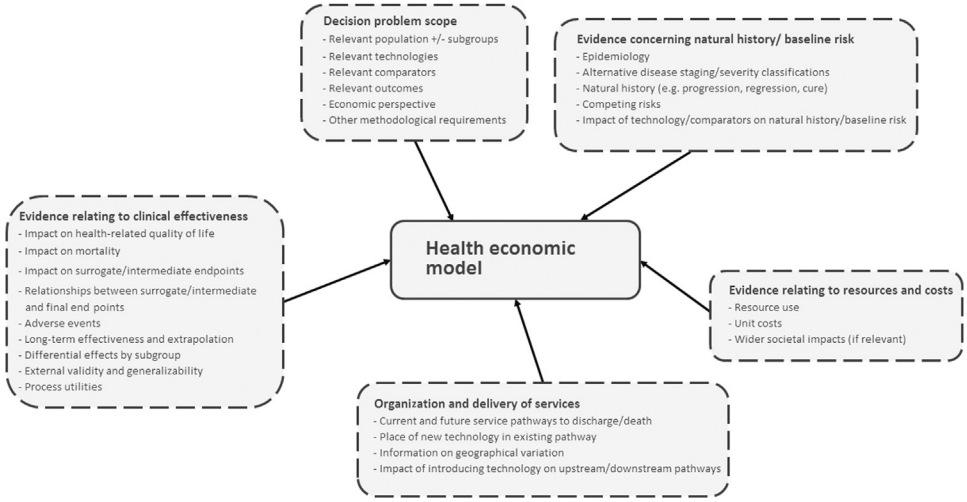


**Fig. 1 – Types of evidence used to inform models.**

requirement, resource use, the authors considered prospective data collection or analysis of reliable administrative data to be the highest level of evidence, with expert opinion again the lowest.

While reviewing processes are often used to identify evidence for economic models, it is less usual for model reports to describe and justify how they have identified and synthesized the evidence beyond the efficacy data or for reports to set out criteria against which the relevance and quality of the evidence are assessed [3]. While some of the issues surrounding reviewing evidence for models have been discussed previously [1,3–8], there remains very little formal guidance with respect to best practice in this area. Briggs et al. [9] in their ISPOR-SMDM Modeling Good Research Practice report recommend that analysts should conform to the broad principles of evidence-based medicine and avoid "cherry picking" the best single source of evidence. Thus, the selection of sources of evidence for model parameters should follow a systematic and transparent approach. Coyle and Lee [1] demonstrated that using different sources of evidence can have a substantial impact on the results and highlighted that there is a lack of agreement as to what constitutes good evidence for specific data inputs in economic models. It has further been argued that one potential source of errors in HTA models is the separation of information gathering, reviewing, and modeling functions [10].

Current methodological guidance regarding the reviewing of evidence to inform model parameters, apart from clinical effectiveness from the National Institute for Health and Clinical Excellence (NICE), states: "For all parameters (including effectiveness, valuation of HRQL and costs) *a* systematic consideration of possible data sources is required" [11]. This absence of clarity presents a considerable challenge to organizations submitting evidence to NICE because a full systematic review is clearly not required for each parameter, yet it is not clear what a "systematic consideration" is. A recent Technical Support Document (TSD) from the NICE Decision Support Unit [12] considers the requirements and provides methodological guidance for identifying and reviewing evidence to inform models of cost-effectiveness, in particular model parameter estimates, in the NICE Technology Appraisal Process. While this was developed to inform assessments of pharmaceutical interventions, it also has a wider relevance to the appraisal of medical devices and diagnostic techniques. Issues surrounding the identification, review, and selection of evidence to inform model parameter values are relevant to economic analyses that involve secondary data alone as well as those in which a combination of primary and secondary data is required. When economic analyses are undertaken alongside a clinical trial, it is rare that full evidence requirements to assess costs and effect of the technology would be sourced from the trial alone [13]. Part of the TSD provides guidance on methods for reviewing model parameter data in a systematic fashion. It draws distinctions between systematic reviews and reviewing in the context of informing model parameters and demonstrates how the key components of systematic review methods can be used to systematize and make explicit the choices involved in selecting evidence to inform models. Individual model parameters will have different characteristics and therefore varying evidence requirements, information availability, and reviewing needs. The purpose of this article was to provide guidance, informed by a series of focus groups, on what might constitute a systematic and transparent approach to reviewing information to populate model parameters where there is no requirement to use conventional systematic review methods and where little procedural guidance exists. While precise methods that should be used to review individual evidence types should be judged on a case-by-case basis, issues that need to be considered should not. This article highlights what these considerations are and emphasizes the importance of being transparent in how such judgments are reached. The article describes the methods used and identifies seven key themes related to the reviewing of evidence for model parameters and provides further analysis of key themes in the discussion.

## Methods

A series of focus groups was used to gather information on issues around reviewing for model parameters and provide the basis of recommendations covered in the TSD. An initial pilot focus group was held with 18 researchers who had extensive experience in HTA including 6 systematic reviewers, 2 information specialists, and 10 health economic modelers in January 2010. The researchers were all from the School of Health and Related Research at the University of Sheffield, which is a major provider of HTA reports in the United Kingdom. A range of people with different areas and of expertise in HTA was invited to attend the focus group; these individuals were identified purposively to reflect the breadth of input into the model development process. A topic guide was developed to structure the discussion within the focus group and was informed through discussion with experts in the field of HTA and included questions identified through informal