

Supplementary Material: Reporting Guidance for Imprecise-Probability Value-of-Information (IP-VOI) Analyses

This supplement accompanies the manuscript *Value of Information with Imprecise Probabilities for Decision Modeling*. It gives an extended reporting checklist for IP-VOI analyses and shows how to adapt CHEERS-VOI-style reporting. It is intended as online supplementary material and is referenced from the main text.

Reporting checklist for IP-VOI analyses

CHEERS-VOI extends CHEERS for economic evaluations and related decision models that include VOI analyses. It emphasizes transparent reporting of the evidence base, model structure, uncertainty characterization, VOI estimation methods, parameters of interest, study designs, data-generation assumptions, research costs, and ENBS [1,2]. IP-VOI does not replace those items. It adds reporting elements needed when the probability measure used in the uncertainty analysis is not uniquely identified by evidence.

1. **Reference probability measure.** State the precise probability measure P_0 used for the reference uncertainty analysis and conventional VOI calculation.
2. **Admissible probability-measure set.** Define $\mathcal{P}$, or define an outer index set $\mathcal{H}$ such that $\mathcal{P} = \{P_h : h \in \mathcal{H}\}$.
3. **Evidence justification.** Explain why each member of $\mathcal{P}$ is compatible with current evidence and why measures outside $\mathcal{P}$ were excluded.
4. **Imprecise assumptions.** List the distributional, dependence, structural, extrapolation, or elicitation assumptions treated as imprecise.
5. **Decision rule for imprecision.** State whether the rule-specific analysis uses lower expectation, minimax regret, interval dominance, E-admissibility, a weighted lower-upper rule, or another prespecified criterion. Explain why the rule fits the decision context.

6. **Fixed-measure VOI estimator.** State the estimator used for fixed P , such as $\text{EVPI}(P)$, $\text{EVPPI}(P; \phi)$, or $\text{EVSI}(P; d)$.
7. **Endpoint search.** Describe the grid, optimization, p-box propagation, or adaptive search used to approximate the infimum and supremum over $P \in \mathcal{P}$ or the criterion used by the chosen decision rule.
8. **Endpoint assumptions.** Report the assumptions that produced the lower and upper endpoints.
9. **Numerical uncertainty.** Report Monte Carlo or emulator uncertainty at the endpoint settings separately from the width of the fixed-measure VOI envelope.
10. **Decision interpretation.** For EVSI and ENBS, classify the research decision as robustly worthwhile, robustly not worthwhile, or dependent on unresolved assumptions.

Table 1: How to modify CHEERS-VOI-style reporting for IP-VOI.

Reporting area	Standard VOI report	Additional IP-VOI information
Uncertainty characteriza- tion	Joint input distributions under the chosen probability measure	Admissible set $\mathcal{P}$ and justification for ranges, p-boxes, structures, or dependence bounds
Decision criterion	Usually highest expected net benefit under one probability measure	Rule used under imprecision, such as lower expectation, minimax regret, dominance, E-admissibility, or weighted lower-upper value
VOI methods	EVPI, EVPPI, EVSI, or ENBS estimator	Fixed-measure estimator plus outer endpoint search over $P \in \mathcal{P}$ and any rule-specific IP-VOI calculation
Parameters of interest	Groups targeted by EVPPI or EVSI	Whether learning narrows imprecision, variability, or both
Study design and data generation	Proposed sample size, endpoints, likelihood, and pre-posterior method	Whether the predictive distribution for future data varies over $\mathcal{P}$
Results	Point estimate and numerical uncertainty	Reference value, lower endpoint, upper endpoint, endpoint assumptions, and numerical error at endpoints
Research costs	Fixed study cost and ENBS	ENBS interval under fixed or imprecise study costs
Decision conclusion	Whether expected net benefit of sampling is positive	Robustly worthwhile, robustly not worthwhile, or dependent on unresolved assumptions

References

- [1] Kunst N, Siu A, Drummond M, et al. Consolidated Health Economic Evaluation Reporting Standards–Value of Information (CHEERS-VOI): Explanation and Elaboration. *Value in Health*. 2023;26(10):1461–1473. doi:10.1016/j.jval.2023.06.014.
- [2] Kunst N, et al. Reporting Economic Evaluations with Value of Information Analyses Using the CHEERS Value of Information (CHEERS-VOI) Reporting Guideline. *Medical Decision Making*. 2023. doi:10.1177/0272989X231214791.