R you *seriously* saying we shouldn't use Excel?

Gianluca Baio

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(With contributions by Andrea Berardi, Andrea Gabrio, Anna Heath, Christina Ding et al)

ISPOR European Conference

Barcelona

Wednesday, 14 November 2018

R for trial and model-based cost-effectiveness analysis

Mon, 9 Jul, 2018 · 5 min read

11 July 2018, University College London

Venue: Room G13 in 1-19 Torrington Place, University College London, United Kingdom.

Background and objectives

This one-day workshop on the use of R for trial and model-based cost-effectiveness analysis (CEA) is jointly organised by a consortium of researchers at various institutions (UCL, University of York, University of Oxford and Bangor University), led by the MRC Hubs for Trials and Methodology and Research Conduct-II. The Scientific Committee include: Howard Thom, Gianluca Baio, Anthony Hatswell, Dyfrig Hughes, Chris Jackson, Marta Soares, Claire Williams, Nicky Welton, Padraig Dixon, Boby Mihaylova and Iryna Schlackow.

Funding for the workshop has been provided by the MRC Network of Hubs for Trials Methodology Research and the UCL Research Group Statistics for Health Economics.

CEA is often performed using `MS Excel` but, despite its ease of use, `MS Excel` incurs the disadvantages of slow computational speed and a lack of transparency; our workshop aims to explore the use of R for CEA as an alternative. The aim of the workshop is to present a wide range of technical aspects, including a discussion of the many available add-on packages to help users get the most out of R for CEA. Presentations and public discussions address the computational and transparency advantages of R over `MS Excel` for CEA and for easing collaboration. The speakers have diverse experience in government (including NICE), academia and industry.

Final Programme

Session 1: Invited talks (1) - chair: Anthony Hatswell

- 9:30-9:45. Howard Thom, University of Bristol. *Welcome.*
- 9:45-10:15. Gianluca Baio. Department of Statistical Science, University College London. *R you seriously saying we shouldn't use `Excel`?*

  This talk will showcase some of the R packages recently developed to aid the work of modellers working in health economic evaluations. The motivation and general philosophy of a few packages will be briefly presented. Examples of their use/advantages over more established, but often non-optimal computational tools, such as `MS Excel` will be demonstrated. Link to relevant web-applications.

- 10:15-10:35. Marta Soares. Centre for Health Economics, University of York. *Using R for Markov modelling: an introduction.*

  This talk introduces the use of R for generic decision modelling detailing some of the advantages and disadvantages of this software package in relation to others commonly used, such as `MS Excel`. In this talk, I also present generic R code for Markov modelling, probabilistic sensitivity analyses and value of information analyses (using Monte Carlo simulation). R code for deterministic and probabilistic analysis.

- 10:35-11:15. Boby Mihaylova and Iryna Schlackow. Health Economics Research Centre, Nuffield Department of Public Health, University of Oxford. *A policy model of cardiovascular disease in moderate-to-advanced chronic kidney disease.*

  This talk will present the design and structure in R of the SHARP CKD-CVD model, developed using the 5-years follow-up data of 10,000 patients with chronic kidney disease in the SHARP study. The model projects chronic kidney disease progression and cardiovascular complications and mortality using a set of multivariate risk, cost and QoL equations. We will demonstrate the R Shiny-based model interface to enable use by external analysts and will discuss issues related to model functionality and speed of~execution. Paper describing the model; model interface.

- 11:15-11:35. Coffee break.

Session 2: Participants oral presentation session (3 speakers, 15 minutes each) - chair: Marta Soares

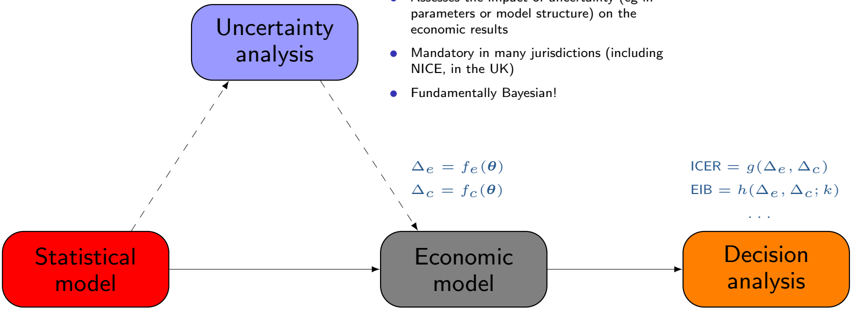
- 11:35-11:55. Jeroen Jansen, Innovation and Value Initiative. *An open-source cost-effectiveness simulation model for rheumatoid arthritis in R.*

  As part of the Open Source Value Project (OSVP), we developed a flexible open-source individual patient simulation model for rheumatoid arthritis (IVI-RA model). Alternative biologic treatment sequences, parameter and structural uncertainty, and decision framework (i.e.~cost-effectiveness of multi-criteria decision analysis) can be easily explored. The model facilitates dialogue between stakeholders about relevant clinical data, modelling approaches, and value perspectives. R and C++ code is available in a GitHub repository, along with Shiny server user interfaces for a non-technical audience.

- 11:55-12:15. Eline Krijkamp, Erasmus MC. *Introducing the Decision Analysis in R for Technologies in Health (DARTH) initiative.*

  This talk will present an introduction to the tools and educational materials created by the DARTH (Decision Analysis in R for Technologies in Health) collaboration. DARTH is a multi-institutional, multi-university effort aiming to develop transparent and open-source solutions to decision analysis in health. DARTH courses and tutorial papers cover diverse applications of R in health decision sciences, including decision trees, cohort models, and microsimulations. DARTH have also created `OpenTree`, an online graphical user interface for building decision trees and Markov models than can output code to R.

Objective: Combine costs & benefits of a given intervention into a rational scheme for allocating resources



- Assesses the impact of uncertainty (eg in parameters or model structure) on the economic results
- Mandatory in many jurisdictions (including NICE, in the UK)
- Fundamentally Bayesian!

$$\Delta_e = f_e(\boldsymbol\theta)$$
$$\Delta_c = f_c(\boldsymbol\theta)$$

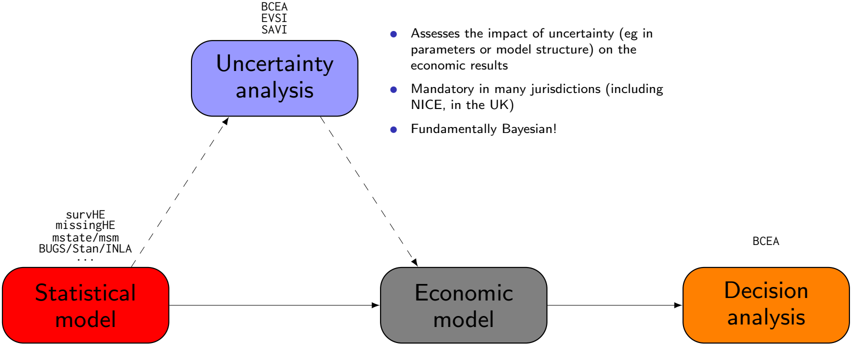
$$\text{ICER} = g(\Delta_e, \Delta_c)$$
$$\text{EIB} = h(\Delta_e, \Delta_c; k)$$
$$\ldots$$

- Estimates relevant **population** parameters $\boldsymbol\theta$
- Varies with the type of available data (& statistical approach!)

- Combines the parameters to obtain a population average measure for costs and clinical benefits
- Varies with the type of available data & statistical model used

- Summarises the economic model by computing suitable measures of "cost-effectiveness"
- Dictates the best course of actions, given current evidence
- Standardised process

For each module, we may need/use different/specific packages!



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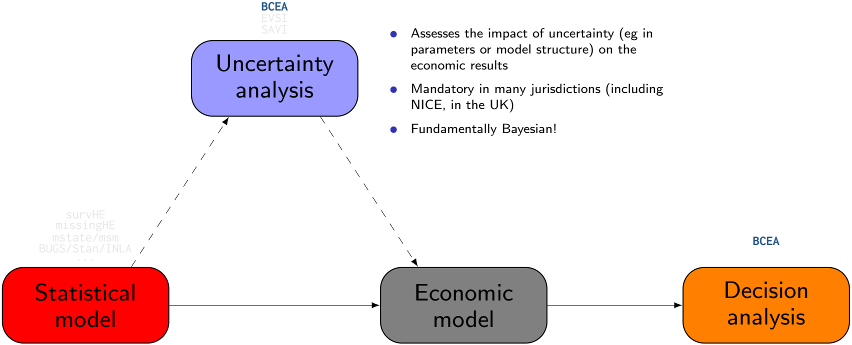

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BCEA & its use directly in R are designed with these objectives in mind

0. Checking the model assumptions — Throughout — Uncertainty analysis
   - Do we mean what we mean (eg in terms of PSA simulations)?...
   - Simulation error (especially, **but not only**, for a Bayesian approach)

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1. Produce the base-case economic evaluation — Decision analysis
   - What's the most cost-effective intervention, given current evidence?
   - Cost-effectiveness plane, Expected Incremental Benefit (as a function of k),...

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2. Perform uncertainty analysis — Uncertainty analysis
   - Standard PSA (mandatory): Cost-effectiveness Plane, CEAC, ...
   - Fairly easy (but not always used): CEAF
   - More advanced/"too difficult" (rarely used): EVP(P)I/EVSI

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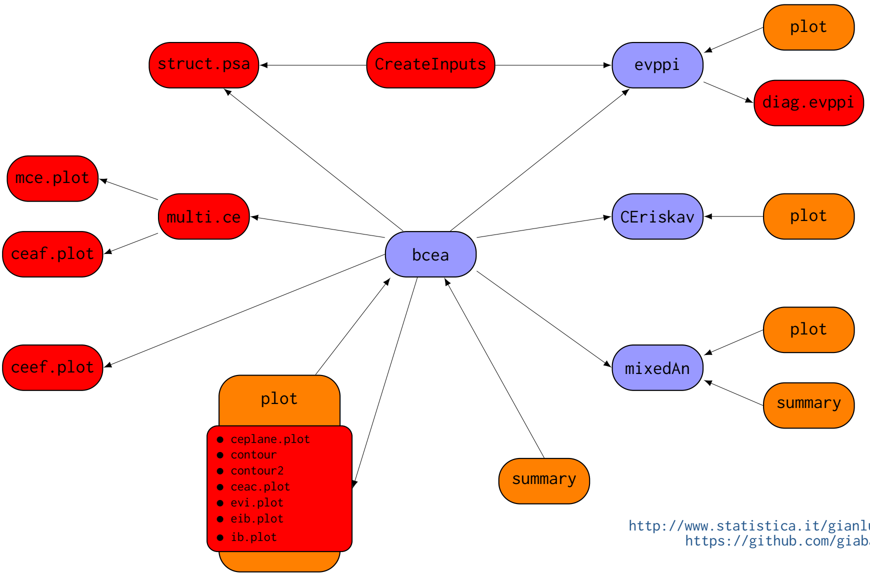
3. Standardised reporting — Throughout
   - Graphical tools (use **excellent** R facilities)
   - Rmarkdown: analysis, commenting & reporting all in one go (**real transparency + efficiency!**)



http://www.statistica.it/gianluca/BCEA
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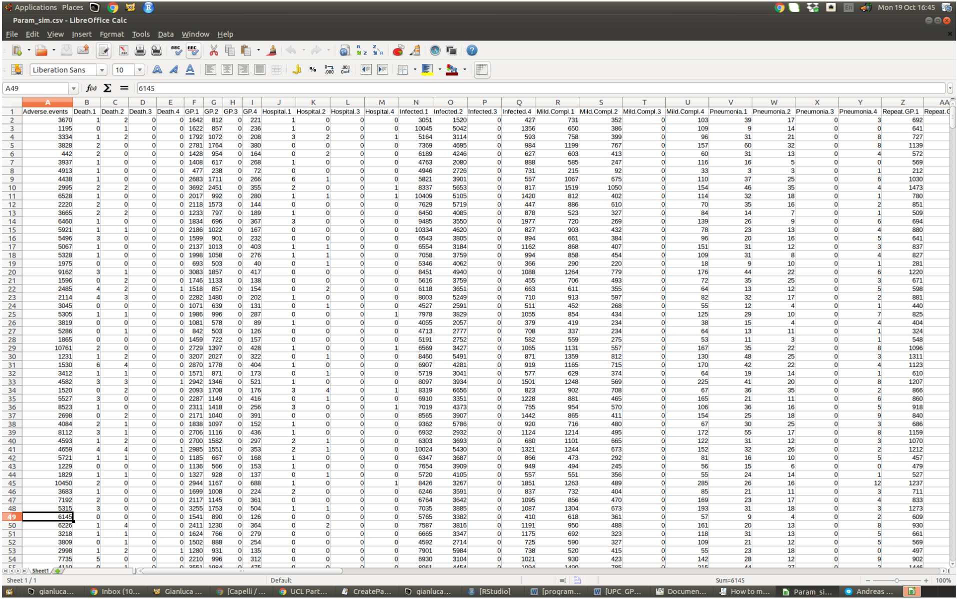

	Adverse.events	Death.1	Death.2	Death.3	Death.4	GP.1	GP.2	GP.3	GP.4	Hospital.1	Hospital.2	Hospital.3	Hospital.4	Infected.1	Infected.2	Infected.3	Infected.4	Mild.Compl.1	Mild.Compl.2	Mild.Compl.3	Mild.Compl.4	Pneumonia.1	Pneumonia.2	Pneumonia.3	Pneumonia.4	Repeat.GP.1
2	3670	1	2	0	0	1642	812	0	221	1	0	0	0	3051	1520	0	427	731	352	0	103	39	17	0	3	692
3	1195	0	1	0	0	1622	857	0	236	1	0	0	0	10045	5042	0	1356	650	386	0	109	9	14	0	0	641
4	3334	1	2	0	0	1792	1072	0	208	3	2	0	1	5164	3114	0	593	758	399	0	96	31	21	0	8	727
5	3828	2	0	0	0	2781	1764	0	380	0	0	0	0	7369	4695	0	984	1199	767	0	157	60	32	0	8	1139
6	442	2	0	0	0	1428	954	0	164	0	2	0	0	6189	4246	0	627	603	413	0	60	31	13	0	4	572
7	3937	1	0	0	0	1408	617	0	268	1	0	0	0	4763	2080	0	888	585	247	0	116	16	5	0	0	569
8	4913	1	0	0	0	477	238	0	72	0	0	0	0	4946	2726	0	731	215	92	0	33	3	3	0	1	212
9	4438	1	0	0	0	2683	1711	0	266	6	1	0	0	5821	3901	0	557	1067	675	0	110	37	25	0	6	1030
10	2995	2	2	0	0	3692	2451	0	355	2	0	0	1	8337	5653	0	817	1519	1050	0	154	46	35	0	4	1473
11	6528	1	0	0	0	2017	992	0	280	1	1	0	1	10409	5105	0	1420	812	402	0	114	32	18	0	1	780
12	2220	2	0	0	0	2118	1573	0	144	0	0	0	0	7629	5719	0	447	886	610	0	70	35	16	0	2	851
13	3665	2	2	0	0	1233	797	0	189	1	0	0	0	6450	4085	0	878	523	327	0	84	14	7	0	1	509
14	6460	1	0	0	0	1834	696	0	367	3	0	0	0	9485	3550	0	1977	720	269	0	139	26	9	0	6	694
15	5921	1	1	0	0	2186	1022	0	167	0	0	0	0	10334	4620	0	827	903	432	0	78	23	13	0	4	880
16	5496	3	0	0	0	1599	901	0	232	0	0	0	0	6543	3805	0	894	661	384	0	96	20	16	0	5	641
17	5067	1	0	0	0	2137	1013	0	403	1	1	0	0	6554	3184	0	1162	868	407	0	151	31	12	0	3	837
18	5328	1	0	0	0	1998	1058	0	276	1	1	0	0	7058	3759	0	994	858	454	0	109	31	8	0	4	827
19	1975	0	0	0	0	693	503	0	40	0	1	0	0	5346	4062	0	366	290	220	0	18	9	10	0	1	281
20	9162	3	1	0	0	3083	1857	0	417	0	0	0	0	8451	4940	0	1088	1264	779	0	176	44	22	0	6	1220
21	1596	0	2	0	0	1746	1133	0	138	0	0	0	0	5616	3759	0	455	706	493	0	72	35	25	0	3	671
22	2485	4	2	0	1	1518	857	0	154	0	2	0	0	6118	3651	0	663	611	355	0	64	13	12	0	5	598
23	2114	4	3	0	0	2282	1480	0	202	1	0	0	0	8003	5249	0	710	913	597	0	82	32	17	0	2	881
24	3045	0	0	0	0	1071	639	0	131	0	1	0	0	4527	2591	0	511	452	268	0	55	12	4	0	1	440
25	5305	1	1	0	0	1986	996	0	287	0	0	0	1	7978	3829	0	1055	854	434	0	125	29	10	0	7	825
26	3819	0	0	0	0	1081	578	0	89	1	0	0	0	4055	2057	0	379	419	234	0	38	15	4	0	4	404
27	5286	0	1	0	0	842	503	0	126	0	0	0	0	4713	2777	0	708	337	234	0	64	13	11	0	1	324
28	1865	0	0	0	0	1459	722	0	157	0	0	0	0	5191	2752	0	582	559	275	0	53	11	3	0	1	548
29	10761	2	0	0	0	2729	1397	0	428	1	0	0	1	6569	3427	0	1065	1131	557	0	167	35	22	0	8	1096
30	1231	1	2	0	0	3207	2027	0	322	0	1	0	0	8460	5491	0	871	1359	812	0	130	48	25	0	3	1311
31	1530	6	4	0	0	2870	1778	0	404	1	0	0	0	6907	4281	0	919	1165	715	0	170	42	22	0	4	1123
32	3412	1	1	0	0	1571	871	0	173	0	1	0	0	5719	3041	0	577	629	374	0	64	19	14	0	1	610
33	4582	3	3	0	1	2942	1346	0	521	1	0	0	0	8097	3934	0	1501	1248	569	0	225	41	20	0	8	1207
34	1520	0	2	0	0	2093	1708	0	176	3	4	0	1	8319	6656	0	823	902	708	0	67	36	35	0	2	866
35	5527	3	0	0	0	2287	1149	0	416	0	1	0	0	6910	3351	0	1228	881	465	0	165	21	11	0	6	860
36	8523	1	0	0	0	2311	1418	0	256	3	0	0	1	7019	4373	0	755	954	570	0	106	36	16	0	5	918
37	2698	0	2	0	0	2171	1040	0	391	0	0	0	0	8565	3907	0	1442	865	411	0	154	25	18	0	9	840
38	4084	2	1	0	0	1838	1097	0	152	1	0	0	0	9362	5786	0	920	716	480	0	67	30	25	0	3	686
39	8112	3	1	0	0	2706	1116	0	436	1	0	0	0	6932	2932	0	1124	1214	495	0	172	55	17	0	8	1159
40	4593	1	2	0	0	2700	1582	0	297	2	1	0	0	6303	3693	0	680	1101	665	0	122	31	12	0	3	1070
41	4659	4	4	0	1	2985	1551	0	353	2	1	0	0	10024	5430	0	1321	1244	673	0	152	32	26	0	2	1212
42	5721	1	1	0	0	1185	667	0	168	1	0	0	0	6347	3687	0	866	473	292	0	81	16	10	0	5	457
43	1229	0	0	0	0	1136	566	0	153	1	0	0	0	7654	3909	0	949	494	245	0	56	15	6	0	0	479
44	1829	1	1	0	0	1327	928	0	137	0	1	0	0	5720	4105	0	557	551	356	0	55	24	14	0	1	527
45	10450	2	0	0	0	2944	1167	0	688	1	0	0	1	8426	3267	0	1851	1263	489	0	285	26	16	0	12	1237
46	3683	1	0	0	0	1699	1008	0	224	2	0	0	0	6246	3591	0	837	732	404	0	85	21	11	0	3	711
47	7192	2	0	0	0	2117	1145	0	361	0	0	0	0	6764	3642	0	1095	856	470	0	169	23	17	0	4	833
48	5315	3	0	0	0	3255	1753	0	504	1	1	0	0	7035	3885	0	1087	1304	673	0	193	31	18	0	3	1273
49	6145	0	0	0	0	1541	890	0	126	0	0	0	0	5765	3382	0	410	618	361	0	57	9	4	0	2	609
50	6226	1	4	0	0	2411	1230	0	364	0	2	0	0	7587	3816	0	1191	950	488	0	161	20	13	0	8	930
51	3218	1	1	0	0	1624	766	0	279	0	0	0	0	6665	3347	0	1175	692	323	0	118	31	13	0	5	661
52	3809	0	1	0	0	1502	888	0	254	0	0	0	0	4592	2714	0	725	590	327	0	109	21	12	0	5	569
53	2998	1	2	0	1	1280	931	0	135	0	0	0	0	7901	5984	0	738	520	415	0	55	23	18	0	0	497
54	7735	5	0	0	0	2210	996	0	312	0	0	0	0	6930	3104	0	1021	930	423	0	142	28	12	0	9	902

```
# Loads BCEA into the R workspace
> library(BCEA)

# Loads the PSA data from the R object "Vaccine"
> data(Vaccine)
# Or from an Excel spreadsheet, for example
> vaccine = read.csv("PSA_simulations.csv")

# Uses BCEA to create suitable input
> inp = CreateInputs(vaccine)
```

```
# Shows the first few rows of the PSA matrix
> head(inp$mat)

  Adverse.events Death.1.1. Death.2.1. Death.2.2. GP.1.1. GP.2.1. GP.2.2. Hospital.1.1.
1           1466          1          0          0    1664     958     230             0
2           5329          1          1          0    1414     748     276             0
3           5203          1          1          0     809     489      80             0
4           2351          2          0          0    1761    1157     261             1
5           8303          1          2          0    2472     964     432             1
6           3607          1          1          0    2224    1342     260             1
  Hospital.2.1. Hospital.2.2. Infected.1.1. Infected.2.1. Infected.2.2. Mild.Compl.1.1.
1             1             0          5992          3401           876             691
2             0             1          7471          4024          1536             570
3             0             0          6718          4300           788             332
4             0             0          4837          3269           702             739
5             1             0          4749          1894           846            1049
6             0             0          4938          2976           596             915

...

(many more rows & variables!)
```

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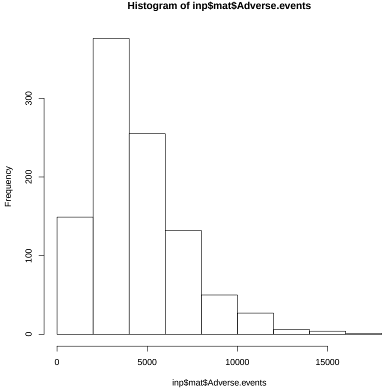
```
# Checks that the intended PSA distribution gives meaningful results
> hist(inp$mat$Adverse.events)
```



```
# Combines the model parameters to determine costs & effectiveness
> QALYs.inf <- QALYs.pne <- QALYs.hosp <- QALYs.adv <- QALYs.death <- matrix(0,n.sims,2)
> for (t in 1:2) {
    QALYs.inf[,t] = ((Infected[,t,1] + Infected[,t,2])*omega[,1]/365)/N
    QALYs.pne[,t] = ((Pneumonia[,t,1] + Pneumonia[,t,2])*omega[,4]/365)/N
    QALYs.hosp[,t] = ((Hospital[,t,1] + Hospital[,t,2])*omega[,5]/365)/N
    QALYs.death[,t] = ((Death[,t,1] + Death[,t,2])*omega[,6])/N
  }
> QALYs.adv[,2] = (Adverse.events*omega[,7]/365)/N

> e = -(QALYs.inf + QALYs.pne + QALYs.adv + QALYs.hosp + QALYs.death)
> ...
```

```
# Displays the first few row of the matrix for (e,c) in the two treatment arms
> head(cbind(e,c))

       Status Quo   Vaccination  Status Quo Vaccination
[1,] -0.0010466668 -0.0008986026  10.409146   16.252537
[2,] -0.0008836105 -0.0007320416   5.834875    9.373437
[3,] -0.0008898137 -0.0006975327   5.784903   15.935623
[4,] -0.0016430238 -0.0011393237  12.208484   18.654250
[5,] -0.0013518841 -0.0009574948   9.786787   16.467321
[6,] -0.0014325715 -0.0009358231   6.560276    9.689887

...

(many more rows!)
```

Enter BCEA!

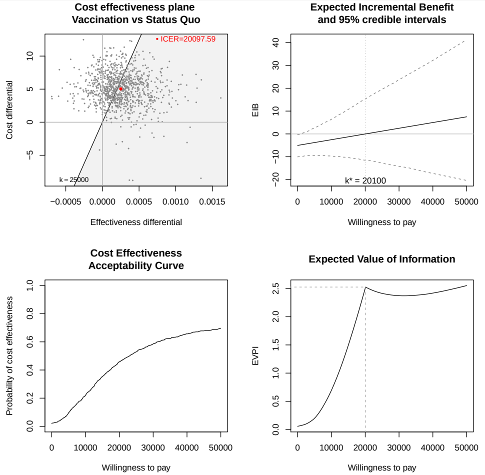
```
# Uses BCEA to perform the decision analysis
> m = bcea(e,c,ref=2,interventions=c("Status Quo","Vaccination"),...)
```

```
# Summarises the results
> summary(m)

Cost-effectiveness analysis summary

Reference intervention:  Vaccination
Comparator intervention: Status Quo

Optimal decision: choose Status Quo for k<20100 and Vaccination for k>=20100


Analysis for willingness to pay parameter k = 25000

            Expected utility
Status Quo           -36.054
Vaccination          -34.826

                               EIB   CEAC   ICER
Vaccination vs Status Quo 1.2284 0.529 20098

Optimal intervention (max expected utility) for k=25000: Vaccination

EVPI 2.4145
```

Enter BCEA!

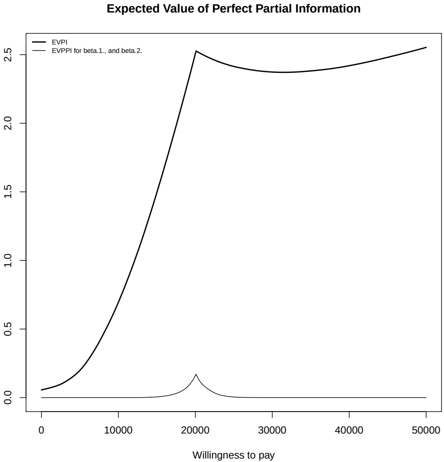
```
# Uses BCEA to perform the decision analysis
> m = bcea(e,c,ref=2,interventions=c("Status Quo","Vaccination"),...)
```

```
# Plots the results
> plot(m)
```



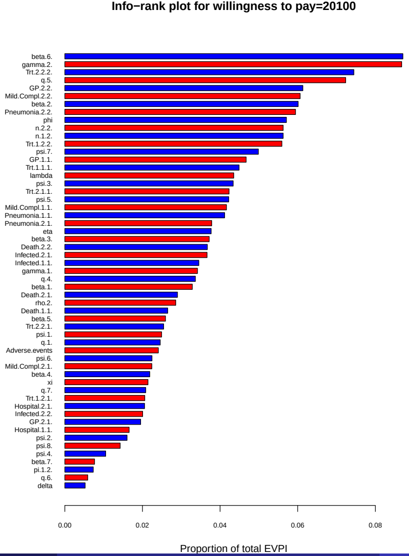
Enter BCEA!

```
# Makes the analysis of the Expected Value of Partial Perfect Information
> x = evppi(c("beta.1.","beta.2."), inp$mat, m)

# Plots the outcome
> plot(x)
```

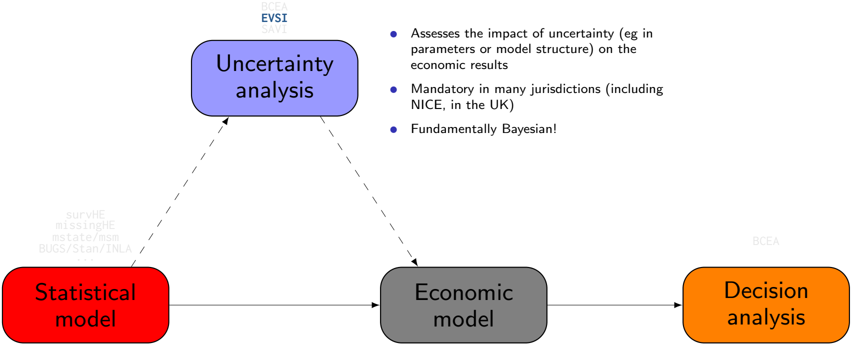


Enter BCEA!

```
# Summarises uncertainty in the decision making process by means of the "Info Rank" plot
info.rank(inp$parameters,inp$mat,m)
```



For each module, we may need/use different/specific packages!



- Assesses the impact of uncertainty (eg in parameters or model structure) on the economic results
- Mandatory in many jurisdictions (including NICE, in the UK)
- Fundamentally Bayesian!

- Estimates relevant **population** parameters $\boldsymbol{\theta}$
- Varies with the type of available data (& statistical approach!)

- Combines the parameters to obtain a population average measure for costs and clinical benefits
- Varies with the type of available data & statistical model used

- Summarises the economic model by computing suitable measures of "cost-effectiveness"
- Dictates the best course of actions, given current evidence
- Standardised process

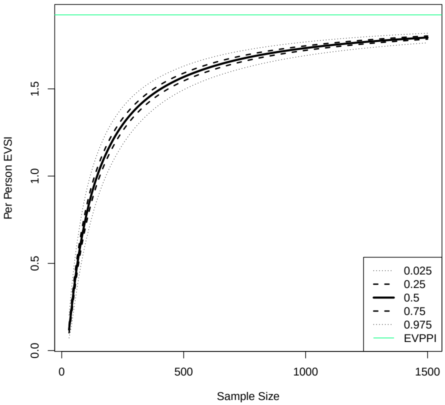
VoI: Basic idea

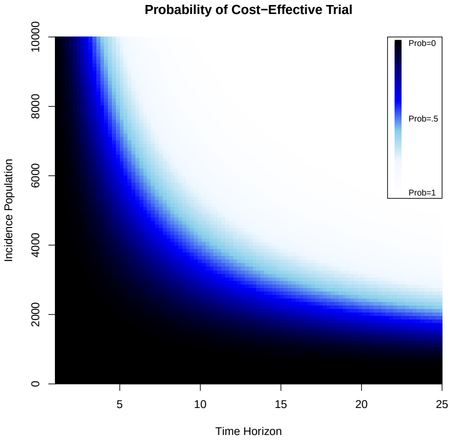
- A new study will provide new data
  - Reducing (or even eliminating) uncertainty in a subset of model parameters
- Update the cost-effectiveness model
  - If the optimal decision changes, gain in monetary net benefit (NB = utility) from using new optimal treatment
  - If optimal decision unchanged, no gain in NB
- **Expected** VOI is the average gain in NB

VoI: Basic idea and relevant measures

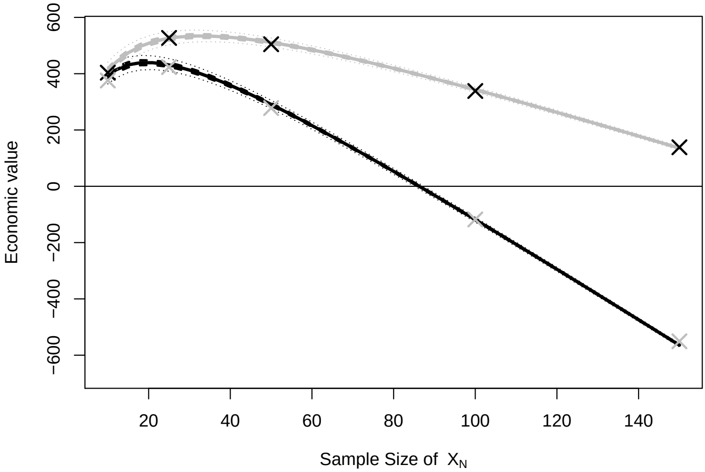
- A new study will provide new data
  - Reducing (or even eliminating) uncertainty in a subset of model parameters
- Update the cost-effectiveness model
  - If the optimal decision changes, gain in monetary net benefit (NB = utility) from using new optimal treatment
  - If optimal decision unchanged, no gain in NB
- **Expected** VOI is the average gain in NB

1. **Expected Value of Perfect Information** (EVPI)
   - Value of completely resolving uncertainty in all input parameters to decision model
   - Infinite-sized long-term follow-up trial measuring everything!
   - Gives an upper-bound on the value of new study — if EVPI is low, suggests we can make our decision based on existing information
2. **Expected Value of Partial Perfect Information** (EVPPI)
   - Value of eliminating uncertainty in subset of input parameters to decision model
   - Infinite-sized trial measuring relative effects on 1-year survival
   - Useful to identify which parameters responsible for decision uncertainty
3. **Expected Value of Sample Information** (EVSI)
   - Value of reducing uncertainty by conducting a study of given design
   - Can compare the benefits and costs of a study with given design
   - Is the proposed study likely to be a good use of resources? What is the optimal design?



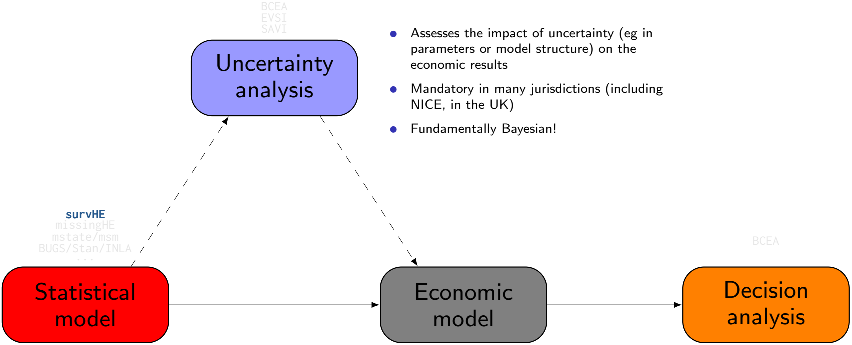


https://github.com/giabaio/EVSI
https://egon.stats.ucl.ac.uk/projects/EVSI
Heath et al (2018). https://arxiv.org/abs/1804.09590
Heath et al *Medical Decision Making*. 2017. **38(2)**: 163-173


600
400
200
0
−200
−400
−600
Economic value
20
40
60
80
100
120
140
Sample Size of X_N

Health technology assessment (HTA)

For each module, we may need/use different/specific packages!



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Objective: Simplify and standardise commands to fit survival analysis

- Can do MLE + bootstrap to get (possibly rough-ish!) estimates from the joint distribution of the parameters
- Can also do Bayesian models to get (usually better!) estimates from the joint **posterior** distribution of the parameters
  - **INLA**: Super fast (comparable to MLE), but currently supports only a restricted range of models
  - **MCMC**: Slower, but more generalisable — `survHE` produces and saves the model code + data & initial values, so the user could then customise them

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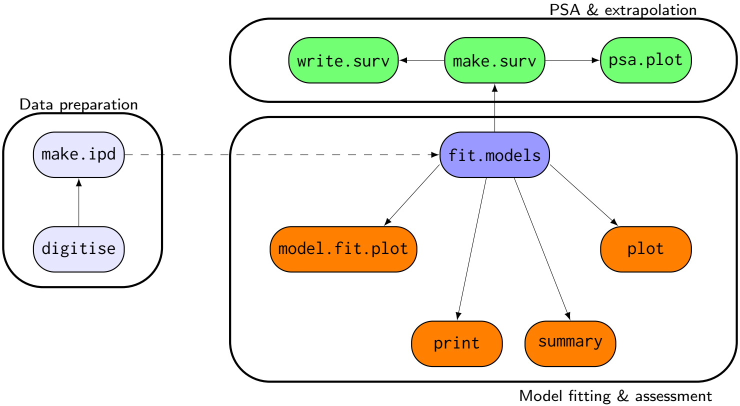
- Automatically produce specialised graphs
  - Survival curves + model fitting statistics (AIC, BIC, DIC)
- Can produce a full PSA characterisation of the parameters **and** the survival curves
  - These can be directly used in the economic model!

Objective: Simplify and standardise commands to fit survival analysis



https://github.com/giabaio/survHE

All in!

SAVI http://savi.shef.ac.uk/SAVI/

SAVI - Sheffield Accelerate... ×

savi.shef.ac.uk/SAVI/

Search

The University Of Sheffield.

SAVI - Sheffield Accelerated Value of Information

Funded by NIHR

Release version 2.0.10 (2015-09-24)

Home | About your model | Import files | Check upload | PSA Results | EVPI | EVPPI single parameters | EVPPI groups | Report | About us

What SAVI does

Using **only** PSA results from your model

In a matter of seconds from the SAVI online application you can generate:

1. Standardised assessment of uncertainty (C-E planes and CEACs)
2. Overall EVPI per patient, per jurisdiction per year and over your decision relevance horizon
3. Expected Value of Perfect Parameter Information (EVPPI) for single and groups of parameters

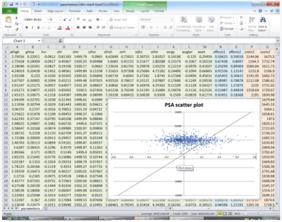
For individual-level simulation models you only need to simulate a small number of individuals per PSA sample. See the "About your model" tab.

Disclaimer: This application is based on peer-reviewed statistical approximation methods. It comes with no warranty and should be utilised at the user's own risk (see here). The underlying code is made available under the BSD 3-clause license.

For more information on the method see Mark Strong's website or this paper.

The SAVI process has 4 steps (using the TABS from left to right)

Step 1: Save PSA input parameters, costs and effects as separate .csv files



Sign up for SAVI news and updates

Send a blank email to savi@sheffield.ac.uk

We won't share your email address with anyone.

Also, you can now follow SAVI on Twitter. The SAVI team tweet regular updates and new features.

Follow @SheffieldSAVI

News

SAVI is now available as an R package, allowing you to run SAVI directly on your own machine. You can download instructions here.

Known issues

Sometimes SAVI will either not load, or will hang for a while. This is because SAVI can only deal with one set of computations at a time, even though SAVI allows multiple concurrent users. Be assurred that SAVI keeps concurrent users' data and results separate.

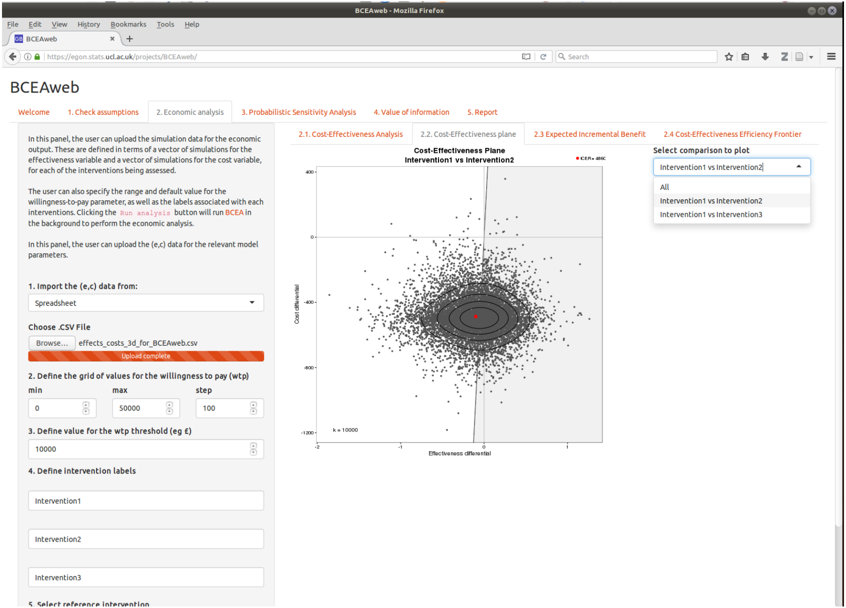
The "Save session" and "Load previously saved session" facilities are temporarily out of action due to problems of backward compatibility with SAVI version 1.

The report that SAVI generates is not quite as polished as we would like. We are working on this.

New features and bug fixes

Fix for version 2.0.9

We have added a note on the EVPPI Groups tab to say that the GP method for calculating partial EVPI for groups of five or more parameters uses only the first 7,500 rows of the PSA.


BCEAweb - Mozilla Firefox
File Edit View History Bookmarks Tools Help
BCEAweb
https://egon.stats.ucl.ac.uk/projects/BCEAweb/
Search
BCEAweb
Welcome
1. Check assumptions
2. Economic analysis
3. Probabilistic Sensitivity Analysis
4. Value of information
5. Report
In this panel, the user can upload the simulation data for the economic output. These are defined in terms of a vector of simulations for the effectiveness variable and a vector of simulations for the cost variable, for each of the interventions being assessed.
The user can also specify the range and default value for the willingness-to-pay parameter, as well as the labels associated with each interventions. Clicking the Run analysis button will run BCEA in the background to perform the economic analysis.
In this panel, the user can upload the (e,c) data for the relevant model parameters.
1. Import the (e,c) data from:
Spreadsheet
Choose .CSV File
Browse...
effects_costs_3d_for_BCEAweb.csv
Upload complete
2. Define the grid of values for the willingness to pay (wtp)
min
max
step
0
50000
100
3. Define value for the wtp threshold (eg £)
10000
4. Define intervention labels
Intervention1
Intervention2
Intervention3
5. Select reference intervention
2.1. Cost-Effectiveness Analysis
2.2. Cost-Effectiveness plane
2.3 Expected Incremental Benefit
2.4 Cost-Effectiveness Efficiency Frontier
Cost-Effectiveness Plane
Intervention1 vs Intervention2
ICER = 486
Cost differential
Effectiveness differential
k = 10000
400
0
-400
-800
-1200
-2
-1
0
1
Select comparison to plot
Intervention1 vs Intervention2
All
Intervention1 vs Intervention2
Intervention1 vs Intervention3

1. Introduction | 2. Parameter input | 3. Cohort simulation | 4. Health economic evaluation | 5. Value of information

The parameters of the base-case scenario can be displayed without running the model.

Show base-case

After completing the selection of the inputs, click the button to run the statistical analysis

Run MCMC

MCMC simulations: 50

Population parameters | Survival analysis | Administration costs | Treatment costs | Adverse events | Utilities

Population indolent non-Hodgkin's lymphoma (source)

13518

% rituximab refractory follicular lymphoma

Mean (source)	SD (assumption)
9	0.01

Mean age (source)

62.07

Weight in kg

Mean (source)	SD (assumption)
81	10

Height in cm

Mean (source)	SD (assumption)
169.52	10

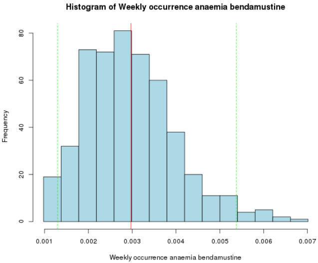
2.1 Check assumptions | 2.2 Trace plots | 2.3 GR plots | 2.4 Effective sample size | 2.5 Autocorrelation

Parameter of interest

Weekly occurrence anaemia bendamustine

Select the number of BINs for histogram

5 15 25



Mean	Standard deviation	2.5%	Median	97.5%	Monte Carlo SE
0.0029703	0.0010262	0.0012969	0.0028678	0.0053797	0.0004194

Escape (from Excel) to victory