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Decision Analytic Modelling in the Economic Evaluation of Health Technologies

A Consensus Statement

Signatories to the consensus statement†

Consensus Conference on Guidelines on Economic Modelling in Health Technology Assessment

There is concern about the credibility of decision analytic models when used for the economic evaluation of health technologies; there is limited guidance for good modelling. Decision analytic modelling, undertaken for the purpose of economic evaluation of health technologies, involves the application of mathematical techniques to synthesise available information about healthcare processes and their implications. Thus, decision models provide an explicit 2-way bridge between primary data and the decisions they inform. These models embrace a variety of techniques, including decision-tree modelling.

A decision model is usually developed to assist decision-makers in making choices relating to the evaluated options. Typically, the objective of a decision model is to obtain a clearer understanding of the relationships between incremental costs and their consequences.

The purpose of the Consensus Conference on Guidelines on Economic Modelling in Health Technology Assessment (University of Sheffield, Sheffield, UK; April 22-23, 1999) was to bring together the builders and users of models with the aim of identifying the intrinsic properties of a good decision analytic model. The conference took place over 2 days. The 4 background papers were circulated to conference participants 2 weeks prior to the conference. A nominated discussant presented a critique of each paper to the conference, after which discussion was opened to the floor.

After all 4 papers had been discussed, a designated consensus panel convened in closed session to produce a first draft of the consensus statement, based on these discussions. The panel continued in closed session at the start of the second day. The first draft of the consensus statement was presented to the conference and discussed in open session. After this discussion, the consensus panel returned to closed session to produce a second draft of the statement reflecting the comments from the discussion. The second draft statement was presented and discussed in the final open session and any final amendments were voted upon in that session. All of the delegates to the conference were then invited to sign up to the amended consensus statement if they agreed with it.

We provide here the consensus statement from the conference on the properties of good decision analytic models. Because a decision analytic model is normally developed in the context of broader healthcare and economic evaluations, for which explicit guidelines exist, this consensus statement should be understood within this context. We have not tried to identify the details of good practice necessary to realise these properties, as these will continue to develop over time. This consensus statement is followed by 4 articles prepared for the conference that address the current and developing roles of modelling in health economic evaluation; quality in decision analytic cost-effectiveness models; handling uncertainty in cost-effectiveness models; and testing the validity of cost-effectiveness models.

† See Acknowledgements for list of signatories.

Properties of Good Decision Analytic Models

A good decision analytic model for the economic evaluation of health technologies is one that:

- is tailored to the purposes for which it is to be used
- is useful for informing the decisions at which it is aimed
- is readily communicated.

A good decision analytic model must, therefore, have certain characteristics which are summarised here.

Transparency

Transparency enables a user to examine the structure of a decision analytic model and any incorporated data without obstacle. The analyst must make the sources of these elements (i.e. the structure and the data) clear, including any underlying theory and assumptions, and justify the choices that are made.

Internal consistency

A good decision analytic model must be mathematically well defined for all combinations of parameter values specified as feasible. No such values should result in inconsistency in the mathematical logic of the model.

Reproducibility

Reproducibility, i.e. being able to be replicable by an independent competent analyst, thereby leading to the same results subject only to expected random variations, is an important characteristic of a good decision analytic model.

Interpretability

A good decision analytic model, and its results, must be clear and interpretable for the decision that it is being used to inform.

Exploration of Uncertainty

The implications of all forms of uncertainty, including methodological, structural and parameter uncertainty, must be explored appropriately.

Other Characteristics of Good Decision Analytic Models

Statement of Scope

The scope of a decision analytic model should be clearly specified, including the health technologies involved, populations addressed and the time frame to which it relates.

External Consistency

The structures used within the model, and data used to populate the model, should be consistent with the most appropriate information. The outputs of the model should be assessed in comparison with the best available relevant empirical evidence or evidence from other models.

Parsimony

A good decision analytic model should avoid unnecessary complexity and introduce only such variables and structural components as are important to the scope of the evaluation.

Inferential Soundness

The causal relationships included in the model should be explained and substantiated by the best available evidence.

Conclusion

We hope that this statement will provide researchers and decision-makers with useful guidance on the construction and evaluation of decision analytic cost-effectiveness models.

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Signatories to the Consensus Statement:

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