Value of information analysis

VOI

- Uncertainty in every decision
- There's a probability of making the wrong decision
- Are there consequences of making the wrong decision?
  - Costs?
  - Foregone benefit?
    - Size of population being affected by the decision
- Value of information
  - How likely we are making the wrong decision and how bad it is to make the wrong decision
  - Cost of uncertainty (i.e., expected loss based on current information)
  - Expected benefit of research

CONFERENCE PAPER

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Using Value of Information Analysis to Prioritise Health Research

Some Lessons from Recent UK Experience

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Abstract

Decisions to adopt, reimburse or issue guidance on the use of health technologies are increasingly being informed by explicit cost-effectiveness analyses of the alternative interventions. Healthcare systems also invest heavily in research and development to support these decisions. However, the increasing transparency of adoption and reimbursement decisions, based on formal analysis, contrasts sharply with research prioritisation and commissioning. This is despite the fact that formal measures of the value of evidence generated by research are readily available.

The results of two recent opportunities to apply value of information analysis to directly inform policy decisions about research priorities in the UK are presented. These include a pilot study for the UK National Co-ordinating Centre for Health Technology Assessment (NCCHTA) and a pilot study for the National Institute for Health and Clinical Excellence (NICE). We demonstrate how these results can be used to address a series of policy questions, including: is further research required to support the use of a technology and, if so, what type of research would be most valuable? We also show how the results can be used to address other questions such as, which patient subgroups should be included in subsequent research, which comparators and endpoints should be included, and what length of follow up would be most valuable.

Viewpoint

A rational framework for decision making by the National Institute For Clinical Excellence (NICE)

Karl Claxton, Mark Sculpher, Michael Drummond

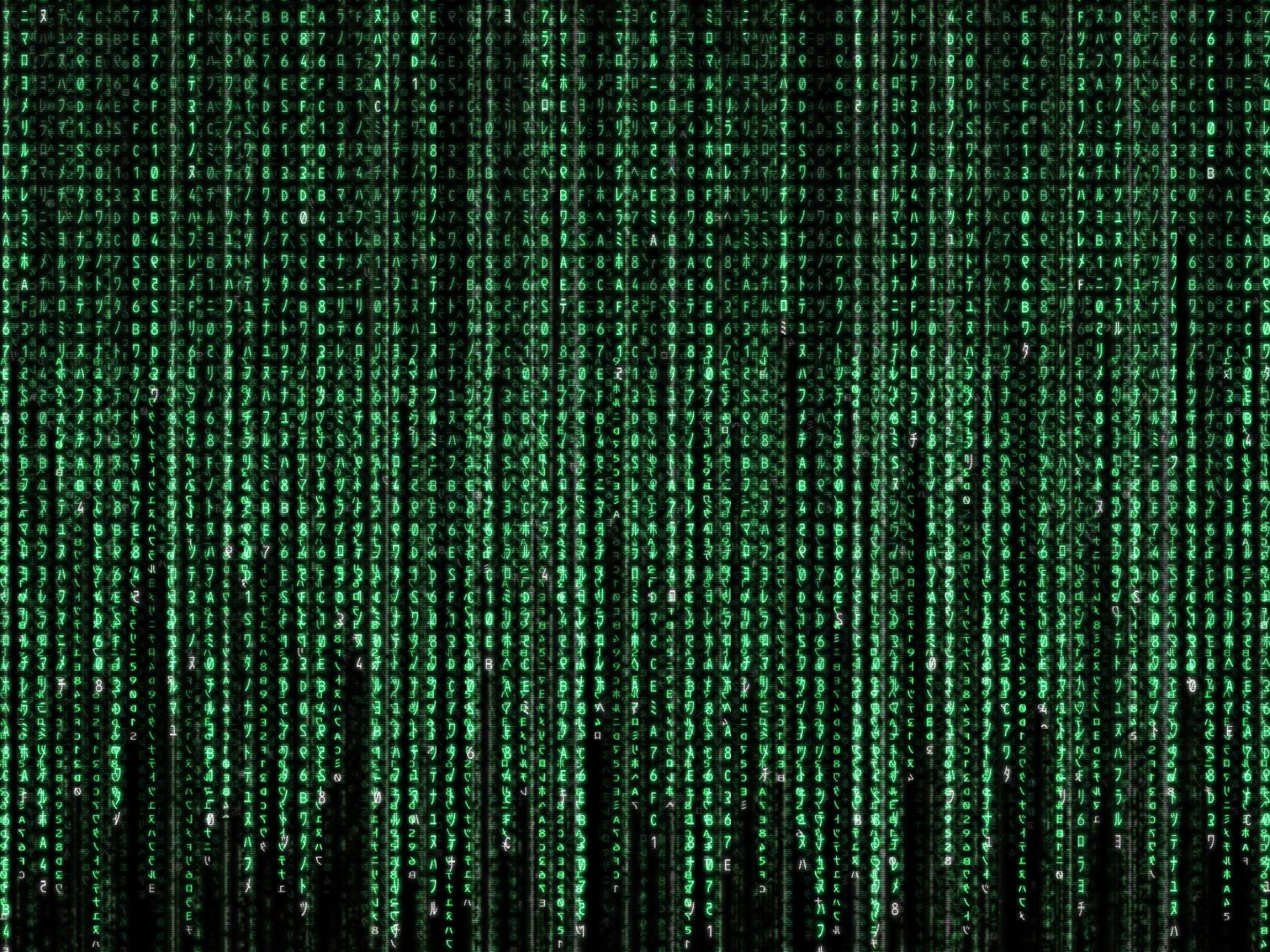
Regulatory and reimbursement authorities face uncertain choices when considering the adoption of health-care technologies. In this Viewpoint, we present an analytic framework that separates the issue of whether a technology should be adopted on the basis of existing evidence from whether more research should be demanded to support future decisions. We show the application of this framework to the assessment of heath-care technologies using a published analysis of a new drug treatment for Alzheimer's disease. The results of the analysis show that the amount and type of evidence required to support the adoption of a health technology will differ substantially between technologies with different characteristics. Additionally, the analysis can be used to aid the efficient design of research. We discuss the implications of adoption of this new framework for regulatory and reimbursement decisions.

Many countries now request that manufacturers of health-care technologies provide evidence for their cost-effectiveness to support applications for funding by the health-care system. This approach was first used in Australia[1] and Ontario, Canada[2] in making decisions about funding new medicines, and has also been used by several managed care groups in the USA.[3] Since then, in the UK, the National Institute for Clinical Excellence (NICE) has done technology appraisals that include analysis of the cost-effectiveness of interventions

Administration in the USA ask manufacturers to show safety and efficacy in experimental studies. In some instances, these studies can also provide data for costs. Data from these phase III registration trials have restrictions, however, for making decisions about reimbursement.[5] First, decisions on cost-effectiveness should be based on the comparison of a new intervention with current practice, rather than with a placebo, as is usually the case in these trials. Second, phase III trials tend to be explanatory (rather than

Warm up exercise

Let’s take it to the Matrix…



A Warm-up Exercise

- 100 patients have Flu, but we don't know what type of flu they have
  - Blue flu, or
  - Red flu
- Neo is the policy-maker who has to decide between two drugs to save the most lives
  - Red pill cures Red flu patients, but kills blue flu patients
  - Blue pill cures blue flu patients, but kills red flu patients
- Neo asks 10 experts to inform the number of patients with either type

Expert Beliefs

		Number of people	
ID	Expert	Red Flu	Blue Flu
1	Ethna	20	80
2	Hilary	70	30
3	Kine	50	50
4	John	80	20
5	Joseph	55	45
6	Shi-Yi	90	10
7	Su-Hsin	30	70
8	Wei	75	25
9	Fernando	35	65
10	Hawre	40	60

Red pill → Red Flu
Blue pill → Blue Flu

Which pill should Neo choose?

Expert Beliefs

		Number of people	
ID	Expert	Red Flu	Blue Flu
1	Ethna	20	80
2	Hilary	70	30
3	Kine	50	50
4	John	80	20
5	Joseph	55	45
6	Shi-Yi	90	10
7	Su-Hsin	30	70
8	Wei	75	25
9	Fernando	35	65
10	Hawre	40	60
	Expected Value	**54.5**	**45.5**

What is Neo risking?

Expert Beliefs

		Number of people		
ID	Expert	Red Flu	Blue Flu	Opportunity Loss
1	Ethna	20	80	60
2	Hilary	70	30	0
3	Kine	50	50	
4	John	80	20	
5	Joseph	55	45	
6	Shi-Yi	90	10	
7	Su-Hsin	30	70	
8	Wei	75	25	
9	Fernando	35	65	
10	Hawre	40	60	
	Average	**54.5**	**45.5**	

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7	Su-Hsin	30	70	40
8	Wei	75	25	0
9	Fernando	35	65	30
10	Hawre	40	60	20
	Average	**54.5**	**45.5**	**15**

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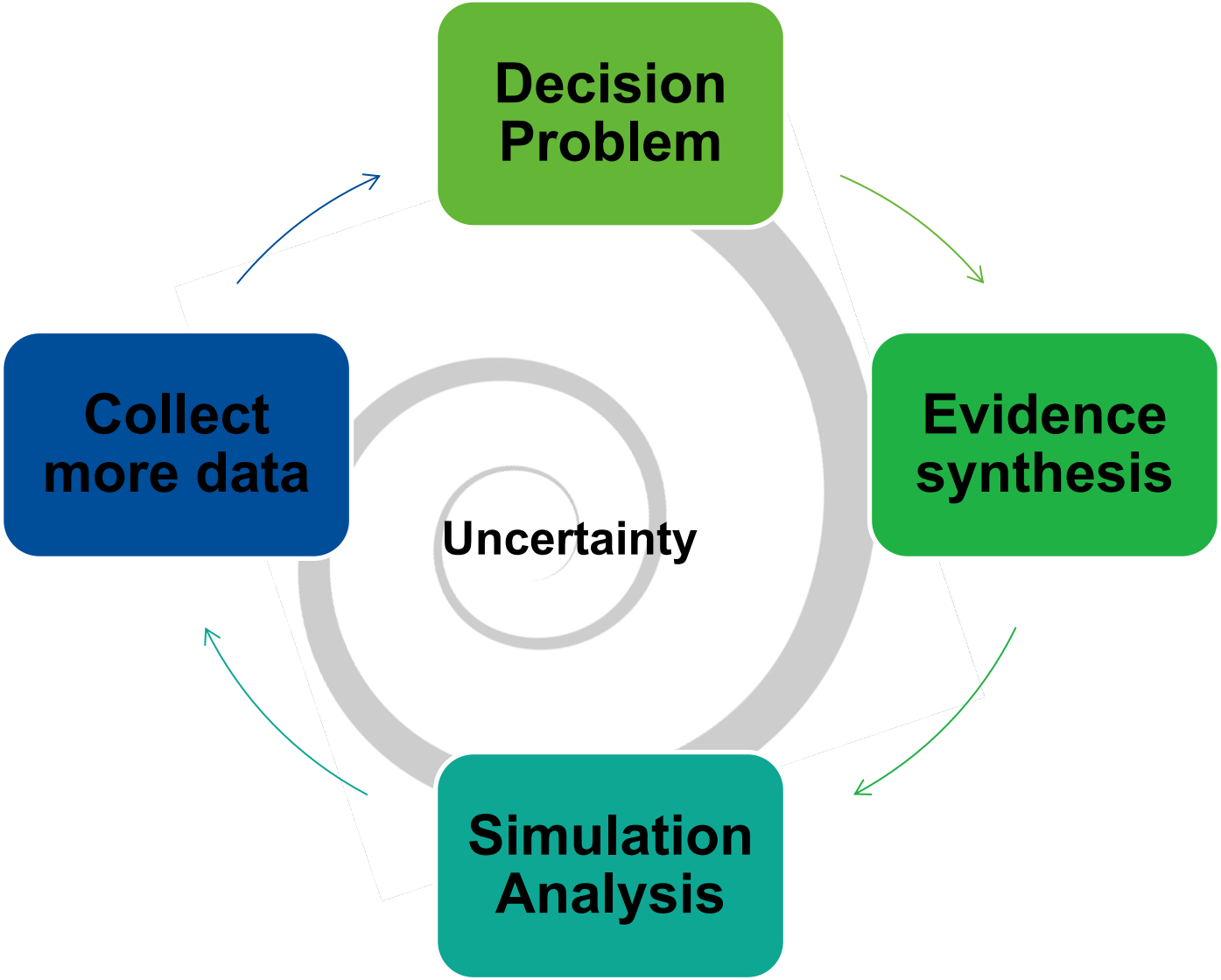
10	Hawre	40	60	20
	Average	**54.5**	**45.5**	**15**

Decision rule

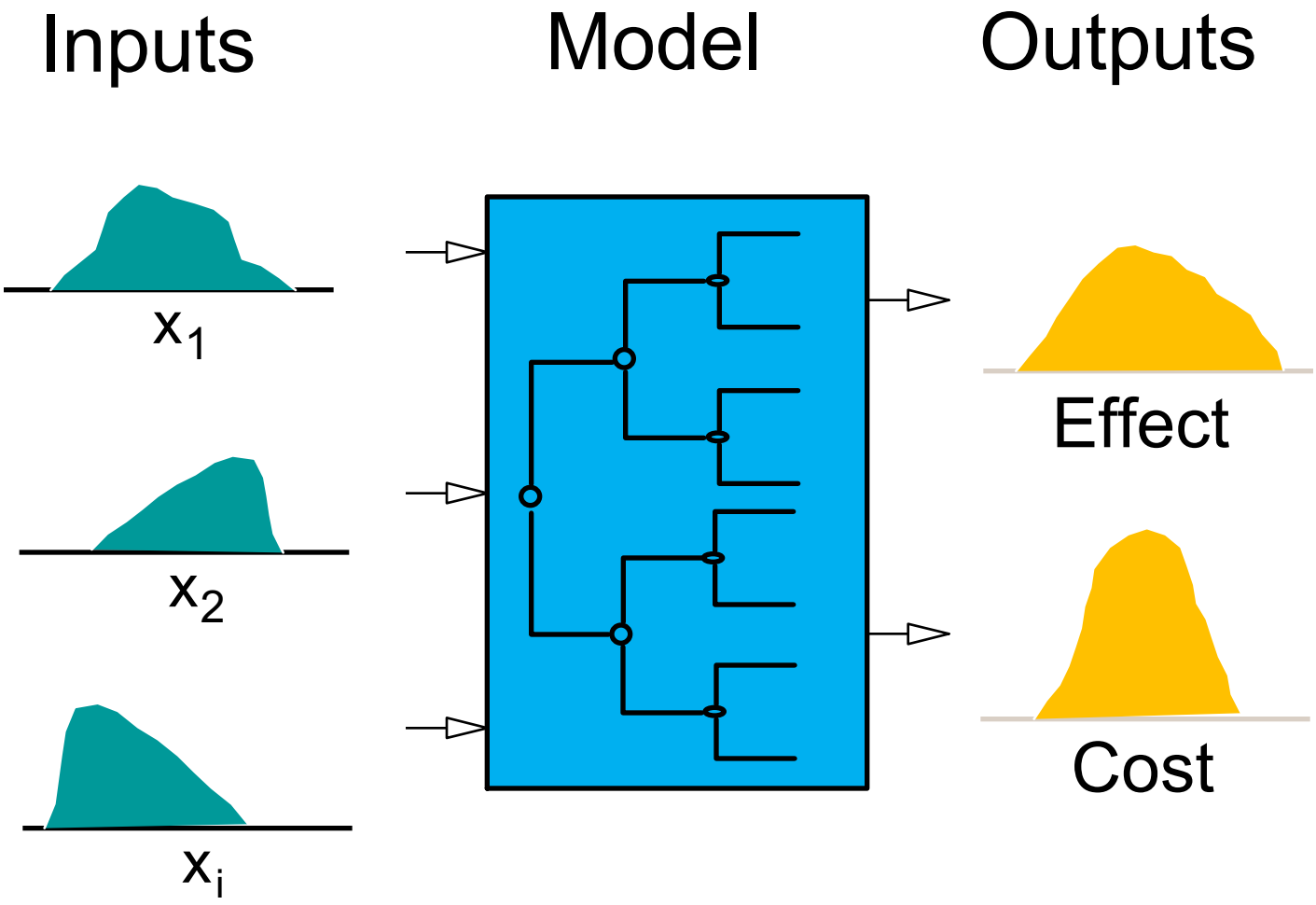
```
4 if(benefit > costs){
5         print("Do more research"},
6    else (costs > benefit){
7         print("Stop doing research"})
```

Iterative approach



Iterative approach - Tools

Probabilistic sensitivity analysis



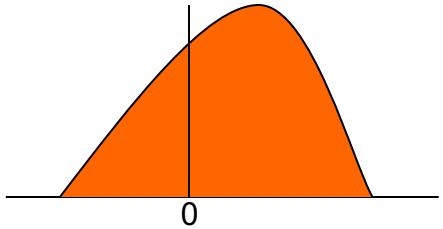
2nd Monte Carlo analysis

Composite outcome

Outputs

Effect Cost

Willingness to pay (WTP)



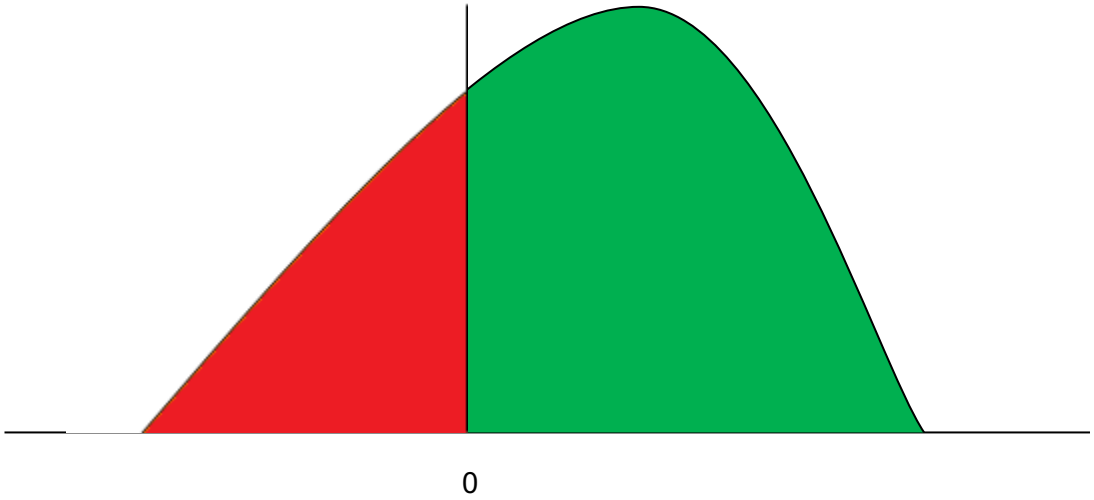
Incremental Net Monetary Benefit (INMB)

Incremental Net Health Benefit (INHB)

Value of Information

- Determine research priorities and design studies
- Reduce research waste
- Design research to support decision making

Incremental Net Monetary Benefit (INMB)



Value of Information Analysis

- What information?
- Example of value of information:
  - Value of collecting information from 100 people is $5000?
  - How did we know that?

- Or rather “Cost of uncertainty” ?
- Same concept

Expected Value of:

- Perfect information (EVPI):

  benefit of reducing uncertainty in all parameters

- Population EVPI (popEVPI):

  maximum value for the population that can benefit

- Partial EVPI (EVPPI):

  benefit of reducing uncertainty in a limited set of parameters

- Sample information (EVSI):

  benefit of reducing uncertainty with study size = n

- Population EVSI (popEVSI):

  overall value for the population that can benefit