



Structured expert elicitation for healthcare decision making: An overview

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This document

This document is based on the protocol for structured expert elicitation (SEE) funded by the Medical Research Council (MRC) written by Bojke et al.¹ and aims to provide an overview to SEE in the context of healthcare decision making. It was written as a collaboration between Lumanity, which regularly conducts SEE to support health technology assessment (HTA) and market access strategic planning, and the Centre for Health Economics at the University of York, which authored the original MRC protocol. The MRC protocol was developed based on a systematic review of elicitation methods and the practical challenges of implementing them in a healthcare decision making setting.

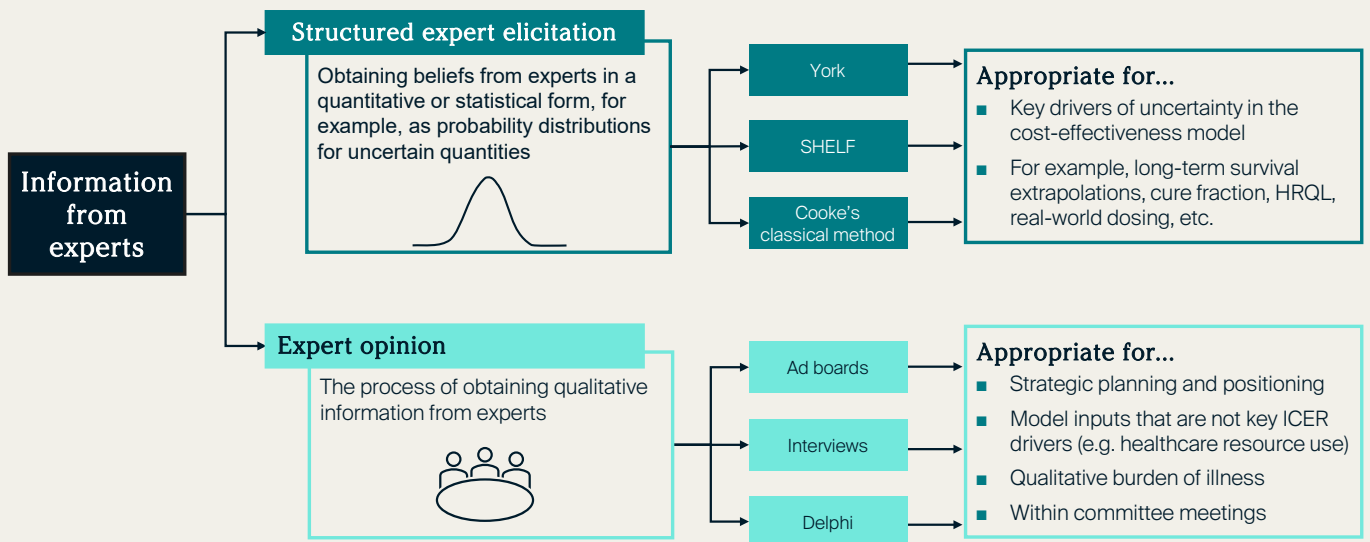


Introduction

What is structured expert elicitation?

SEE is a method of obtaining expert judgements in a quantitative or statistical form, for example, as probability distributions for uncertain quantities (see Figure 1).^{1,2} It is used in a broad range of industries and research fields, including oil and gas, ecology, and meteorology. There are several publicly available protocols for conducting SEE, including the MRC protocol produced by York University¹, Sheffield Elicitation Framework (SHELF, which emphasizes live interaction to reach consensus)³, Cooke's classical method⁴ (which emphasizes weighting expert judgements based on performance in seed questions, and the Delphi method (which emphasizes quasi-anonymity to minimize bias).⁵

Figure 1
Comparison of structured expert elicitation with other methods to gather expert opinion



Key: HRQL, health-related quality of life; ICER, incremental cost-effectiveness ratio; SHELF, Sheffield Elicitation Framework.
References: Bojke et al. 2021¹; Peel et al. 2018.²

Why perform SEE?

(“I used to just ring a clinician or run an ad-board”)

“Evidence generated by expert elicitation, either using structured or unstructured methods, is subject to risk of bias and high uncertainty. Structured methods are preferred because they attempt to minimise biases and provide some indication of the uncertainty.”

National Institute for Health and Care Excellence (NICE)⁶

Global trends towards accelerated access and treatment earlier in the course of disease are leading to increased uncertainty at the point of decision making.

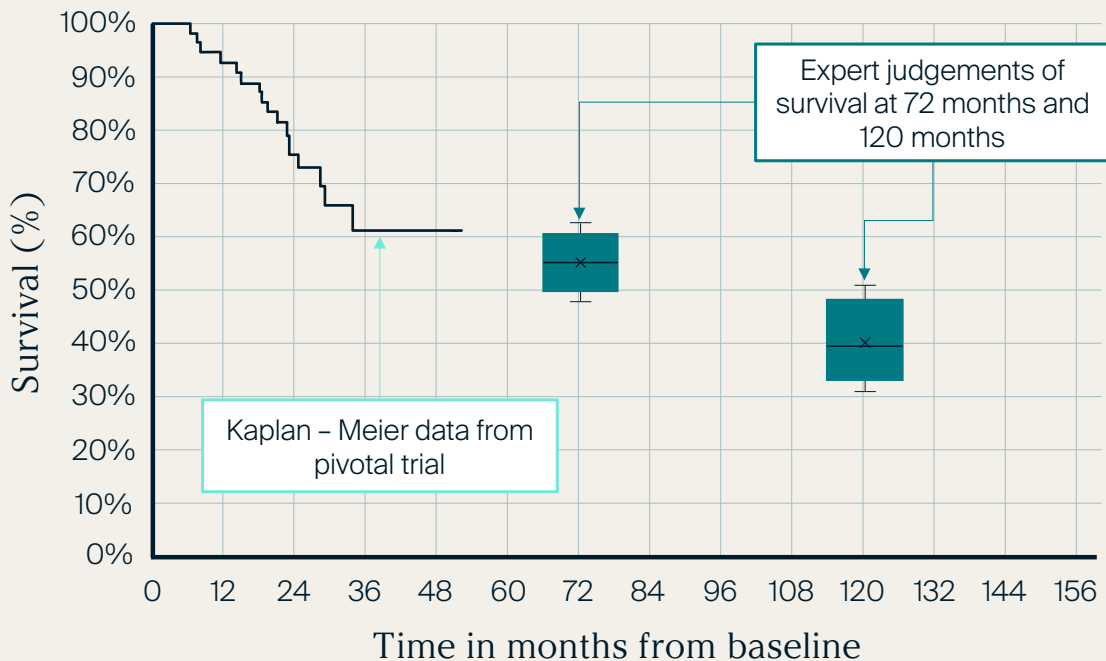
Expert judgement is often deemed useful to support decision making. Such judgements can, via SEE:

1. be elicited in a formal way to minimize biases
2. be elicited in a way that captures the experts' uncertainty for key parameters

An example output of an SEE exercise is shown in Figure 2, with probability distributions representing experts' assessments of the level of uncertainty alongside the available empirical evidence.

Figure 2

Example output of SEE – long-term survival of patients with Disease X receiving Treatment Y?



Undertaking an SEE exercise does take longer than ringing a clinician and, in some instances, only a limited number of questions can be covered. This means that the use of SEE should be prioritized according to the expected impact of parameters on decision making.

As highlighted in the quote from NICE simply asking a clinician for a number to input for a critical model parameter or showing clinicians survival curves to select from has a high risk of bias and high uncertainty and is unlikely to be accepted when you come to present your analyses to HTA decision makers. Some of the key biases that SEE attempts to minimize are shown in Table 1.

Table 1
Common sources of bias

Bias	Description	How is this addressed in SEE?
Cognitive biases		
Anchoring bias	<ul style="list-style-type: none"> Fixing on an initial value and failing to sufficiently adjust estimates away from it 	<ul style="list-style-type: none"> Asking for plausible limits before the median Training in biases and heuristics
Availability bias	<ul style="list-style-type: none"> Basing judgement about the probability of an event on how easily examples of an outcome come to mind Judgement may be biased towards more recent or prominent experiences 	<ul style="list-style-type: none"> Providing an evidence brief, which summarizes key evidence Training in biases and heuristics
Motivation biases		
Confirmation bias	<ul style="list-style-type: none"> Focus on and being less critical of information that is consistent with existing beliefs and preferences 	<ul style="list-style-type: none"> Seeking diversity of opinion in recruitment Training in biases and heuristics
(Un)desirability bias	<ul style="list-style-type: none"> Overestimating the likelihood of positive outcomes (wishful thinking) or negative outcomes (precautionary thinking) 	<ul style="list-style-type: none"> Seeking diversity of opinion in recruitment Training in biases and heuristics

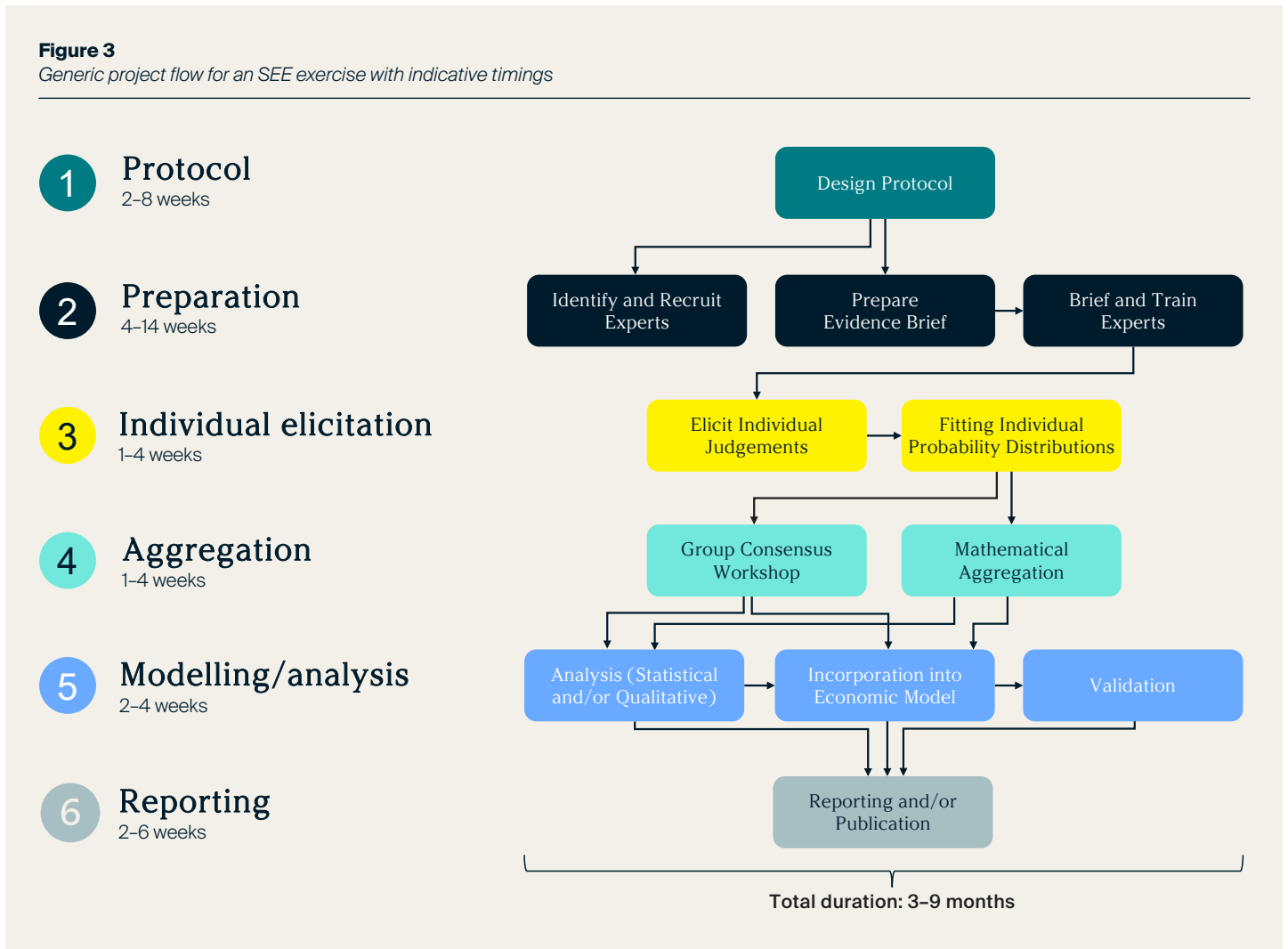
Key principles of SEE

Bojke et al. 2021¹ outlines nine key principles that should underpin SEE for healthcare decision making. The approach to an SEE project should strive to follow these principles:

- SEE should be **transparent** and reproducible
- Elicited information should be **fit-for-purpose** to be used as an input to further analysis
- The SEE needs to adapt to the practical and logistic constraints faced by different contexts/decision-making bodies, but maintain a level of **consistency** in methods used across evaluations
- SEE must seek to elicit **uncertainty** in experts' judgements
- SEE must recognize common expert **biases** and employ strategies to minimize these
- SEE must utilize methods that are appropriate for experts with lower levels of **normative skills**
- When required, SEE must employ methods that incorporate or promote the **adaptive skills** of experts
- SEE must attempt to capture any **between-expert variation**, understand the reasons why it exists, and explore its potential impact on the decision
- SEE must **motivate** experts to best express their beliefs about a quantity of interest

How is SEE conducted?

A standard example of project flow is shown in Figure 3, with detail provided in our practical guide, available [here](#).



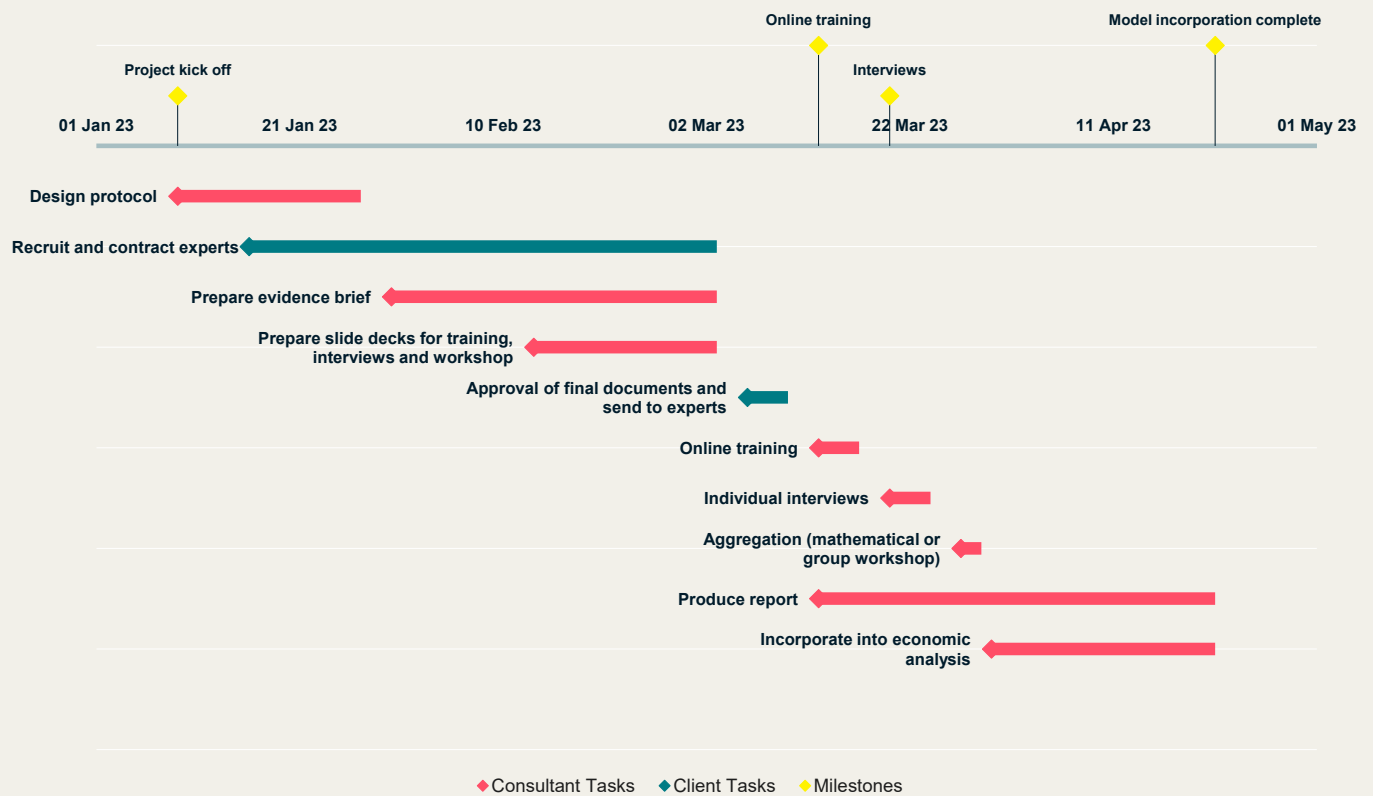
Time required to conduct SEE

The time required to conduct an SEE varies based upon several factors including:

- The number and complexity of quantities to be elicited and how clear these are at project outset
- How well experts are known to the project team, whether identification needs to be conducted from scratch, and how difficult recruitment is likely to be (e.g. rare diseases)
- Whether a pilot exercise with external experts is needed or whether an internal pilot with medical colleagues is sufficient
- Mode of administration (meeting in person has benefits but requires careful scheduling, which may add time)
- Whether a group consensus step is planned, the timing of this, and the feasibility of securing expert time
- Internal requirements for compliance and sign off
- Complexity of incorporation in the economic analysis

The suggested timelines in Figure 4 are based upon a simple case where a pool of experts is already available to the company to recruit from, and mathematical aggregation is chosen.

Figure 4
Example timelines



A more detailed example of an expert elicitation exercise undertaken during the writing of the MRC protocol took place over a 7-month period (equivalent to 4–5 months FTE). The areas which took the most time were:

- Design of the Microsoft Excel®-based elicitation exercise (this represented around 50% of the time taken; time can be saved here through use of standardized packages although some degree of tailoring will always be required)
- Design of the training sessions (again time can be saved here through use of standardized materials)
- Development and piloting of the protocol (this can however be staged in order to reduce the impact on timelines)

From the point of expert recruitment up to write up of the exercise prior to distribution fitting and aggregation the exercise took 2 months to complete, which is similar to the timeline provided in our example. Note that time for developing, submitting and publishing a manuscript of the study is not including in the above timelines.



Checklist of things to consider

There are several key choices that must be made regarding the methods for SEE. The checklist below is designed to ensure you have considered the key issues surrounding your methodological choices. More detailed guidance is provided in our practical guide, which is available [here](#).

1. Quantities of interest		
a	Have I identified the key drivers of model uncertainty?	<input type="checkbox"/>
b	Have I justified the need for eliciting these quantities, in light of the amount, quality and relevance of existing empirical evidence?	<input type="checkbox"/>
c	Can the quantities of interest be expressed as reasonably observable quantities to experts? <i>Example: as relative risk is not observable you could instead ask for the absolute risk in both scenarios and then calculate the relative risk</i>	<input type="checkbox"/>
d	Are the quantities of interest expressed in as simple terms as possible?	<input type="checkbox"/>
e	If eliciting multiple quantities, consider eliciting dependencies or re-expressing quantities in way that independence can reasonably be assumed	<input type="checkbox"/>
f	Have I ensured that the quantities defined for the elicitation are coherent among themselves and fit-for purpose for inclusion in the decision model?	<input type="checkbox"/>
g	Is the elicitation exercise clearly worded in a way that experts understand? <i>Note: consider the terminology/units that experts will be most familiar with</i>	<input type="checkbox"/>
2. Recruitment		
a	Do my inclusion/exclusion criteria identify the individuals with expertise or skills most relevant to the quantities of interest?	<input type="checkbox"/>
b	Have I pursued diversity and broad representation as far as possible?	<input type="checkbox"/>
c	Will the experts be motivated to participate?	<input type="checkbox"/>
d	Have I minimized and recorded any conflicts of interest?	<input type="checkbox"/>
e	Can I achieve a sample of five or more experts? If not, can I justify this?	<input type="checkbox"/>
3. Training		
a	Will the experts be trained on normative skills, biases, and heuristics?	<input type="checkbox"/>
b	In what setting will the training session be delivered? <i>Note: face-to-face is preferable but not always feasible</i>	<input type="checkbox"/>
4. Elicitation		
a	How will the elicitation approach be piloted? <ul style="list-style-type: none"> ■ Which tool will be used? ■ Which approach will be used (e.g. bisection, chips and bins etc...)? 	<input type="checkbox"/>
b	Am I eliciting judgements from experts individually first? If not, can I justify this?	<input type="checkbox"/>
c	What is the rationale for the elicitation method am I using?	<input type="checkbox"/>
d	How will judgements and/or probability distributions be fed back to the experts?	<input type="checkbox"/>
e	How will I collect and record rationales for judgements?	<input type="checkbox"/>
g	Will experts have an opportunity to refine their judgements following feedback?	<input type="checkbox"/>
5. Aggregation		
a	How will I explore between-expert variation? If no exploration will be performed, can I justify this?	<input type="checkbox"/>
b	Which statistical distribution(s) will be fitted to expert judgements and why?	<input type="checkbox"/>
c	Will I be using behavioural aggregation (e.g. a group workshop) or mathematical aggregation (e.g. linear opinion pooling)? What weighting will I use within any mathematical aggregation (e.g. equal weights)? What is the rationale?	<input type="checkbox"/>

References

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