

Introduction to Health Economics (HE101)

Matthew Prettyjohns

Prif Ymchwilydd

Principal Researcher

Technoleg Iechyd Cymru
Health Technology Wales



Technoleg Iechyd Cymru
Health Technology Wales



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

Brief overview of Health Technology Wales



Technoleg Iechyd Cymru
Health Technology Wales



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

The purpose of HTW

To deliver a strategic, national approach to the **identification, appraisal** and **adoption** of new technologies into health and care settings



IDENTIFICATION



APPRAISAL

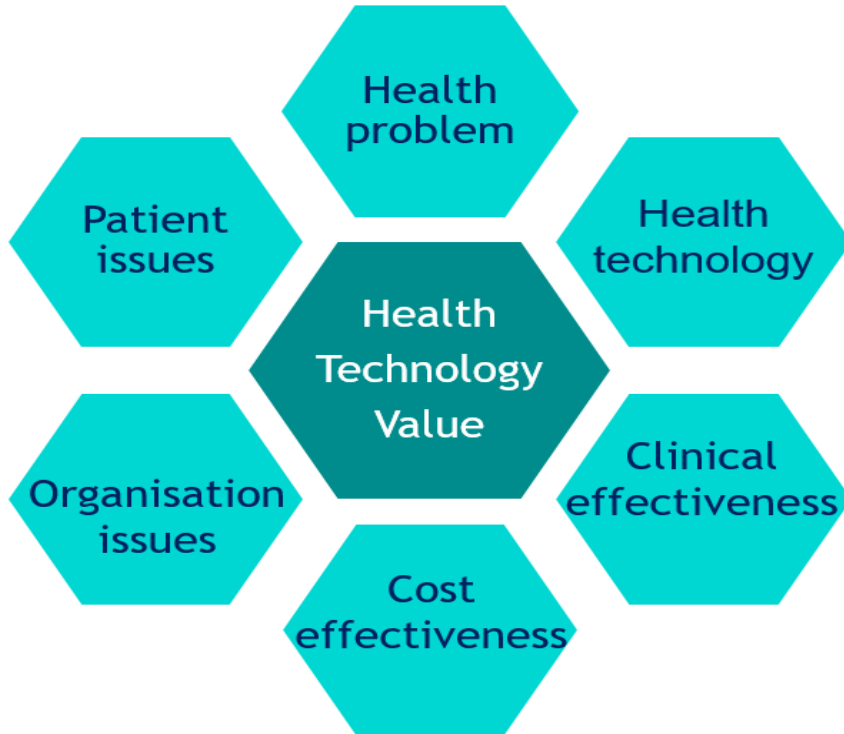


ADOPTION





Appraisal process



Technologies are critically appraised using health technology assessment (HTA) methodology:

multidisciplinary process using scientifically robust methods to assess the value of a health technology at different points in its lifecycle

Process is comparative, systematic, transparent and involves multiple stakeholders.

The purpose is to inform health policy and decision-making to promote an efficient, sustainable, equitable and high-quality health system.

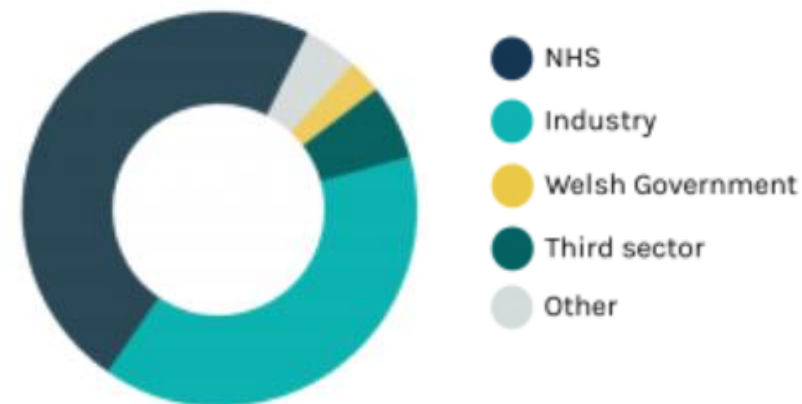
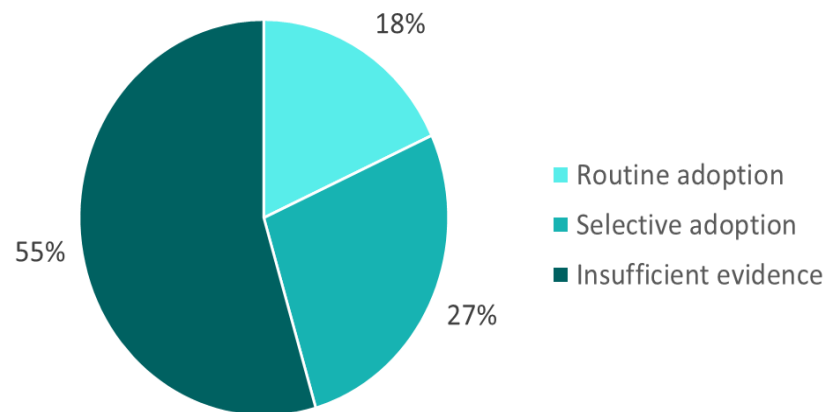
Evidence is required to demonstrate that technologies are **clinically** and **cost-effective**





Appraisals to date

- Full evidence appraisals have been carried out for **21 technologies**,
- **15 pieces of Guidance** have been produced



Encourage adoption of clinically and cost effective technologies

Discourage adoption of technologies that are unsupported by evidence

Improve quality of care and patient outcomes



Overview of health economics

What it is and what it isn't



Technoleg Iechyd Cymru
Health Technology Wales



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

Why consider health economics?

- NHS faces a **limited budget**
- Difficult spending decisions must be made across different disease areas
- Spending **more in one area** necessitates **spending less somewhere else**
- Economic analysis estimates whether the **gains** from the new spending outweighs the **losses** from what has been displaced (i.e. the '**opportunity cost**')



HE Mythbusting

- Health economics is **NOT** about saving money and spending less
 - Money is never really ‘saved’ in the NHS budget as it would always be spent on something else
- Health economists are concerned with **maximising benefits** **NOT minimising costs**
- This means that it is possible for costly treatments to be cost-effective if they are more effective than the available treatments
- Also means that treatments may not be cost-effective just because they are cheaper. **Effectiveness matters**



Types of economic analysis

- **Cost-effectiveness analysis (CEA)**

Consequences of interventions measured in non-monetary terms using a single outcome. Interventions are compared as cost per unit of effectiveness (e.g. cost per life year gained).

- **Cost-utility analysis (CUA)**

Consequences are expressed in terms of quantity and quality of life using quality-adjusted life years (QALYs).

- **Cost consequence analysis (CCA)**

Compares costs and consequences of different interventions but does not summarise outcomes in a single measure or in financial terms.

- **Cost-benefit analysis (CBA)**

Costs and outcomes of an intervention are expressed in monetary terms.

- **Cost minimisation analysis (CMA)**

Costs of interventions that are equally effective are compared.



Choice of economic analysis

- **Economist's view** – **CUA is the gold standard** and best way to establish whether something is cost-effective
- However, CUA may not always be feasible and it may be **more pragmatic** to consider whether **value could be demonstrated with alternative approaches**
- Choice of appropriate analysis depends upon what the intervention is expected to offer to patients and the NHS
- **For example**, a technology that allows for a procedure to be performed under **local anaesthetic instead of general anaesthetic**
 - If there is evidence of equivalent effectiveness, CMA could be performed to demonstrate reduced costs
 - However, contentious issue would be whether treatments are truly equivalent – **perhaps equivalent on some aspects but not others**



Measuring effectiveness and costs



Technoleg Iechyd Cymru
Health Technology Wales



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

Effectiveness measures – like for like?

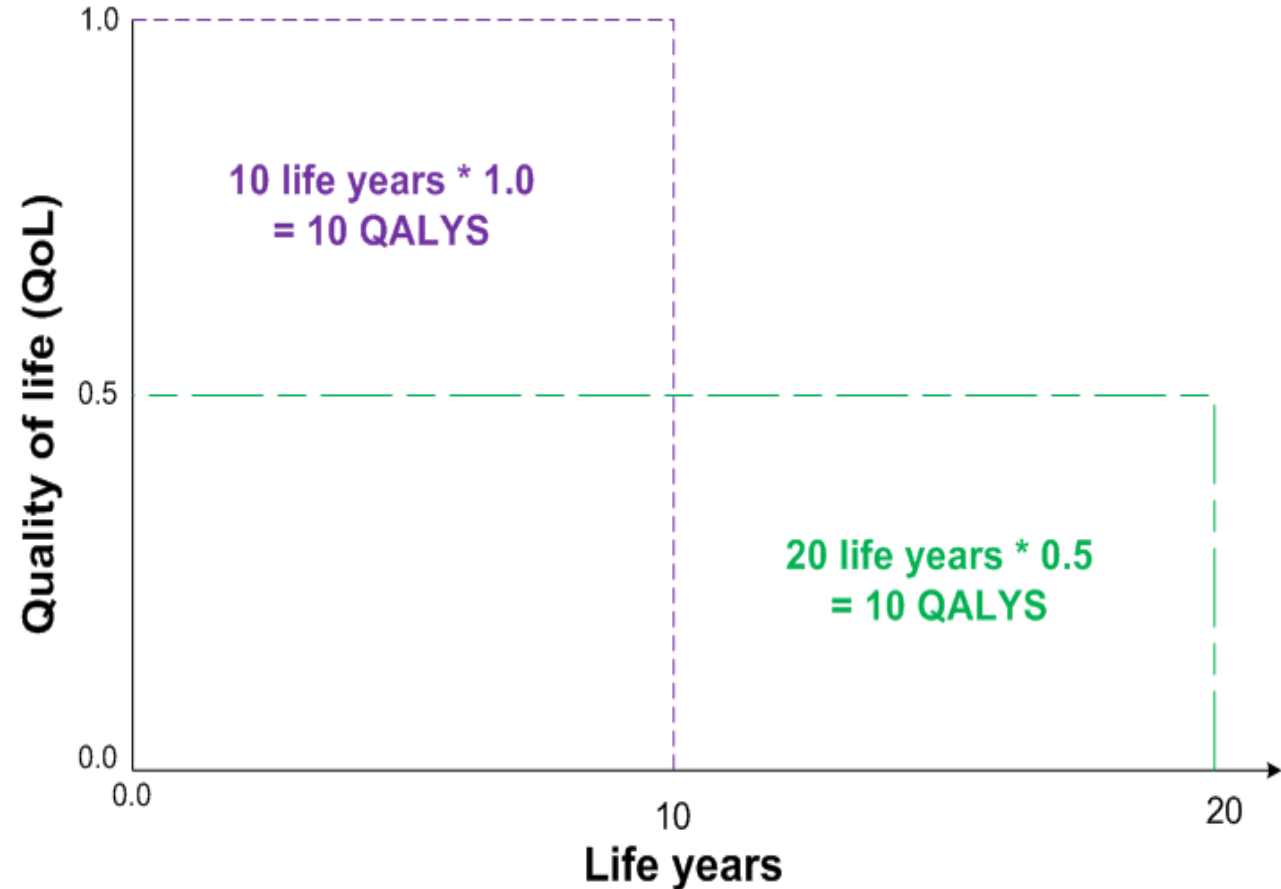
Intervention	Cost	Benefit
New surgical intervention	£10,000 per procedure	Decreases operative morbidity and complications
New diagnostic test	£400 per test	Greater diagnostic accuracy
New palliative care medication	£50 per week	Improves patient quality of life
New telemonitoring device	£100 per device	Faster detection of problems or deterioration

- > The differences in costs is clear but it is difficult to assess the **relative value** of the interventions because of the variability in the benefits
- > **A uniform measure of benefit is required**



A common measure of effectiveness

- QALYs combines *quantity* and *quality of life* (QoL) into a single measure of health gain
- The amount of time spent in a health state is weighted by the QoL score attached to that health state
- QoL is scored with 'perfect health'=1 and death=0



Measuring quality of life

- EQ-5D is preferred measure for valuing quality of life for economic analyses

Mobility

I have no problems in walking about

I have some problems in walking about

I am confined to bed

Self-care

I have no problems with self care

I have some problems washing or dressing myself

I am unable to wash or dress myself

Usual activities

I have no problems with performing my usual activities

I have some problems with performing my usual activities

I am unable to perform my usual activities

Pain/discomfort

I have no pain or discomfort

I have moderate pain or discomfort

I have extreme pain or discomfort

Anxiety/depression

I am not anxious or depressed

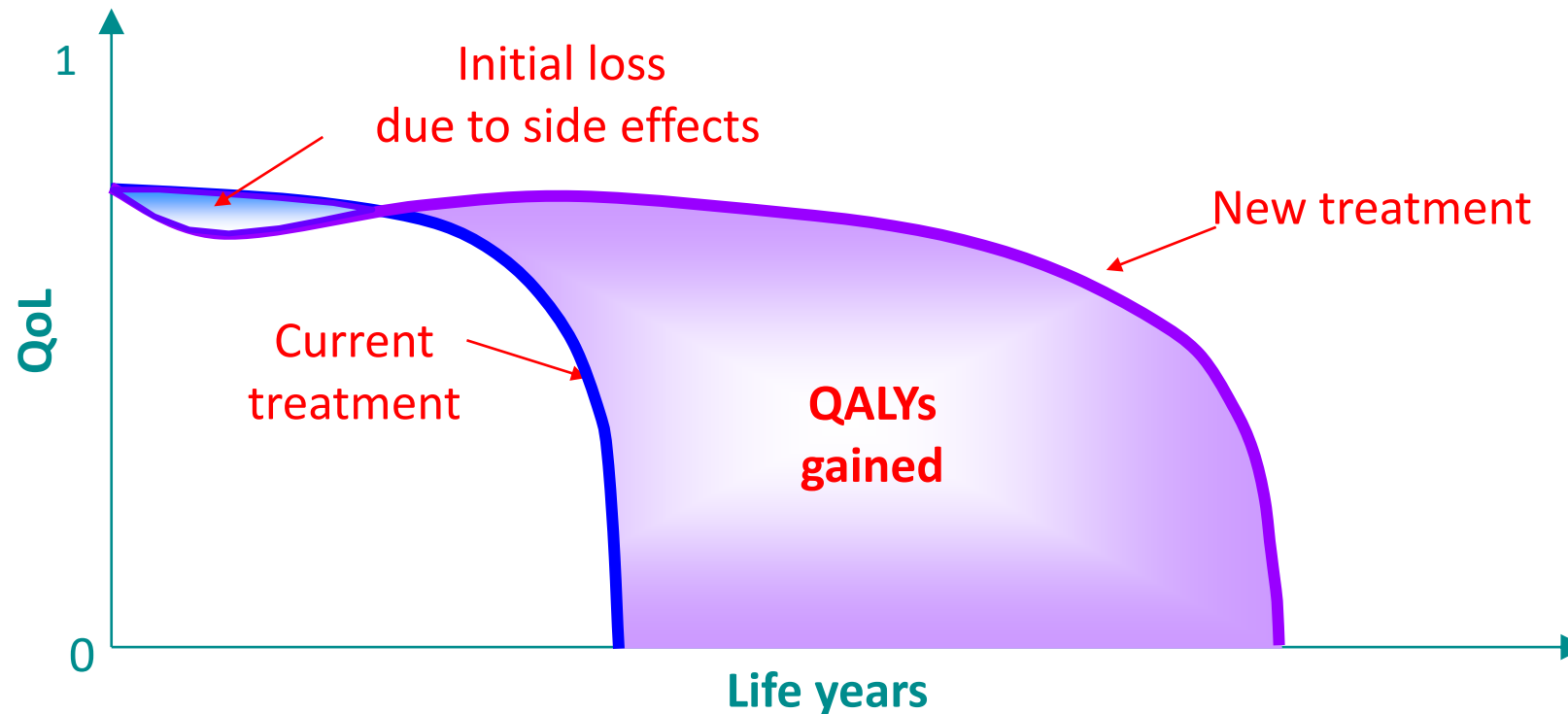
I am moderately anxious or depressed

I am extremely anxious or depressed



QALY profile example

- QALYs combines *quantity* and *quality* of life (QoL) into a single measure of health gain



Converting effectiveness into QALY outcomes

- To generate a QALY, there is a need to **link key clinical data to patient outcomes** so that differences can be expressed as differences in **quality of life** or **survival**
- This is easier for some type of interventions than others
- **Example** – if considering diagnostic test then key clinical data may be diagnostic accuracy (**sensitivity** and **specificity**)
- For the purposes of economic analysis:
 - **improvements in sensitivity** need to be linked to **improvements in health as a result of faster diagnosis** (could be survival and/or quality of life gains)
 - **improvements in specificity** could be linked to **quality of life benefits** from **avoiding unnecessary biopsies** or perhaps even treatment



What costs are considered?

- **NHS & Personal Social Services perspective** is adopted in most UK evaluations meaning that only **direct costs** are included in most models
- Costs that are typically included
 - Costs of medical procedures or investigations
 - Staff costs e.g. GP visit, consultation with specialist
 - Cost of time spent in hospital
 - Medication costs (usually sourced from eMit or the BNF)
- Costs that are **not routinely included**:
 - Productivity losses (due to time off work)
 - Costs incurred by patients or carers
 - Costs incurred by other government departments



Economic models



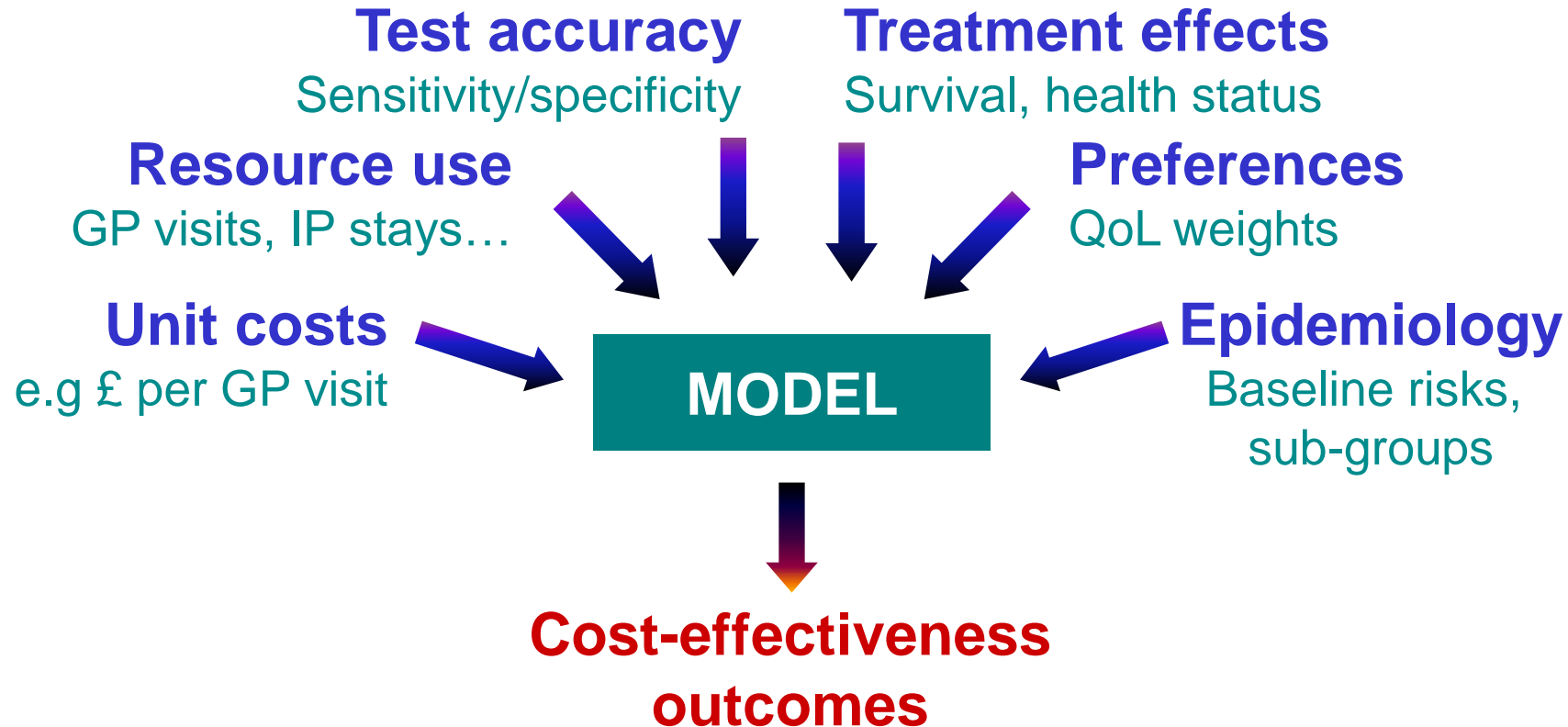
Technoleg Iechyd Cymru
Health Technology Wales



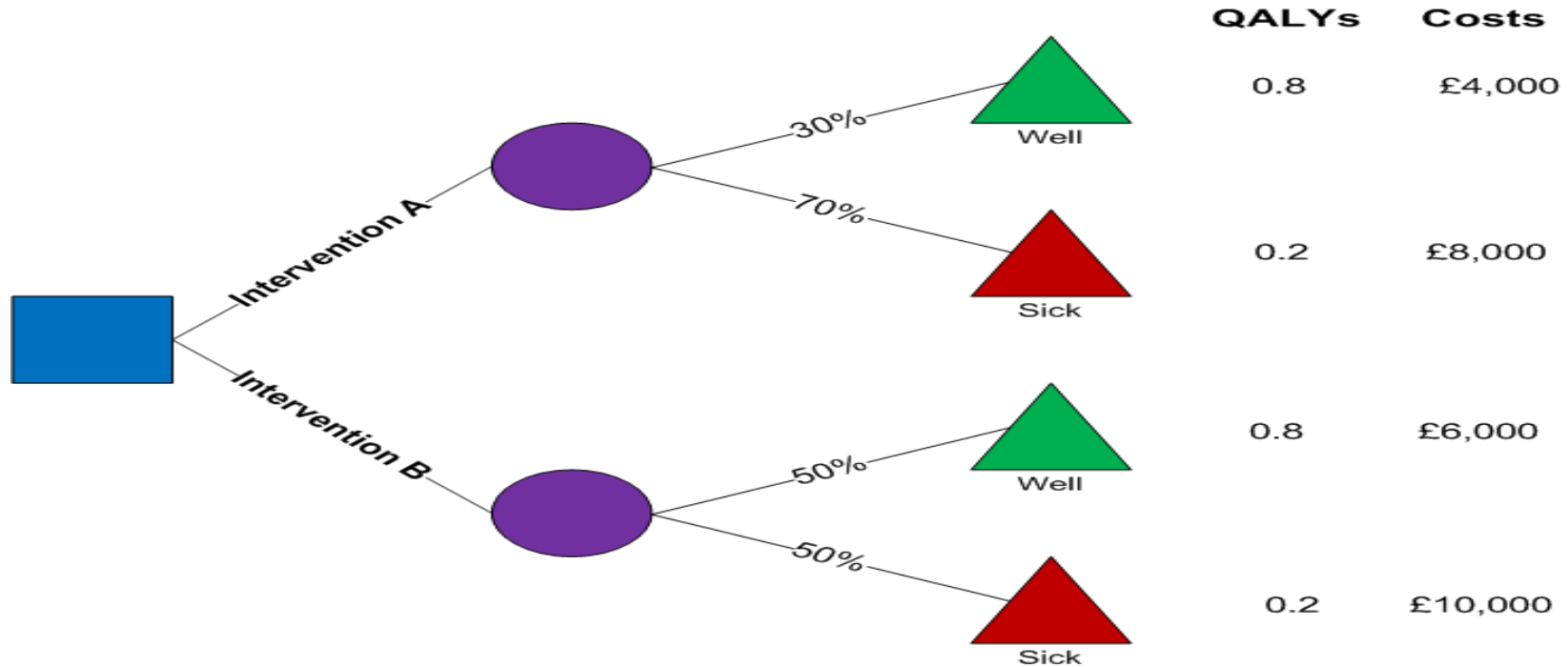
Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

Cost-effectiveness model

Costs and effectiveness are usually estimated using a HE model:



Decision tree model



Outcome	Expected cost	Expected QALYs
Intervention A	£6,800 (30%*£4,000+70%*£8,000)	0.38 (30%*0.8+70%*0.2)
Intervention B	£8,000 (50%*£6,000+50%*£10,000)	0.50 (50%*0.8+50%*0.2)

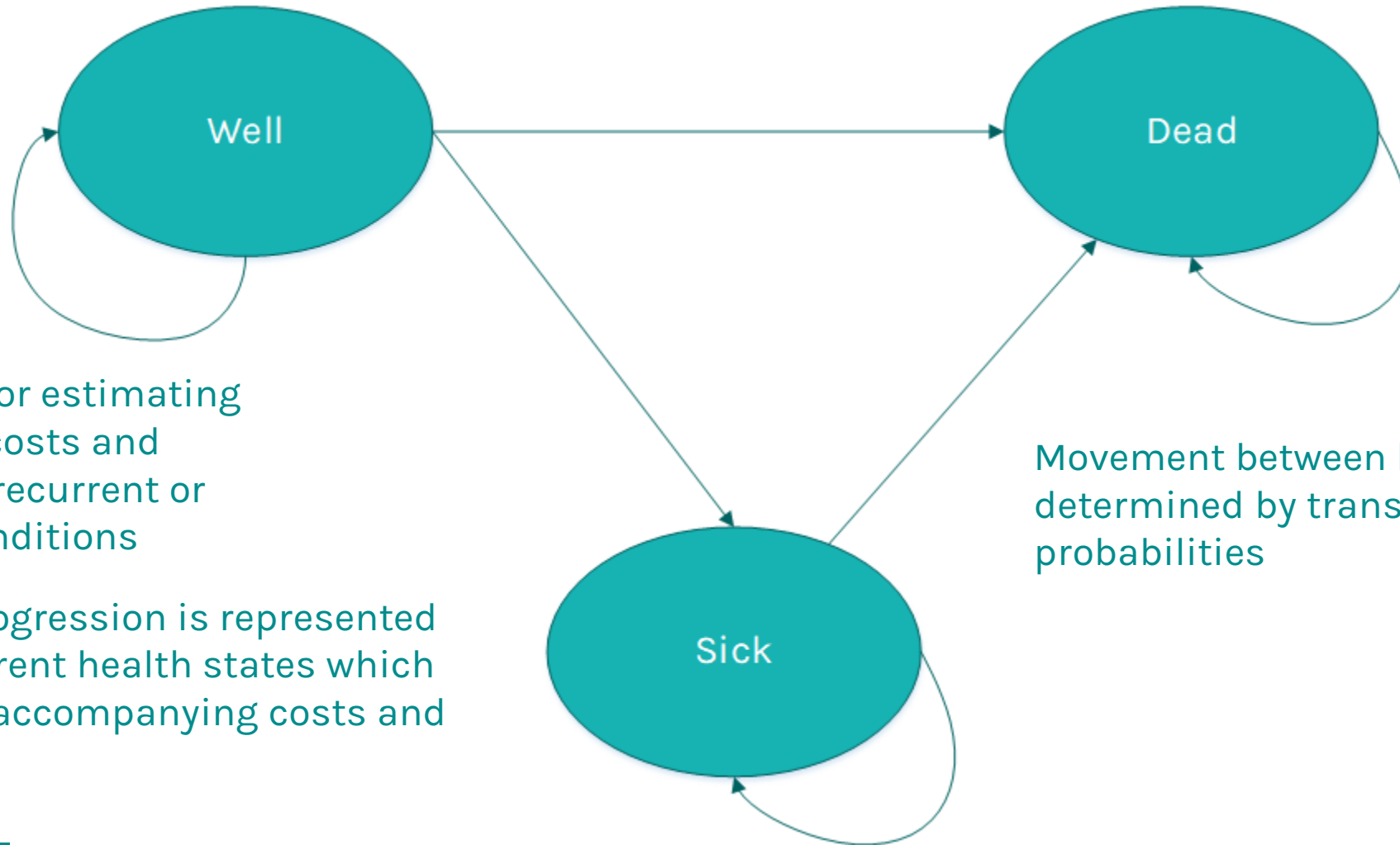


Time horizon

- Decision trees are primarily useful for capturing short-term outcomes
- Economic analysis typically need to capture outcomes over a longer time horizon (often a lifetime horizon)
- Guiding principle is that:
 - Time horizon should cover period over which outcomes could reasonably be expected to differ between intervention and comparator*
- If using a time horizon beyond one year then discounting also needs to be considered, reflecting that *people value future costs and effects less than current costs and effect*
- NICE recommends that future costs and benefits are discounted at a rate of **3.5% per year**



Markov model



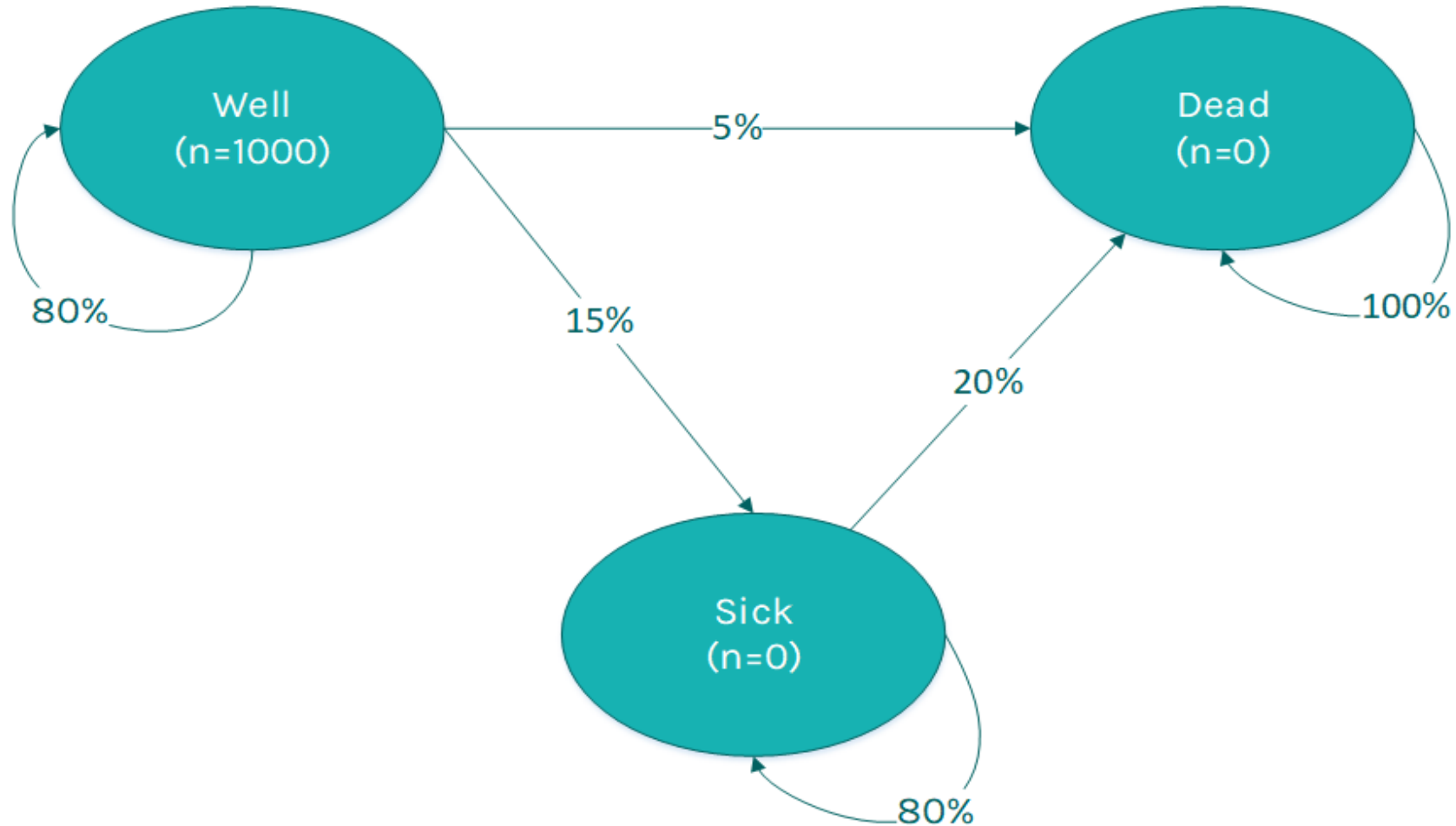
A method for estimating long term costs and effects for recurrent or chronic conditions

Disease progression is represented using different health states which each have accompanying costs and benefits

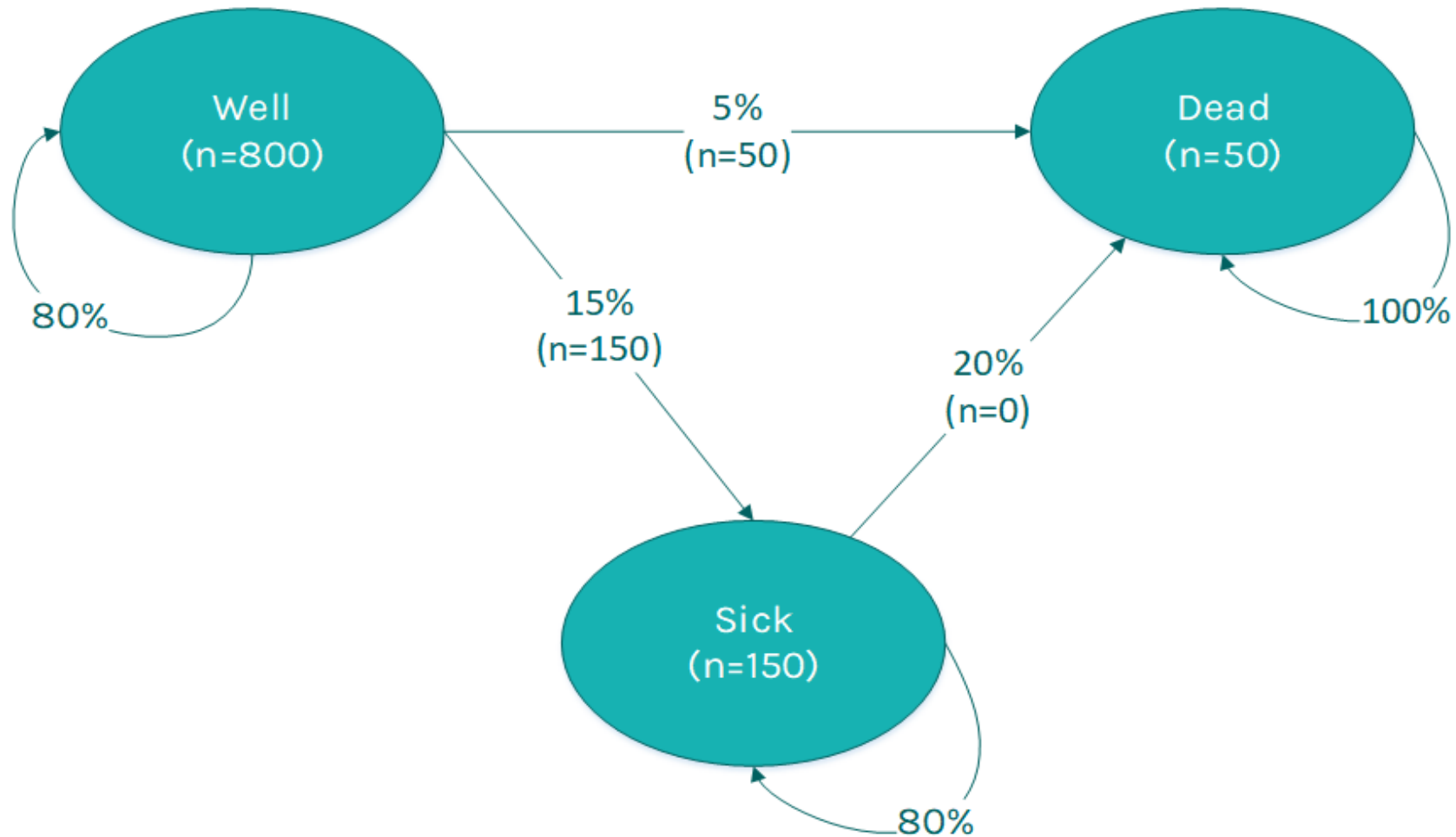
Movement between health states is determined by transition probabilities



Markov model at cycle 1



Markov model at cycle 2



Estimated results from a Markov model

Total costs and benefits accrued over the time horizon are estimated for each strategy

Year	Well	Sick	Dead	Cost	QALYs
1	1000	0	0	£300,000	900
2	800	150	50	£390,000	825
3	640	240	120	£432,000	744
4	512	288	200	£441,600	662
5	410	307	283	£430,080	584
6	328	307	365	£405,504	510
7	262	295	443	£373,555	442
8	210	275	515	£338,166	381
9	168	252	581	£301,990	327
10	134	226	639	£266,758	279
Total				£3,679,653	5,655



Interpreting cost-effectiveness results

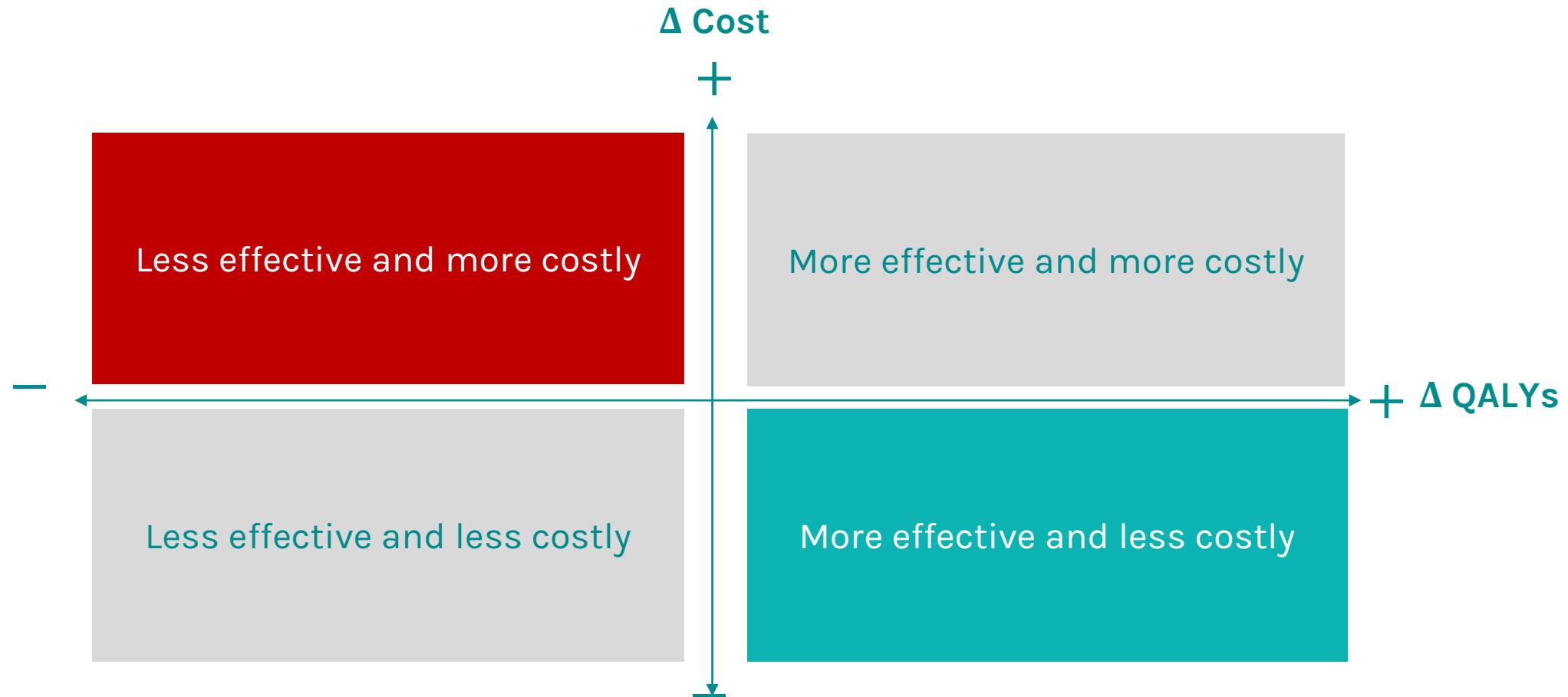


Technoleg Iechyd Cymru
Health Technology Wales



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

Assessing value



Calculating the ICER

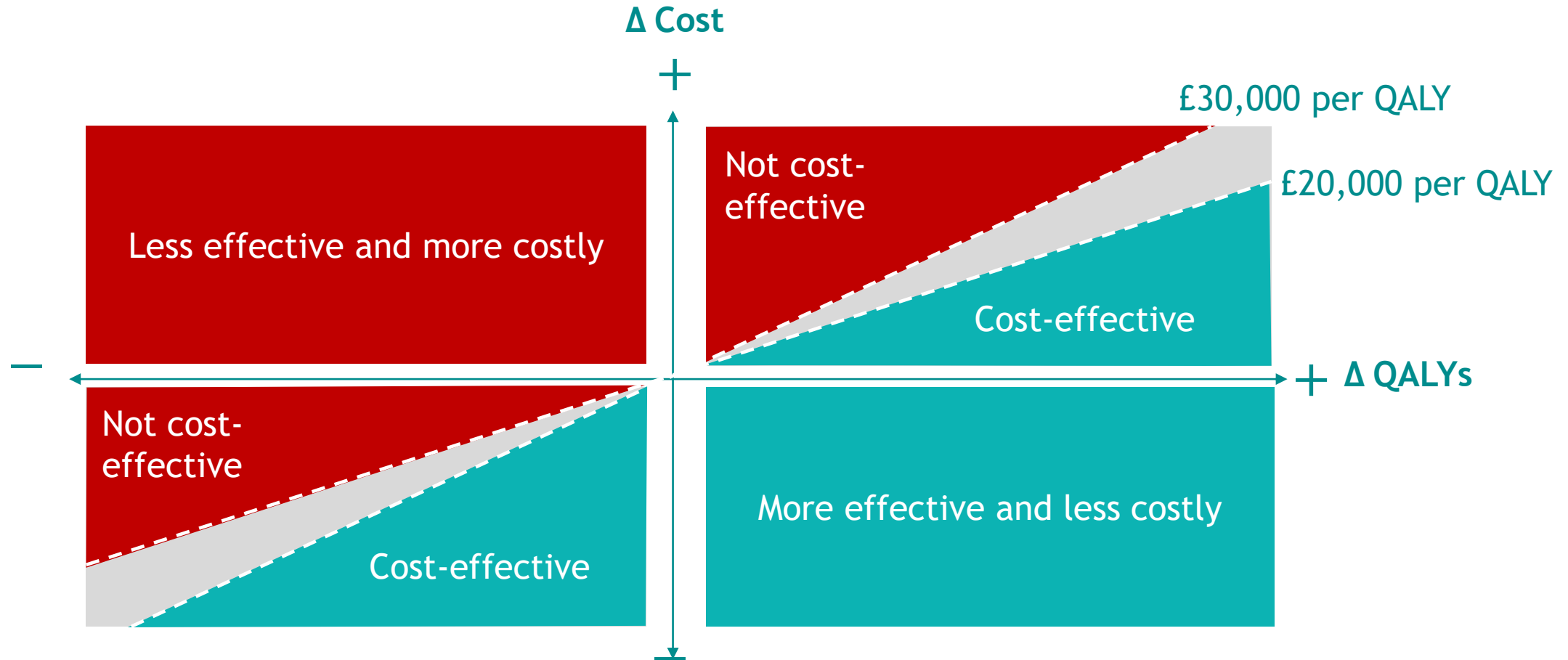
To make decisions about therapies in the grey areas, the incremental cost-effectiveness ratio (**ICER**), calculated as:

$$\text{ICER} = \frac{\Delta \text{ Cost (Cost}_{\text{Intervention A}} - \text{Cost}_{\text{Intervention B}})}{\Delta \text{ QALYs (QALYs}_{\text{Intervention A}} - \text{QALYs}_{\text{Intervention B}})}$$

The ICER is then compared against a “**willingness to pay**” threshold, defined as the amount that the decision maker is willing to pay for one additional QALY.



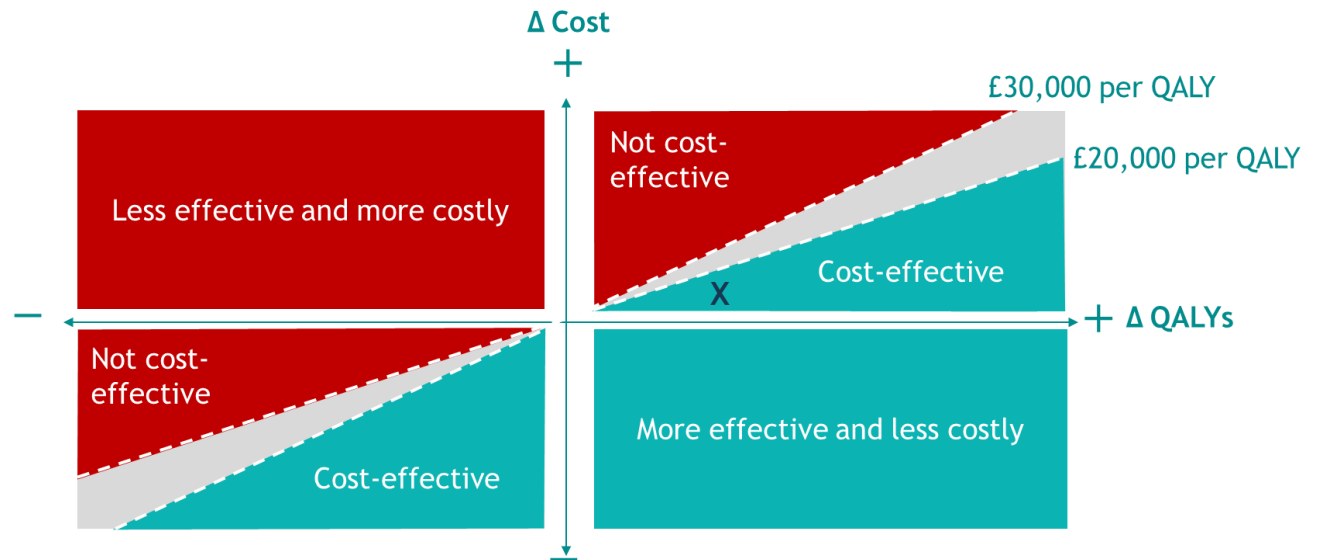
Cost-effectiveness thresholds



Example of cost-effectiveness results

Intervention	Cost	QALYs
Intervention A	£6,800	0.38
Intervention B	£8,000	0.50
Difference	£1,200	0.12
ICER		£10,000

- Intervention B can be considered cost-effective as, in comparison to Intervention A, it provides **one additional QALY at a cost of £10,000**



Sensitivity analysis

- Economic analyses **do not rely on the base case result alone** as the uncertainty around results is a very important consideration
- Uncertainty is explored in economic analyses through sensitivity analysis
- The analysis aims to assess the **impact of uncertainty on the results** of an economic analysis
- This is valuable information to decision makers to consider as it may affect the robustness of the conclusions that can be drawn
- The results may also offer insight into the value of additional research
 - For example, it may show that QoL is a **key driver** of the overall result and that additional research should focus on this outcome



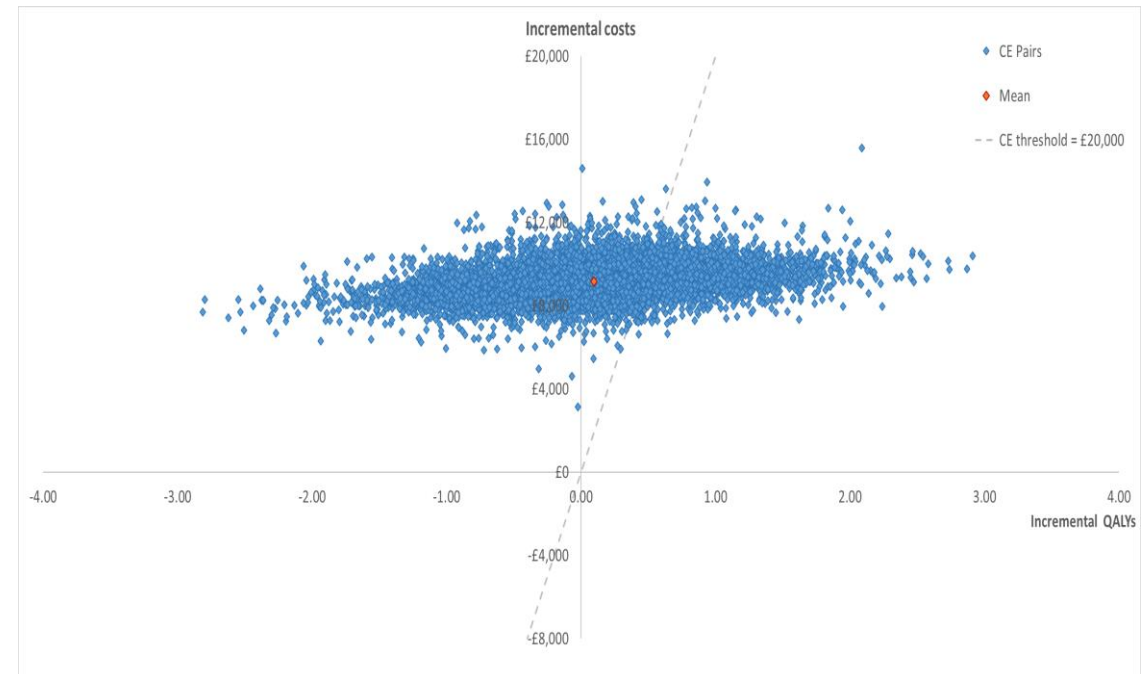
Types of sensitivity analysis

Deterministic sensitivity analysis

- One or more inputs are changed and the new result is recorded
- Often focuses on variables where there is large amount of uncertainty or potential

Probabilistic sensitivity analysis

- Involves assigning distributions to each input to represent uncertainty around its value
- Values are randomly picked from distributions around every input and the analysis is run multiple times
- Allows for an overall probability of cost-effectiveness to be estimated



Diolch am ymuno â ni heddiw. Thank you for joining us today.

Edrychwch ar raglen yr Wythnos Gwerth mewn Iechyd i ymuno â sesiynau eraill trwy weddill yr wythnos

www.lshubwales.com/cy/wythnosgwerthmewniechyd

Ymunwch â'r sgwrs ar-lein #GmIWales

Check out the Value in Health Week programme to join other sessions throughout the rest of the week

www.lshubwales.com/valueinhealthweek

Join the conversation online #ViHWales

