Structured Elicitation for Cost-Effectiveness Analyses, an overview

Marta Soares, Centre for Health Economics,
University of York

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What is expert elicitation?

*"systematic process of formalizing and quantifying, typically in probabilistic terms, expert judgments about **uncertain** quantities"* [White paper on elicitation]

- Subjective priors for Bayesian inference.
- Uncertainty = degree of belief (imperfect knowledge)
- Good elicitation (structured expert elicitation, SEE) should minimise bias and heuristics, but inevitably, the probabilities elicited are personal
- Formally used in decision making in, e.g., food safety [EFSA]

Use of SEE within decision modelling

- Cost-effectiveness typically requires multiple evidence sources to be considered -- decision models
- Uncertainty in the evidence can result in uncertain cost-effectiveness estimates.
  - Approval/rejection can be conditioned on research being conducted


Research Article Statistics in Medicine

Methods to elicit experts' beliefs over uncertain quantities: application to a cost effectiveness transition model of negative pressure wound therapy for severe pressure ulceration

Marta O. Soares,[a*†] Laura Bojke,[a] Jo Dumville,[b] Cynthia Iglesias,[b] Nicky Cullum[b] and Karl Claxton[a]

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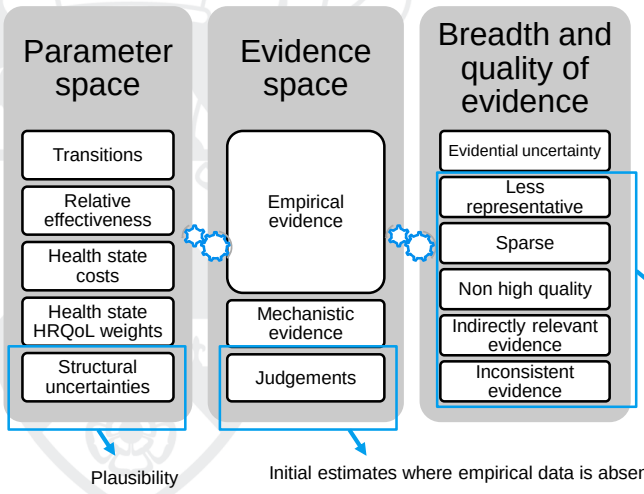
Use of SEE within decision modelling



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- Judgements are **ALWAYS** required, SEE can contribute to accountability

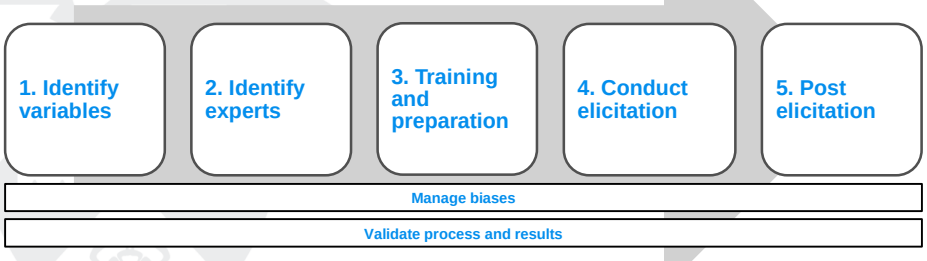
Developing an elicitation exercise

- This presentation takes you through the required methodological options relating to aspects of design, conduct and analyses
- These were identified in a review of existing protocols for elicitation, conducted within an MRC funded project:

  Developing a reference protocol for expert elicitation in health care decision making

  Project team: Bojke L, Claxton K, Fox A, Jankovic D, Soares M (U of York), Taylor A (U of Leeds), Sharples L (LSHTM), Jackson C (U of Cambridge), Morton A, Colson A (U of Strathclyde)

Overview of elicitation



Overview of elicitation

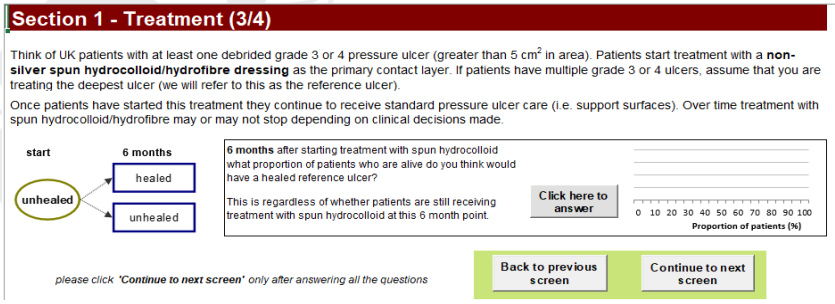
1. Identify variables

1.1 Quantities to elicit

Soares et al

Parameter to elicit: e.g. probability in a Markov model

Quantity to elicit: Probability patient dying/surviving within x years, time to x% patients die, or mean time to death.



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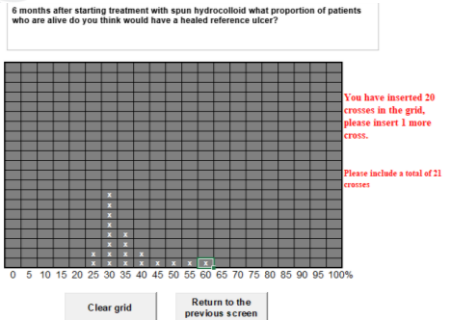
Overview of elicitation

1. Identify variables

1.2 How to encode judgements on uncertainty (methods of elicitation)

Fixed interval method: here illustrated using chips and bins [Soares et al]



Variable interval methods: here illustrated eliciting single bounds of an 80% credible intervals

I am very certain (90% certain) that the true value for this quantity is *higher* than: _____

I am very certain (90% certain) that the true value for this quantity is *lower* than: _____

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Overview of elicitation

2. Identify experts

2.1 Who is an expert?
skills: substantive, normative, adaptive

2.2 Number of experts and recruitment
typically multiple experts are required

3. Training and preparation

3.1 Pilot (and refine) the protocol

3.2 Train and prepare experts

Overview of elicitation

4. Conduct elicitation

4.1 Mode of administration
Face-to-face or remote

4.2 Levels of elicitation and interaction
individual, group, individual followed by group

4.3 Feedback and revision
- Type of feedback (graphical, written description, etc)
- What to feedback (individual's judgments, aggregated group judgments, judgments from other individual experts)
- Opportunity for revision (Iterate elicitation/feedback rounds, update after future data is collected, update for revisions/clarifications after circulating draft elicitation report)

4.4 Opportunity for interaction
- No interaction
- Group discussion prior to individual elicitation
- Group discussion and group elicitation
- Group discussion following individual elicitation (with opportunity for revision)

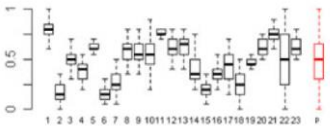
4.5 Collect rationales

Overview of elicitation

4. Conduct elicitation or 5. Post elicitation

4/5.1 Aggregation *

- Aggregate, don't aggregate, analyst provides a distribution that captures knowledge from all experts (the Kaplan approach)
- Method of aggregation
  - Mathematical: equal-weighting, performance-based weighting (with seed questions), analyst-defined weighting (based on rationales, expert qualifications, or other criteria)
  - Bayesian aggregation
  - Behavioural
  - Combination
  - Other



4/5.2 Fit to distributions *

- Fit to parametric distribution; use non-parametric approaches; don't fit at all
- Choice of distribution
- Choice of fitting method

Overview of elicitation

5. Post-elicitation

5.1 Feedback on process

5.2 Adjusting judgements

5.3 Documentation

Use of elicitation in CE

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Experiences of Structured Elicitation for Model-Based Cost-Effectiveness Analyses

Marta O. Soares, PhD[1,*], Linda Sharples, PhD[2], Alec Morton, PhD[3], Karl Claxton, PhD[1,4], Laura Bojke, PhD[1]

[1]Centre for Health Economics, University of York, York, UK; [2]Medical Statistics Department, London School of Hygiene and Tropical Medicine, London, UK; [3]Management Science, University of Strathclyde, Glasgow, UK; [4]Department of Economics, University of York, York, UK

Study	Type of strategy under investigation
Garthwaite et al. [14]	Treatment
Leal et al. [10]	Diagnostic/screening
Girling et al. [15]	Treatment
Stevenson et al. [16]	Prevents transmission
Meads et al. [12]	Diagnostic/screening
McKenna et al. [19]	Treatment
Haakma et al. [13]	Diagnostic/screening
Stevenson et al. [17]	Treatment
Speight et al. [25]	Diagnostic/screening
Sperber et al. [22]	Treatment
Brodtkorb [26]	Several exercises conducted
Colbourn et al. [28]	Diagnostic/screening
Soares et al. [9]	Treatment
Bojke et al. [18]	Treatment
Cao et al. [11]	Diagnostic/screening
Fischer et al. [23]	Treatment
Poncet et al. [27]	Diagnostic/screening
Grigore et al. [24]	Treatment
Wilson et al. [20]	Treatment
Meeyai et al. [21]	Vaccine
Grimm et al. [35]	Diagnostic/screening

R&D, research and development.
† Rate of implementation in clinical practice over time.

Discussion

- Little research to support the choices that need to be made.
  - Accuracy cannot be measured as expert beliefs are inherently unobservable
  - Existing methodological research: noncommittal, inconsistent, poor quality…
- Methodological uncertainties may be main reason for the limited use of SEE in the context of HTA.
- There are no guides to good practice in HTA, but:
  - Our systematic review identified 16 unique SEE guidelines, 5 generic and 11 domain-specific
  - Examples of generic guidelines are: Sheffield elicitation framework (SHELF) or Cooke's classical method (Cooke R.M 1991)
- Not clear if any can appropriately be used to inform HTA

Thanks!

Marta Soares, Centre for Health Economics, University of York

marta.soares@york.ac.uk