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How to communicate cost-effectiveness analysis to a lay audience?

Mike Drummond (chair), University of York
Robert Hettle, AstraZeneca
Rita Faria, University of York
Gabriel Rogers, National Institute for Health and Care Excellence (NICE)

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Introduction to the Workshop

- Who are the 'lay audience'?
  - the general public (including patients)
  - colleagues from other disciplines (in research or on committees)
- What do we need to communicate?
  - economic concepts
  - detailed methods and analyses
- What issues do we face?

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What Issues Do we Face?

- The economic message is more complicated than the clinical message
- Consider:

  ‘ This drug delivers no benefits’

  versus

  ‘ The benefits from this drug do not justify the costs’

- The effort economists put in to learning about medicine and clinical research is not always reciprocated

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Media Reporting of Economic Analysis

Daily Mail, Saturday, November 18, 2006

Alzheimer's cover-up

Drugs watchdog refuses to reveal why it denied thousands of patients £2.50-a-day medication on the NHS

By Jenny Hope and Charlotte Gill

THE drugs rationing watchdog has refused to reveal secret papers that show why it decided to stop thousands of Alzheimer's patients getting drugs on the NHS.

The National Institute for Health and Clinical Excellence is withholding vital documents that helped it reach its decision.

The medication costs just £2.50 a day for sufferers at the early stages of the disease. Drug companies have received overwhelming support from doctors and charities by seeking to challenge NICE's findings in court.

Last year, the Daily Mail launched a campaign to retain the drugs for all those who could benefit for them.

At issue are four drugs, the most popular being Aricept, which NICE have banned for use by those suffer-

How the Mail has campaigned

We spend more on Viagra than on drugs for dementia. What kind of nation have we become

The drugs gave dad an extra 18 months with me

FURY OVER ALZHEIMER DRUGS BAN

Why nursing homes could be swamped

Alzheimer victims 'may have to buy illicit drugs'

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Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: In a scale of 1 to 10, 1 being easy-peasy and 10 being almost impossible, how do you find communicating cost-effectiveness models to non-health economists?

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Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: When communicating a cost-effectiveness analysis to non-modellers, the essential tools are:

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Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: How often do you communicate cost-effectiveness models to non-modellers?

HOW TO COMMUNICATE COST-EFFECTIVENESS ANALYSIS TO A LAY AUDIENCE?

Robert Hettle
Director, Health Economics and Payer Evidence
AstraZeneca

Laypersons and their involvement in HTA (1)

- A “layperson” may be a patient, carer, service user, expert by experience, survivor, and the public1
  - Heterogeneous
  - Various levels of knowledge of Health Technology Appraisal (HTA)

- We extend the term “layperson” to cover medical or technical professionals that have limited knowledge or experience of
  - HTA
  - Economic evaluations
  - Statistics and/or simulation modelling

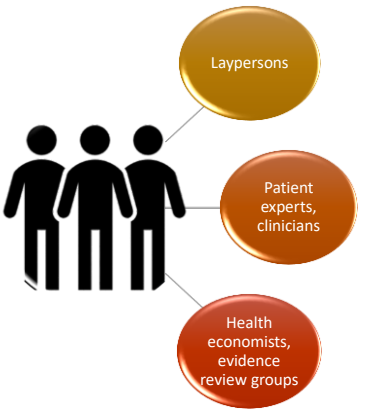
1 NICE’s approach to public involvement in guidance and standards: a practical guide;

Laypersons and their involvement in HTA (2)

- Layperson involvement in HTA varies considerably between countries[2]
  - 25% (13 of 53) of HTA agencies surveyed in 2016 had documented public and patient involvement
  - 15% (8 of 53) of HTA agencies had patients/public on committees
- The importance of layperson involvement in HTA is becoming widely recognised[3]
  - Key stakeholders and users of the technology
  - Provide insight not available elsewhere
- Patient organisations are increasingly involved in the dissemination of HTA decisions and results[2]

2 Public and patient involvement in health technology assessment: a framework for action, 3 EUPATI Guidance for Patient Involvement in Medicines Research and Development: Health Technology Assessment

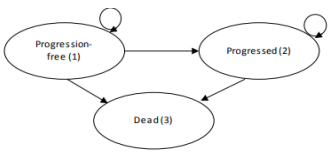
Developing manufacturer submission dossiers for payers

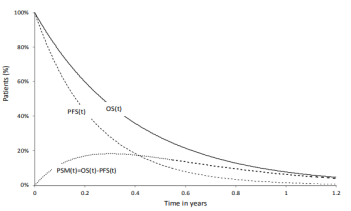


- Manufacturer submission dossiers must cater for multiple audiences
- Submission dossiers can be long, complex and technical (NICE ~ 150 pages maximum excluding appendices, up to 1200 with appendix)
- In April 2017, NICE introduced a committee summary document (maximum length of 25 pages)
- Intention to reduce information burden on committee's
- Section on cost-effectiveness includes model diagram
  - Requires annotation for cycle length, time horizon and transition probabilities

Why is communication of economic modelling important? An example from oncology

- Majority of models submitted in advanced cancer follow a simple three-state structure (progression-free, progressed disease, death)



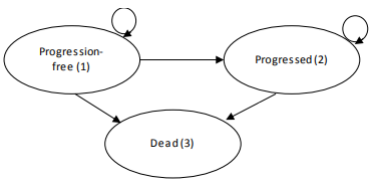


- The majority (73% of NICE appraisals[1]) use partition survival analysis
- They are/were often incorrectly described as Markov-Like or Semi-Markov
- Review groups (experts), manufacturers and committees have miscommunicated these methods

1 NICE TSD 19: Partitioned survival analysis as a decision modelling tool

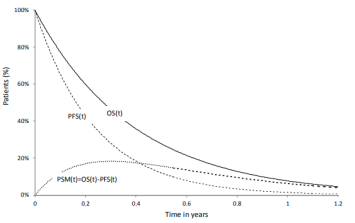
Why is communication of economic modelling important? An example from oncology

- Partitioned survival and Markov models are distinct methods
- Different methods = different assumptions = different results



Markov:

- **Three sets of parameters** *(progression-free to progressed, progression-free to death, progressed to death)*
- Depends on multiple transitions (e.g. progression free to progressed to death)
- Dependency between progression status and death

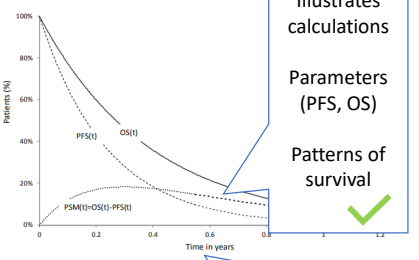


Partitioned survival:

- **Two sets of parameters** *(progression-free survival and overall survival)*
- Independent of transitions (e.g. progressed disease inferred from progression free and overall survival)
- PFS and OS are independent

Use of model diagrams to present economic models – are they useful?

Different approaches convey different information……not all of which is critical to the final decision



Illustrates calculations

Parameters (PFS, OS)

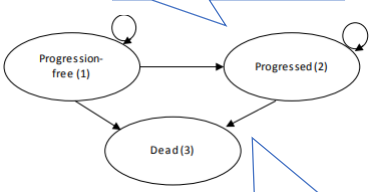
Patterns of survival ✓

✗ Patient pathway / health states
Time spent in health states

Survival curves are difficult to understand

Patient pathway

Health states ✓



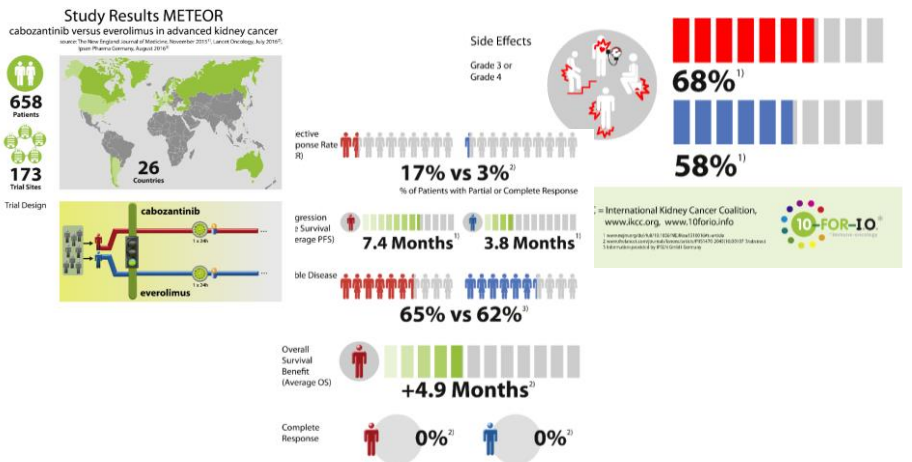
✗ Calculations and parameters used
Patterns of survival/ assumptions

Understandable by laypersons, but does not communicate assumptions

What can we learn from others on the communication of scientific research?

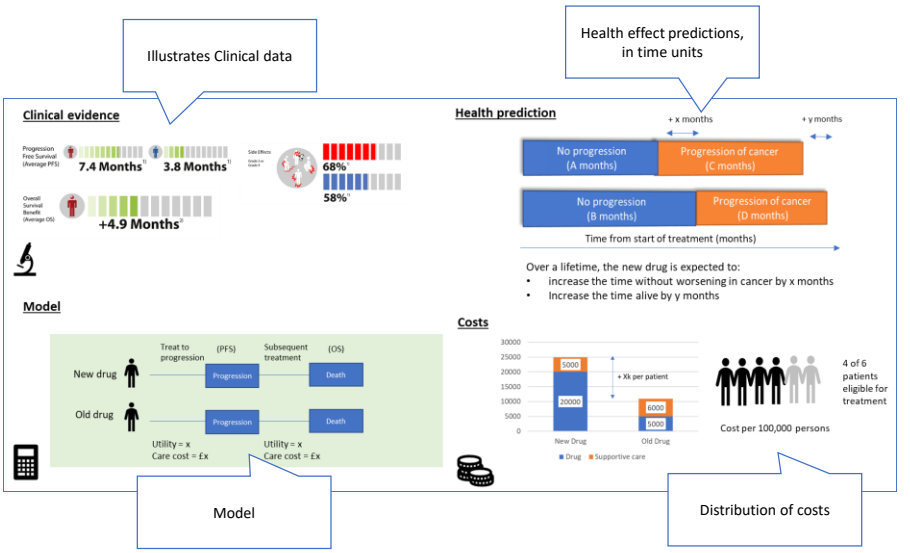
- Communication of scientific research is difficult, other organisations struggle:
  - Criticism of Policymaker's summary of the international governmental panel for climate change
- EU clinical trials regulation 536/2014 (article 37) requires sponsors of clinical trials to provide summary results of clinical trials in a format understandable to laypersons
- General principles:
  - Simple text summaries
  - Present absolute numbers rather than relative measures
  - **Use of visual aids in support of text are encouraged – infographics cited as an example**
- Presentation of design alongside results

EMA recommends the use of infographics to aid understanding of clinical trials



https://ikcc.org/wp-content/uploads/2018/08/IKCC_Studien-Ergebnisse_Meteor_RZ_3.png

Infographics may help with the presentation of economic models (an imperfect example)



Concluding remarks

- Laypersons play a critical role in decision-making for new health technologies
- Existing visual approaches to communicating CEA in oncology may not be sufficiently informative
  - Important to focus on outcomes alongside modelling methods
- Adopting techniques used in other areas may improve communication
  - Infographics for summaries of clinical trial results
  - Learning from the experience of other groups
  - Involvement of graphic designers and end users to support development of visual aids
- Visual aids (e.g. infographics) may help with the dissemination of peer reviewed publications to a wider audience

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Communicating…..
CEAs of diagnostic tests

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Outline

- Challenges in explaining CEA of diagnostic tests to lay (non-health economist) audiences
- (My) common pitfalls and potential solutions

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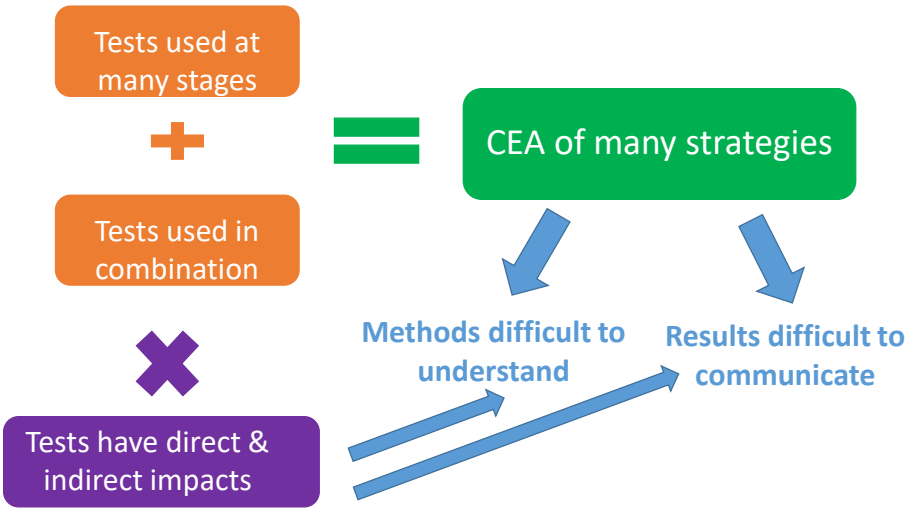
Challenges of CEA of diagnostic tests



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393 strategies

69 screening strategies
969 diagnostic strategies

European Urology
Volume 73, Issue 1, January 2018

HEALTH TECH

The identification and treatment of women with hyperglycaemia in pregnancy: an analysis of individual participant data, systematic reviews, meta-analyses and an economic evaluation

Diane Farrar, Mark Simmonds, Susan Griffin, Ana Duarte, Debbie A Lawlor, Mark Sculpher, Lesley Fairley, Su Golder, Derek Tuffnell, Martin Bland, Fidelma Dunne, Donald Whitelaw, John Wright and Trevor A Sheldon

e.g. Hep B: 84 str

Cost-effectiveness of non-invasive methods for assessment and monitoring of liver fibrosis and cirrhosis in patients with chronic liver disease: systematic review and economic evaluation

Catriona Crossan, Emmanuel A Tsochatzis, Louise Longworth, Kurinchi Gurusamy, Brian Davidson, Manuel Rodríguez-Perálvarez, Konstantinos Mantzoukis, Julia O'Brien, Evangelos Thalassinos, Vassilios Papastergiou and Andrew Burroughs

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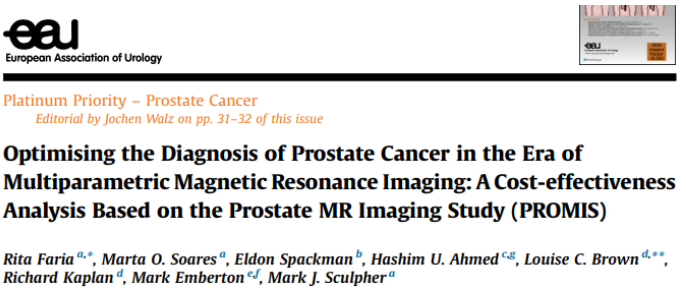
The motivating example



European Association of Urology

Platinum Priority – Prostate Cancer

Editorial by Jochen Walz on pp. 31–32 of this issue

Optimising the Diagnosis of Prostate Cancer in the Era of Multiparametric Magnetic Resonance Imaging: A Cost-effectiveness Analysis Based on the Prostate MR Imaging Study (PROMIS)

Rita Faria [a,], Marta O. Soares [a], Eldon Spackman [b], Hashim U. Ahmed [c,g], Louise C. Brown [d,**], Richard Kaplan [d], Mark Emberton [e,f], Mark J. Sculpher [a]*

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Before turning on the computer… Map out the impact of the test

BMJ

RESEARCH METHODS & REPORTING

Assessing the value of diagnostic tests: a framework for designing and evaluating trials

The value of a diagnostic test is not simply measured by its accuracy, but depends on how it affects patient health. This article presents a framework for the design and interpretation of studies that evaluate the health consequences of new diagnostic tests

Lavinia Ferrante di Ruffano *research fellow*[1], Christopher J Hyde *professor of public health and clinical epidemiology*[2], Kirsten J McCaffery *associate professor and principal research fellow*[3], Patrick M M Bossuyt *professor of clinical epidemiology*[3], Jonathan J Deeks *professor of biostatistics*[1]

Original Article

MDM Medical Decision Making

Toward Alignment in the Reporting of Economic Evaluations of Diagnostic Tests and Biomarkers: The AGREEDT Checklist

Michelle M.A. Kip, Maarten J. IJzerman, Martin Henriksson, Tracy Merlin, Milton C. Weinstein, Charles E. Phelps, Ron Kusters, and Hendrik Koffijberg

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Agree which impacts are modelled

Direct impact

- Cost of the test
- Direct health consequences
- Health consequences from side effects
- Costs of managing side effects
- Adherence to test

Indirect

- Different management decisions given diagnostic classification
- Timing of management
- Adherence to management

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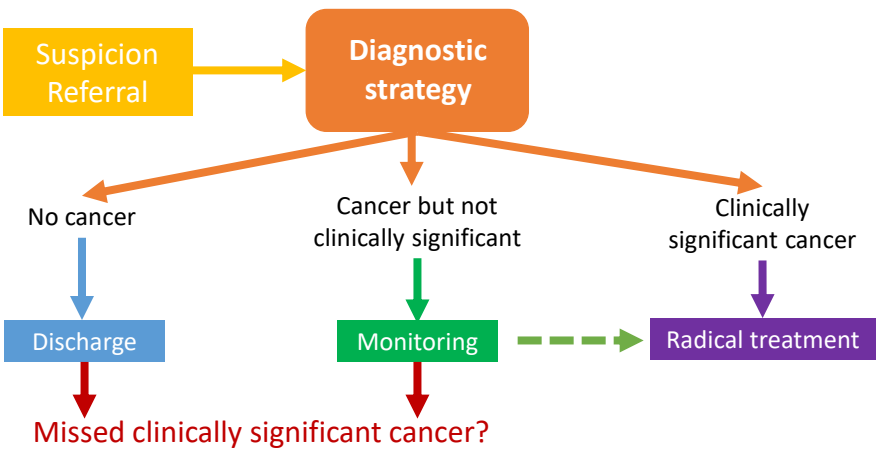
Represent the general testing strategy in the management pathway



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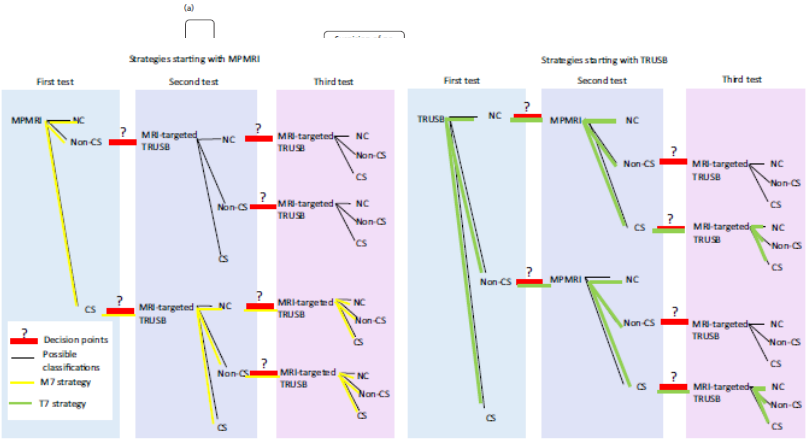
Decouple model diagram from mathematical model



Faria et al (2018) Optimising the Diagnosis of Prostate Cancer in the Era of Multiparametric Magnetic Resonance Imaging: A Cost-effectiveness Analysis Based on the Prostate MR Imaging Study (PROMIS). European Urology. 10.1016/j.eururo.2017.08.018
Brown et al (2018). Multiparametric MRI to improve detection of prostate cancer compared with transrectal ultrasound-guided prostate biopsy alone: the PROMIS study. HTA. 10.3310/hta22390

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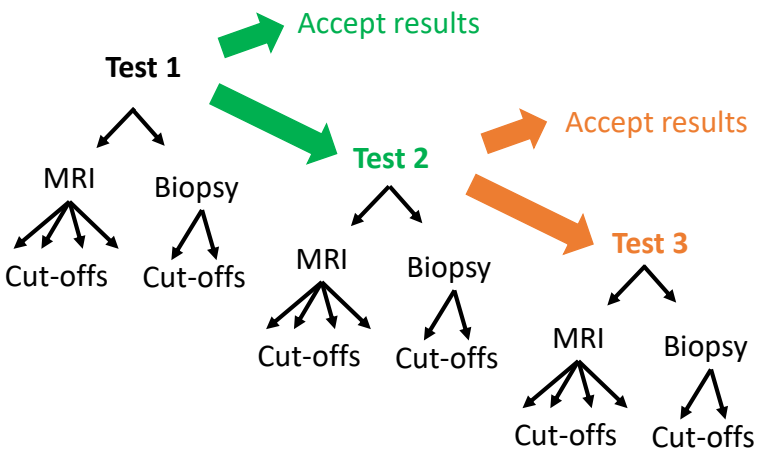
Break down the problem



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Avoid sensitivity and specificity
Talk about conditional probabilities

- Difficult to remember their definition
- Easy to confuse concepts
- Only work for dichotomous classification

- Conditional probabilities
  - Probability of having CS cancer given that the MRI score is X.

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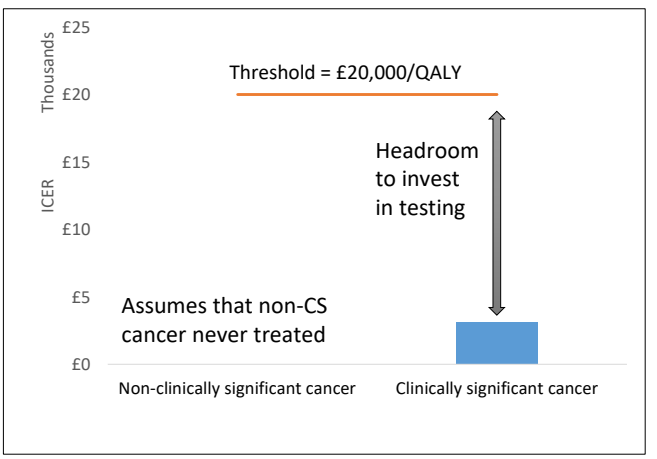
Prepare the ground for the results
How cost-effective is treatment?



These graphs are illustrative and do not necessarily represent the results of the motivating example.

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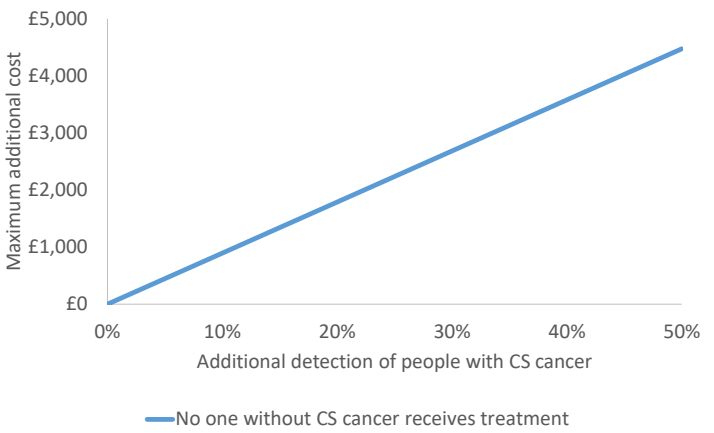
How much to invest in testing?



These graphs are illustrative and do not necessarily represent the results of the motivating example.

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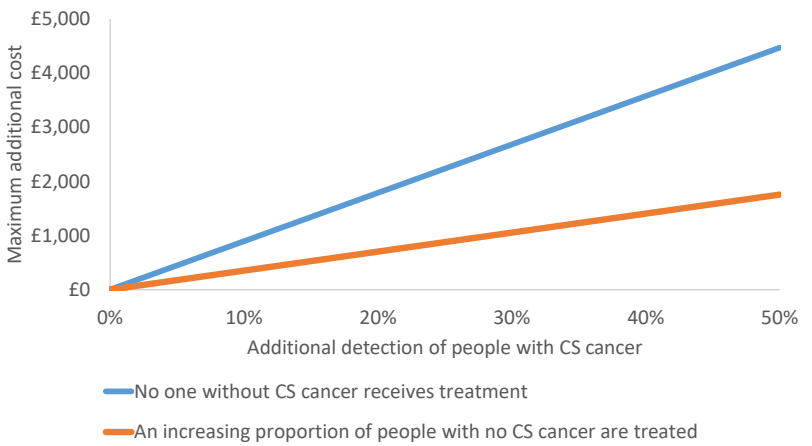
What if people diagnosed with non-CS cancer are treated?



These graphs are illustrative and do not necessarily represent the results of the motivating example.

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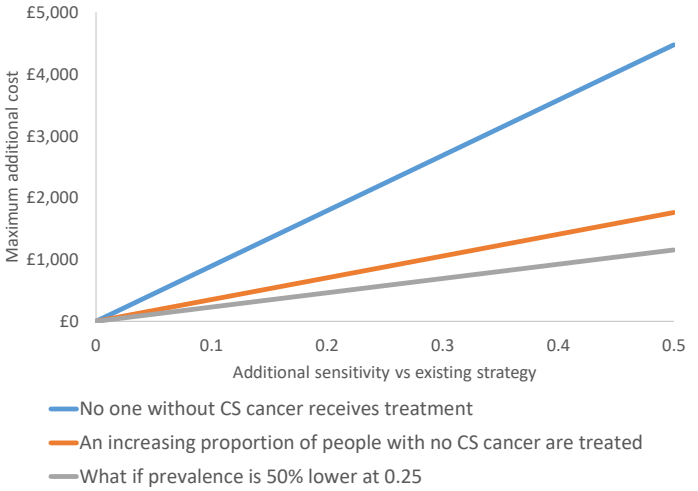
What if the prevalence of CS cancer is lower?



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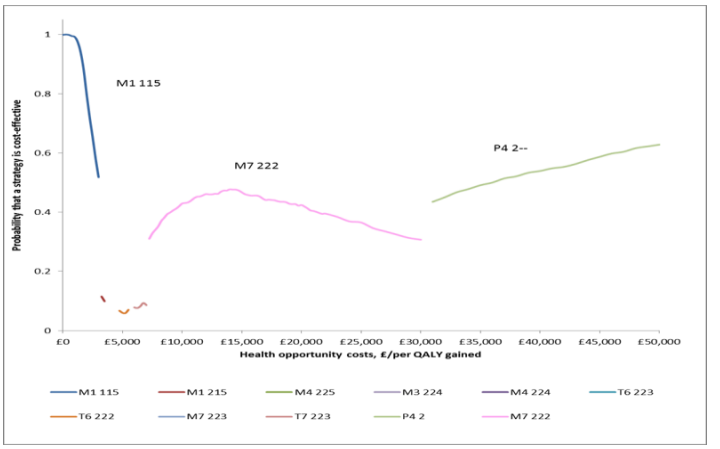
Results
CEACs/CEACs are difficult to understand



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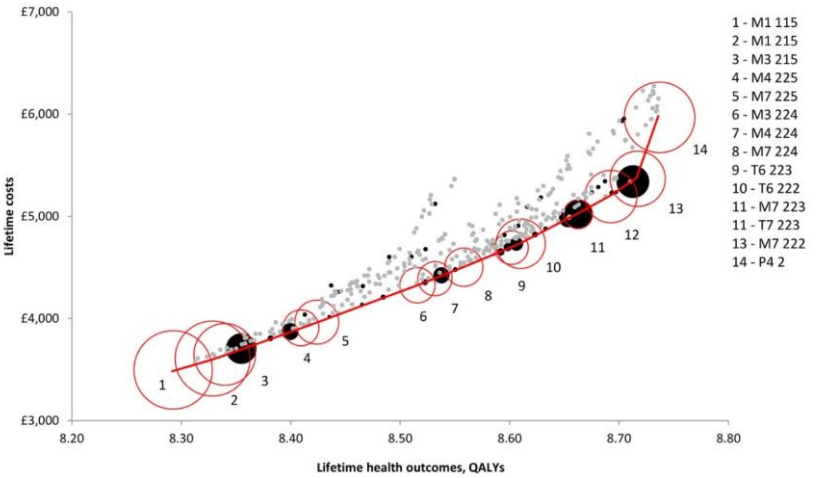
CE planes too!



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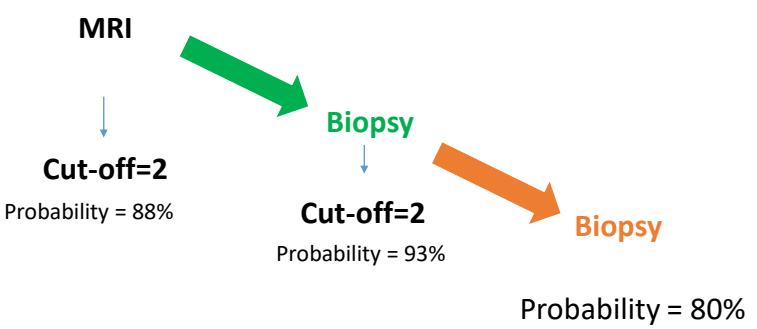
Relate results to the model diagram
Focus on the key results



These graphs are illustrative and do not necessarily represent the results of the motivating example.

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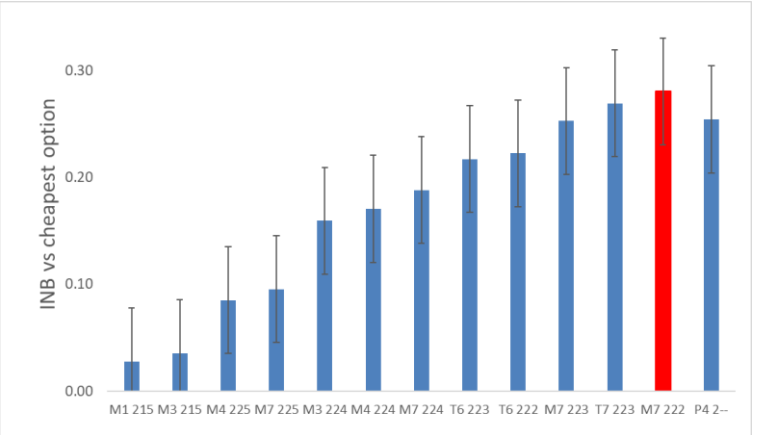
If there is an accepted threshold
Show results as INB



These graphs are illustrative and do not necessarily represent the results of the motivating example. Inspired by Drummond et al. (2015). Methods for the Economic Evaluation of Health Care Programmes, Table 11.5.

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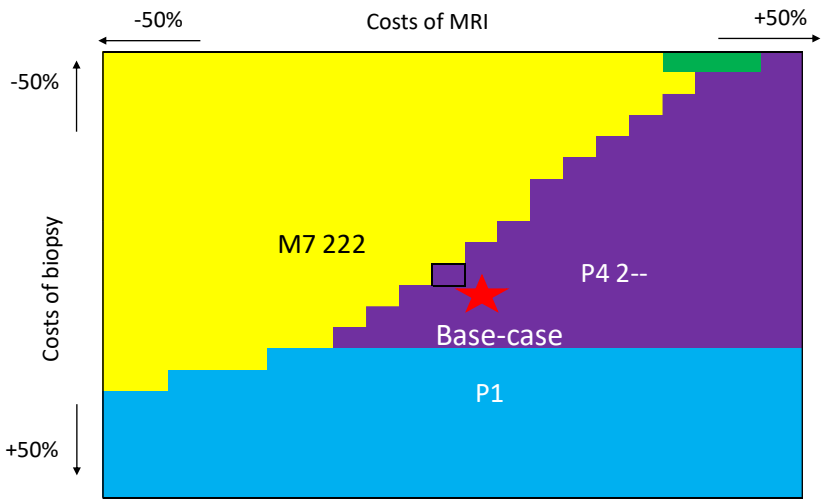
2-way sensitivity analysis
What is the cost-effective option?



These graphs are illustrative and do not necessarily represent the results of the motivating example.

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Concluding remarks

- Discuss CEA with stakeholders from scoping to final results
- Acknowledge the compromise between completeness and clarity.
- More work is needed on how to
  - Engage with the users of CEA from the outset.
  - Develop outputs that work for the audience.

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Thank you!

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NICE National Institute for Health and Care Excellence

How to communicate cost-effectiveness analysis to a lay audience?

Experience from NICE clinical guidelines

Gabriel Rogers
Centre for Guidelines, NICE

NICE clinical guidelines

The decision-making context

- All decision-making committees for NICE guidelines are experts in the topic but seldom in methods
  - Always at least 2 patient / carer members
- NICE guideline committees have an unusual dual role. They are:
  - The source of topic-specific knowledge as you build a model
  - The decision-makers who have to make sense of what you ultimately present
- Always concentrate on the things they know about
  - They are experts on the pathway and patients' experience
- Find ways to help them inform and then validate the model
  - Time spent visualising structure and outputs is never wasted
- Aim to get 95% of the way through before mentioning costs and QALYs
  - If the topic experts validate the model's simulation of the world they know, the cost–utility results are just the consequence

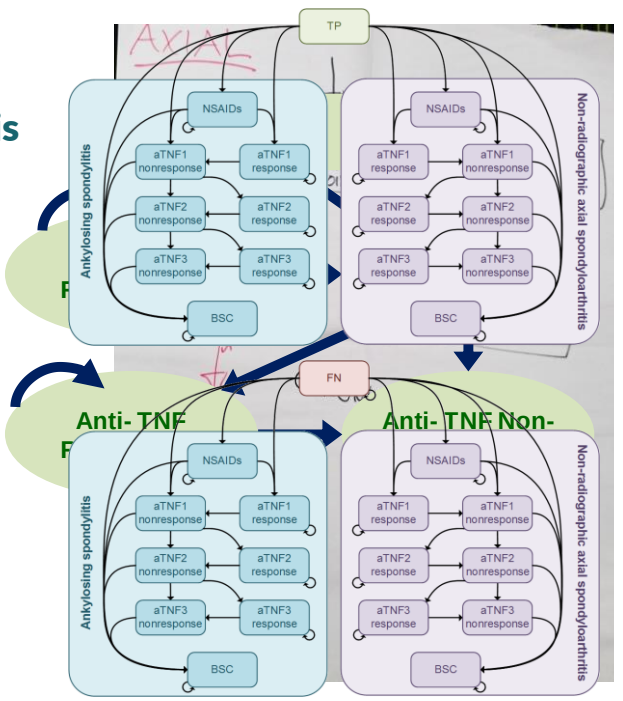
Understanding model dynamics

A case-study from spondyloarthritis (NG65)

Screening for axial spondyloarthritis

Model structure

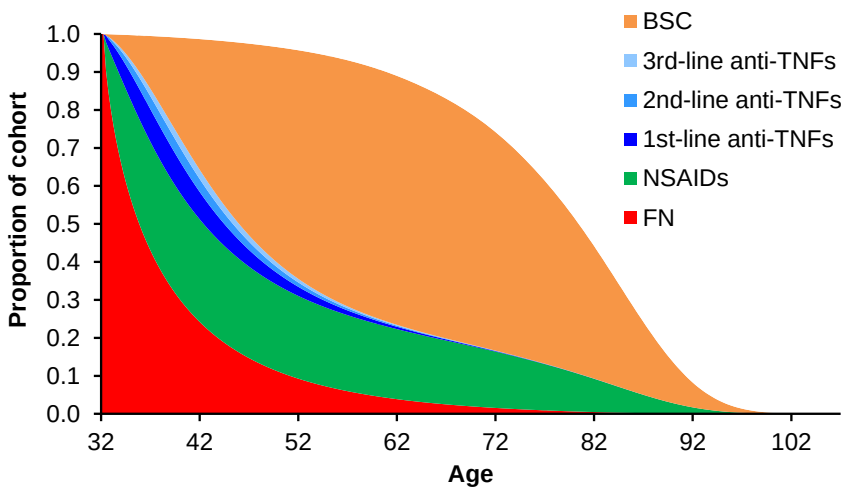
- Initial brainstorm
- First draft
- Final structure



NICE

State occupancy graph

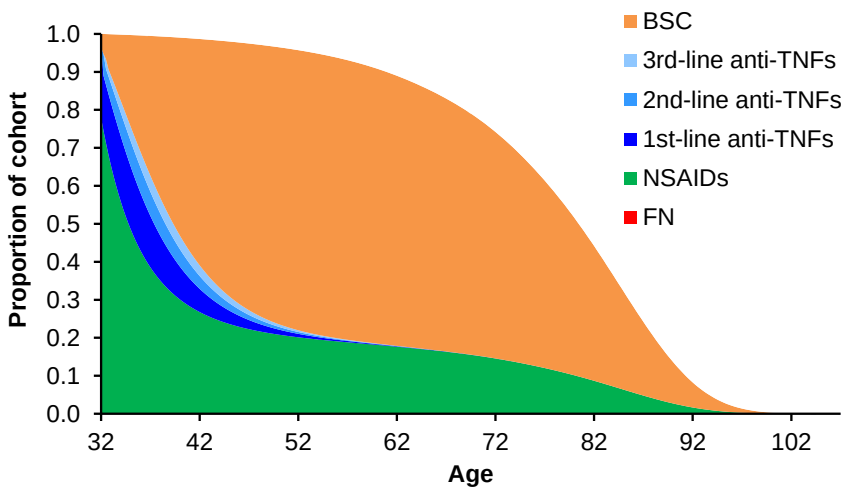
Current practice



NICE

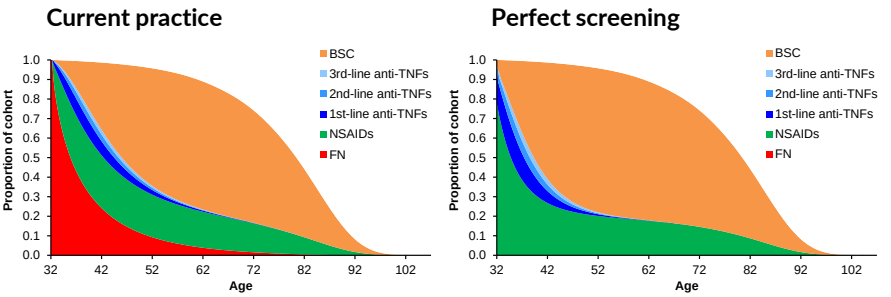
State occupancy graph

Perfect screening



NICE

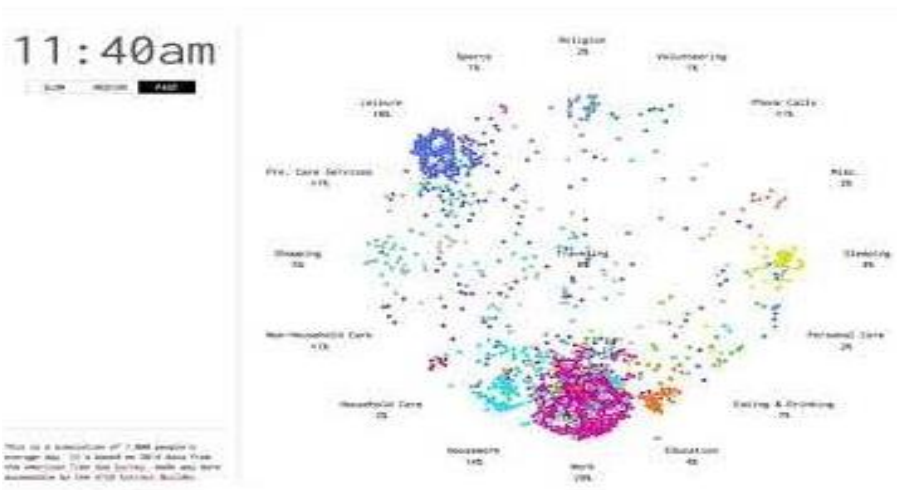
State occupancy graph



NICE

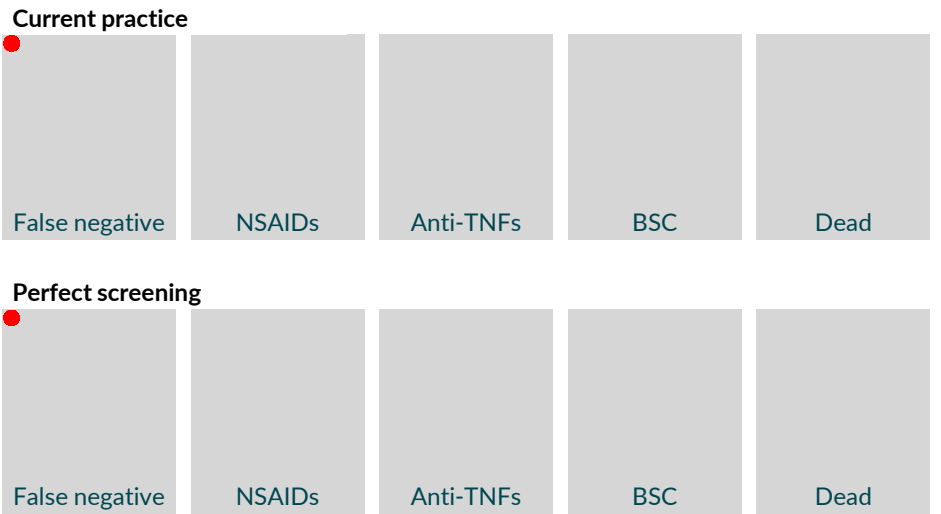
State occupancy animation

Inspiration: 'A Day in the Life of Americans' – flowingdata.com



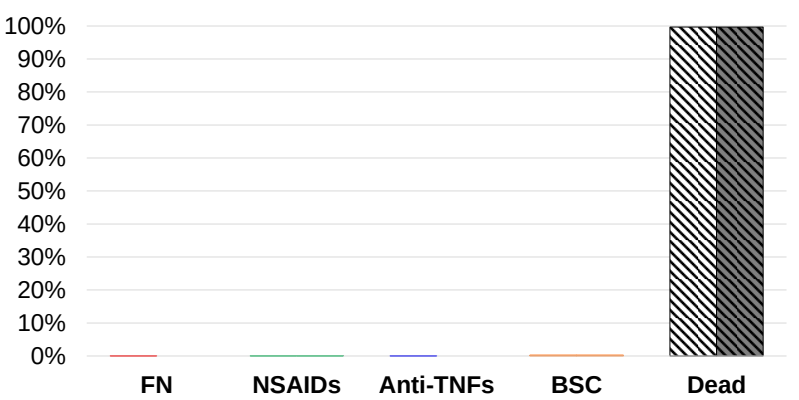
NICE

State occupancy animation



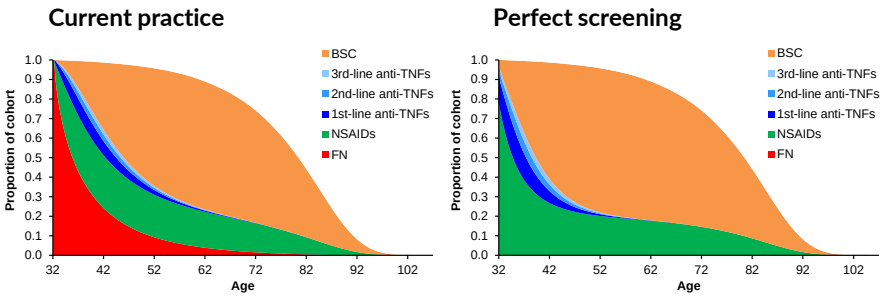
NICE Year: 40.00 Age: 72.00

State occupancy animation (2)



NICE Year: 68.00 Age: 100.00

State occupancy graph



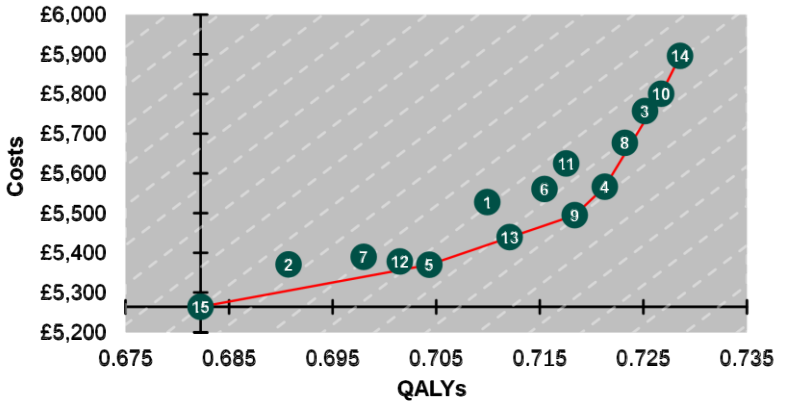
NICE

Understanding cost-effectiveness results

In defence of the cost–utility plane

NICE

Cost–utility plane



(1) Van Hoeven (SSB27): >=2
(2) Van Hoeven (SSB27): >=3
(3) Braun (2013): >=3
(4) Braun (2013): >=4
(5) Braun (2013): >=5
(6) Van Hoeven (2015): >=1.5
(7) Van Hoeven (2015): >=2
(8) Braun (2013): Buttock OR HLA B27
(9) Braun (2013): 2-step
(10) Braun (2011): >=2
(11) Braun (2011): >=3
(12) Braun (2011): >=4
(13) HLA B27: alone
(14) "Refer everybody"
(15) "Current practice"

NICE

PSA results – case-study from type 2 diabetes

Conventional CEAC

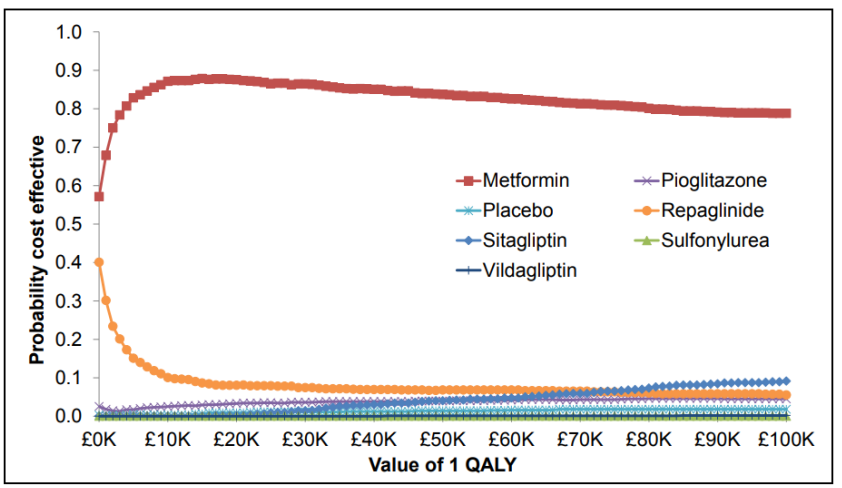
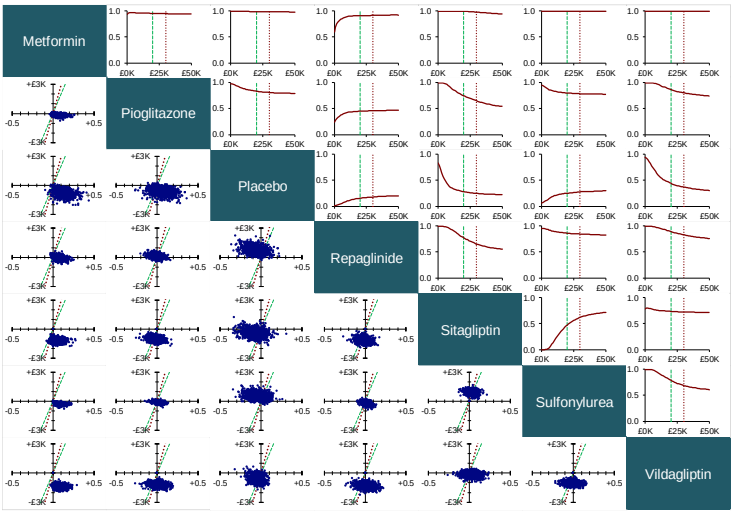


Figure 15: Cost-effectiveness acceptability curve for initial therapy

NICE

Pairwise PSA results

CEACs and scatterplots for all pairwise combinations



NICE

Pairwise PSA results

'Mileage chart': probability of providing best value

Metformin	0.042	0.010	0.087	0.003	0.000	0.000
0.958	Pioglitazone	0.162	0.548	0.247	0.195	0.133
0.990	0.838	Placebo	0.844	0.716	0.745	0.554
0.913	0.452	0.156	Repaglinide	0.220	0.135	0.107
0.997	0.753	0.284	0.780	Sitagliptin	0.526	0.263
1.000	0.805	0.255	0.865	0.474	Sulfonylurea	0.207
1.000	0.867	0.446	0.893	0.737	0.793	Vildagliptin

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Values estimate probability that [option in column] is cost effective compared with [option in row] (if QALYs are valued at £20K each)

Concluding remarks

- We do ourselves few favours by relying on MSOffice
  - I haven't presented anything **that** complicated, but it feels like I'm pushing PowerPoint to its limit
    - » Slide 10 had 1,052 animation events
    - » Slide 11 had 276 graphs
    - » Embedded videos don't always work
      (I bet PowerPoint has failed at least once in the last 10 minutes)
  - We're using R more and more
  - Dedicated charting solutions?
    - » Charticulator, Flourish, Tableau, etc.
    - » Questions of expense and confidentiality
  - But we still end up pasting the output into a .ppt
- Animations are hard to put in documents!
- Some research on what objectively works would be extremely valuable
  - NICE guidelines might be a good testbed for that

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Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: In a scale of 1 to 10, 1 being easy-peasy and 10 being almost impossible, how do you find communicating cost-effectiveness models to non-health economists?

NICE

Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: When communicating a cost-effectiveness analysis to non-modellers, the essential tools are:

NICE