



HEALTH ECONOMICS/PHARMACOECONOMICS FOR NON-HEALTH ECONOMISTS

INTRODUCTION

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Objectives

- ☐ What Health Economics (HE)
- ☐ The link between clinical trials and HE
- ☐ The key questions need to be addressed for HE with payers
- ☐ How HE studies help to provide “the evidence” to address the questions of the payers
- ☐ The difference between cost-saving and cost-effective

Contents

❑ Introduction and definitions

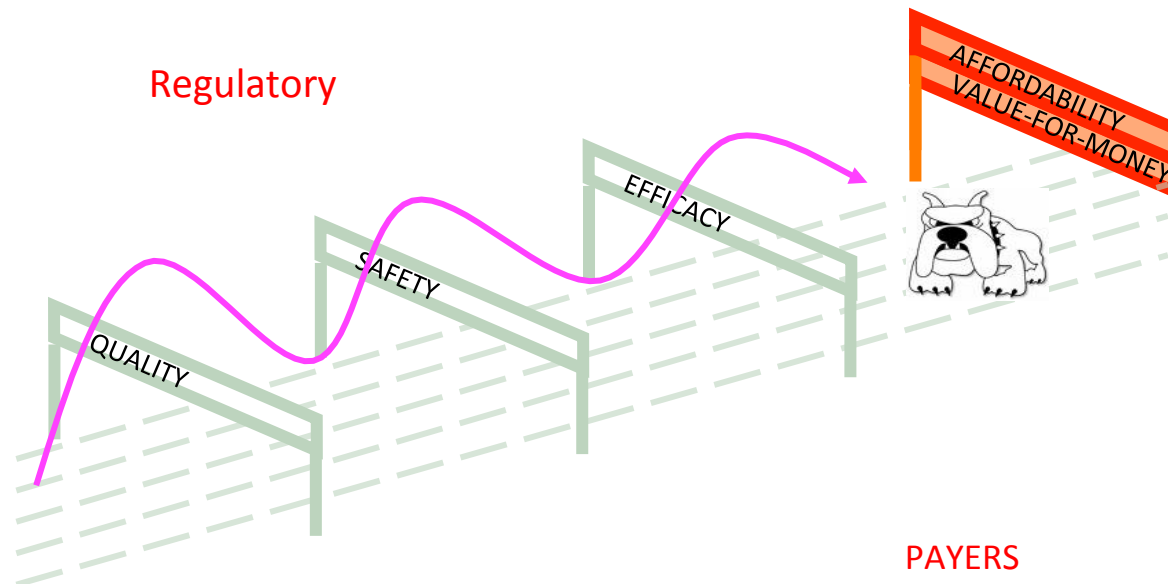
- How to position HE
- What is value and how to quantify?

❑ The 5 key questions for HE assessment

- What is the disease burden under study
 - ✓ Link between clinical and economic burden
- What is **the expected impact** on cost & health outcomes of the new intervention?
- Is the new intervention **cost-effective**?
- What is its **competitive advantage** today and in the near future?
- Is the new intervention short term **affordable**?

❑ Conclusion

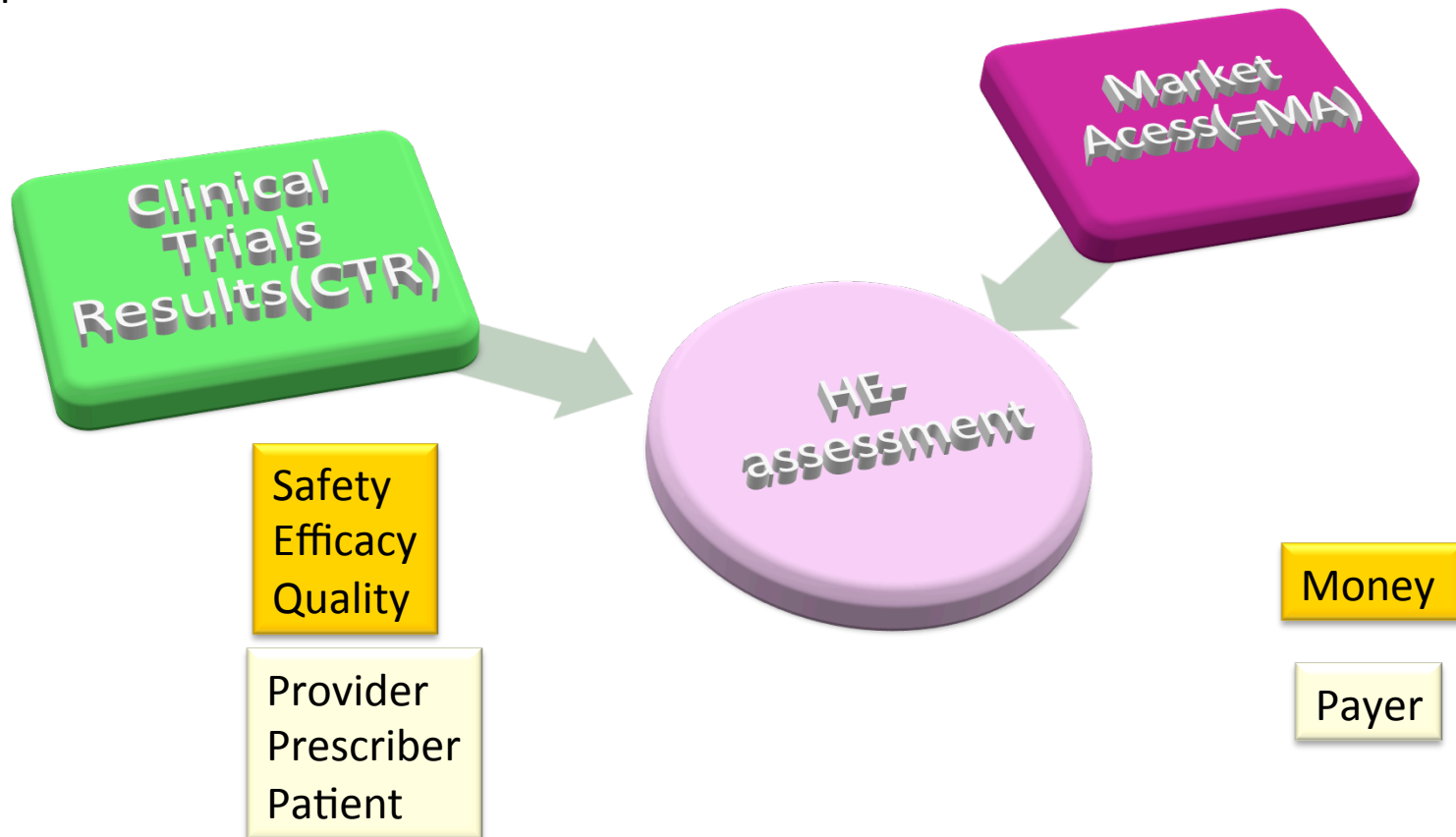
Introduction



Allocate the health care budgets to those interventions that offer the most health gain per unit of money → HE evaluation helps answer this question

How to position HE ?

- Economic and efficiency in Health become more important when budgets for health care are limited
- Less budget, more options, more demand: choice must be clear and explicit



The 5 key questions for HE-assessment?

To define the value statement of the new intervention

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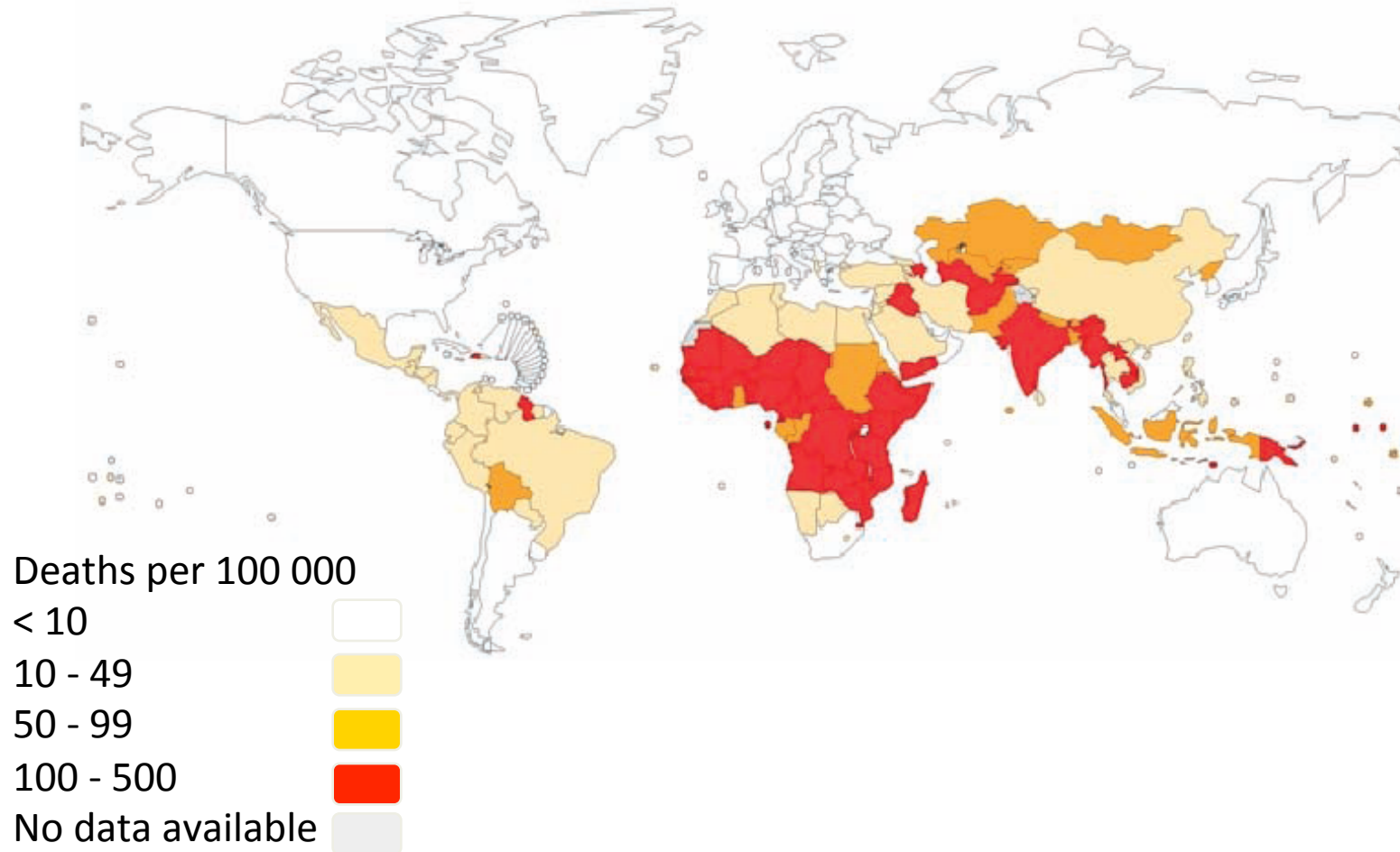
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The disease burden

- Frequencies per time unit and geographic entity:
 - Incidence, prevalence, mortality, morbidity
- Quality of life (QoL) : impact of disease also expressed in QALYs
- Cost of Illness:
 - Direct medical costs
 - Indirect non-medical cost

	Direct	Indirect
Medical	Cost related to the treatment of the disease from payers perspectives	the up-coming expenditure on health care
Non medical	Expenses not related to health care, but are linked to disease (travel expenses, special diets, ...)	Loss of productivity due to absenteeism or premature death

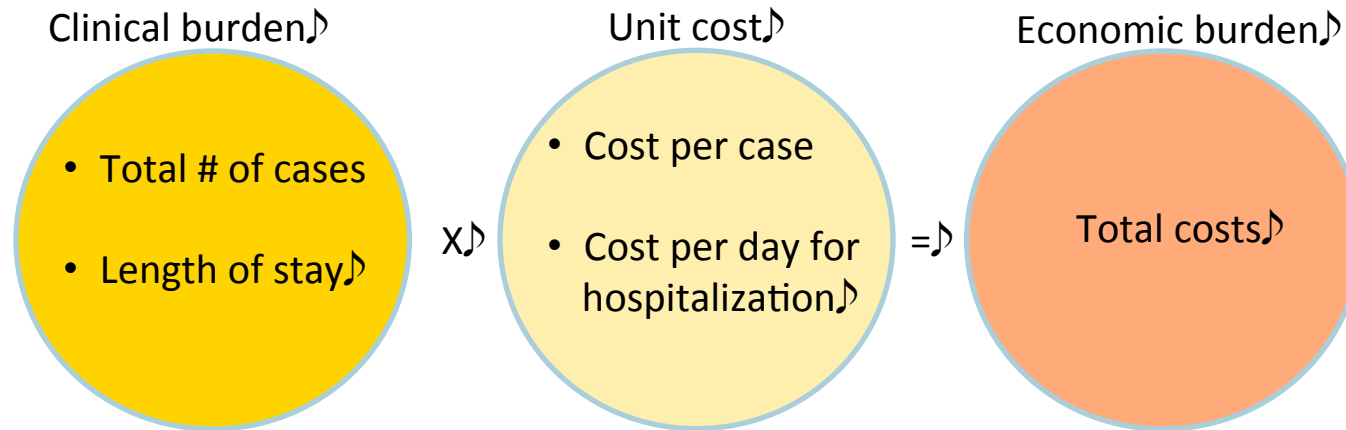
Example: Rotavirus mortality rate per 100 000 children <5 years of age, by country, in 2004



This publication is available on the Internet at:

www.who.int/vaccines-documents/; http://whqlibdoc.who.int/hq/2009/WHO_IVB_09.09_eng.pdf

Link between clinical and economic burden



Estimates of Spn and NTHi diseases annual costs in Italy from the healthcare payer's perspective

Diseases	Annual number	Unit cost (€ 2009)	Total costs
Meningitis	350	6.846	€ 2.396.100
Bacteraemia	4.500	3.605	€ 16.222.500
Pneumonia			
Inpatient	25.000	2.429	€ 60.725.000
Outpatient	50.000	163	€ 8.150.000
Otitis media			
Inpatient	9.536	1.112	€ 10.604.032
Outpatient	1.500.000	63	€ 94.500.000
Total cost			€ 192.597.632

Cost and Perspective

Product cost	Treatment cost	Transportation cost	Loss of productivity
100 €	100 €	10 €	50 €
<i>70% reimbursement for the product cost and treatment cost</i>			

PERSPECTIVES	Public health care payer	70 €	70 €	0 €	0 €
	Patient	30 €	30 €	10 €	0 €
	Societal	100 €	100 €	10 €	50 €

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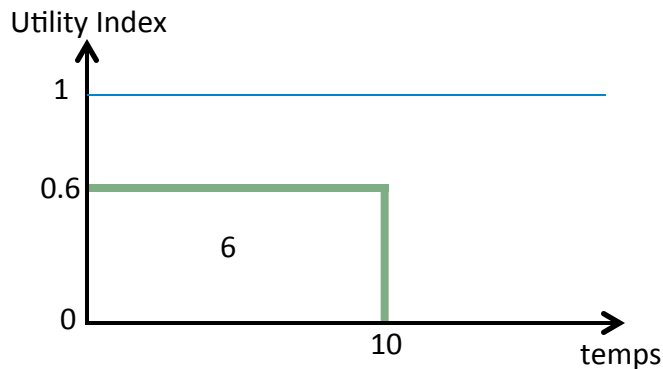
How to measure the benefits of a new treatment ?



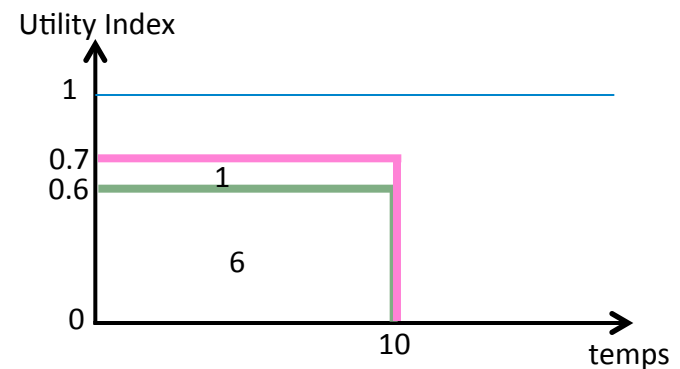
Can be measured, for instance, in Life Years Saved (LYS) or Quality Adjusted Life Years (QALY)

QALY: Quality adjusted life year

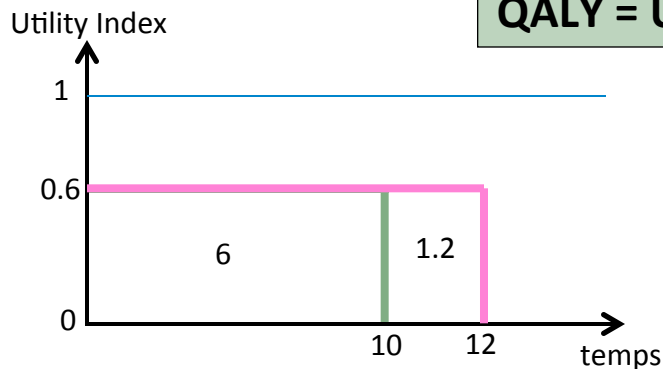
Health is not only about life and death, but also about **Quality of the life lived**
Quality is expressed as **Value Index** : 0 (worst) 1 (best condition)



$$0.6 \times 10 = 6 \text{ QALY}$$

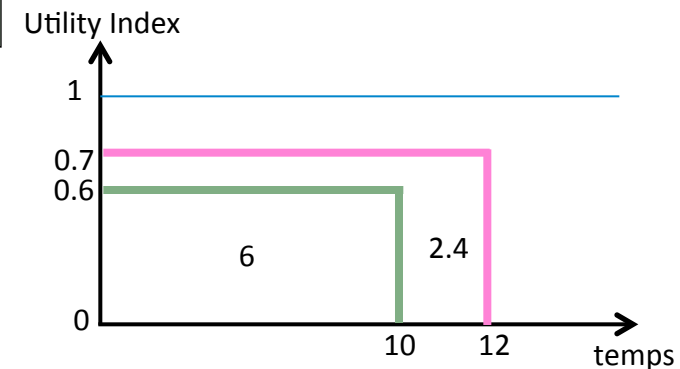


$$(0.7 \times 10) - (0.6 \times 10) = 1 \text{ QALY}$$



$$(0.6 \times 12) - (0.6 \times 10) = 1.2 \text{ QALY}$$

QALY = Utility x Life year

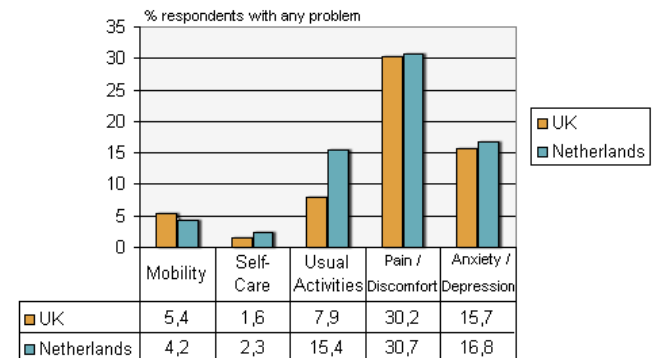


$$(0.7 \times 12) - (0.6 \times 10) = 2.4 \text{ QALY}$$

How to measure the utility index

- ❑ The term "utility" correspond to the health state of a person at a fixed time
- ❑ Economic theory: the choice made by a person between two or more products is determined by her/his budget, the price and the value she/he feels when making the choice
- ❑ Frequent method: EuroQol 5D (EQ-5D)

- ✓ Mobility
- ✓ Autonomy /self-care
- ✓ Usual activities
- ✓ Pain/discomfort
- ✓ Anxiety/depression



The transformation from the EQ-5D to utility index is country specific

For more info: <http://www.euroqol.org/eq-5d/what-is-eq-5d.html>

- ❑ Method SF36: 36 questions (physical component score and mental component score)
- ❑ Other methods...

Example : Impact on the cost

Birth cohort: 198,733

	No treatment (A)	Treatment (B)	Difference (B-A)
Costs (USD)			
treatment cost	0	82,000,000	82,000,000
Disease 1 cost	97,000	50,000	-47,000
Disease 2 cost	1,000,000	600,000	-400,000
Disease 3 cost	545,000,000	540,000,000	-5,000,000
Disease 4 cost	16,000,000	15,000,000	-1,000,000
Total direct costs	562,097,000	637,650,000	75,553,000

The treatment is projected to reduce huge economic disease burden by preventing the diseases

Conclusion

- ❑ Direct Impact on
 - ✓ Clinical burden
 - ✓ Economic burden
 - ✓ QoL/QALY

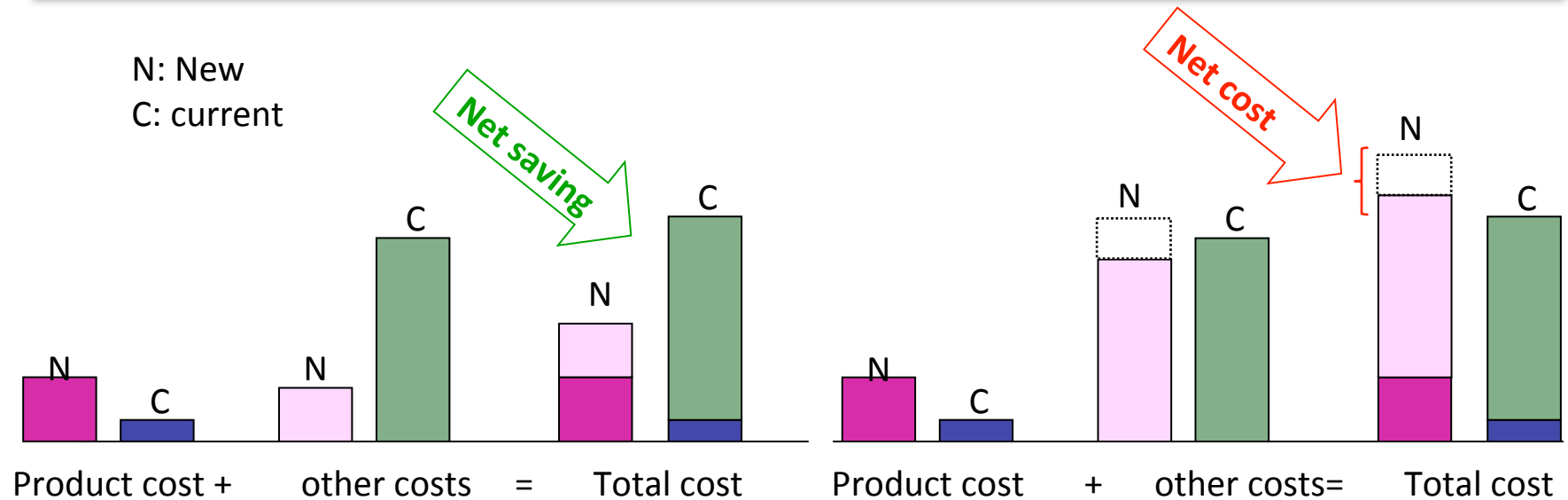
- ❑ Indirect Impact on
 - ✓ Herd Immunity

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When is HE analysis necessary ?



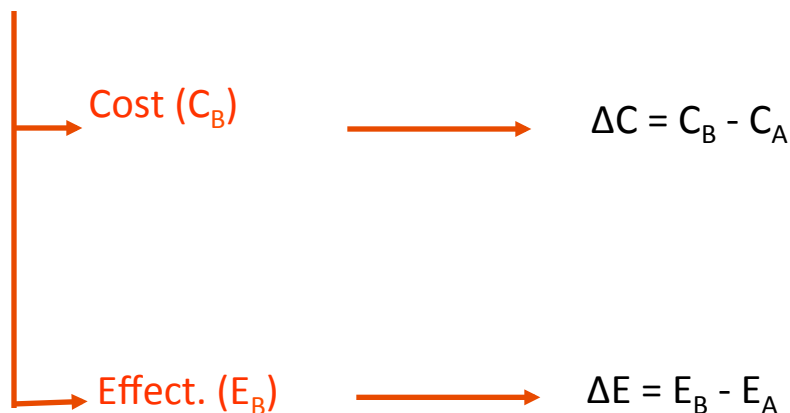
The new product/treatment is dominant: **cost saving** (Lower cost/higher QALYs)

Economic assessment
Health gain
Analyse the ratio cost/effectiveness
If the new product/treatment is **cost-effective** (Higher cost/higher QALYs)

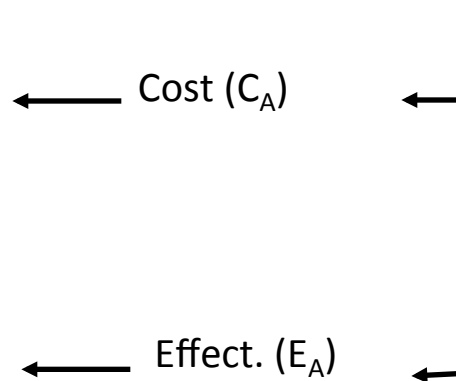
The traditional approach

Comparative analysis of alternative treatments in terms of **BOTH** their **COST** and **HEALTH CONSEQUENCES**

Treatment B (New)



Treatment A (Current)



Incremental Cost Effectiveness Ratio (ICER)

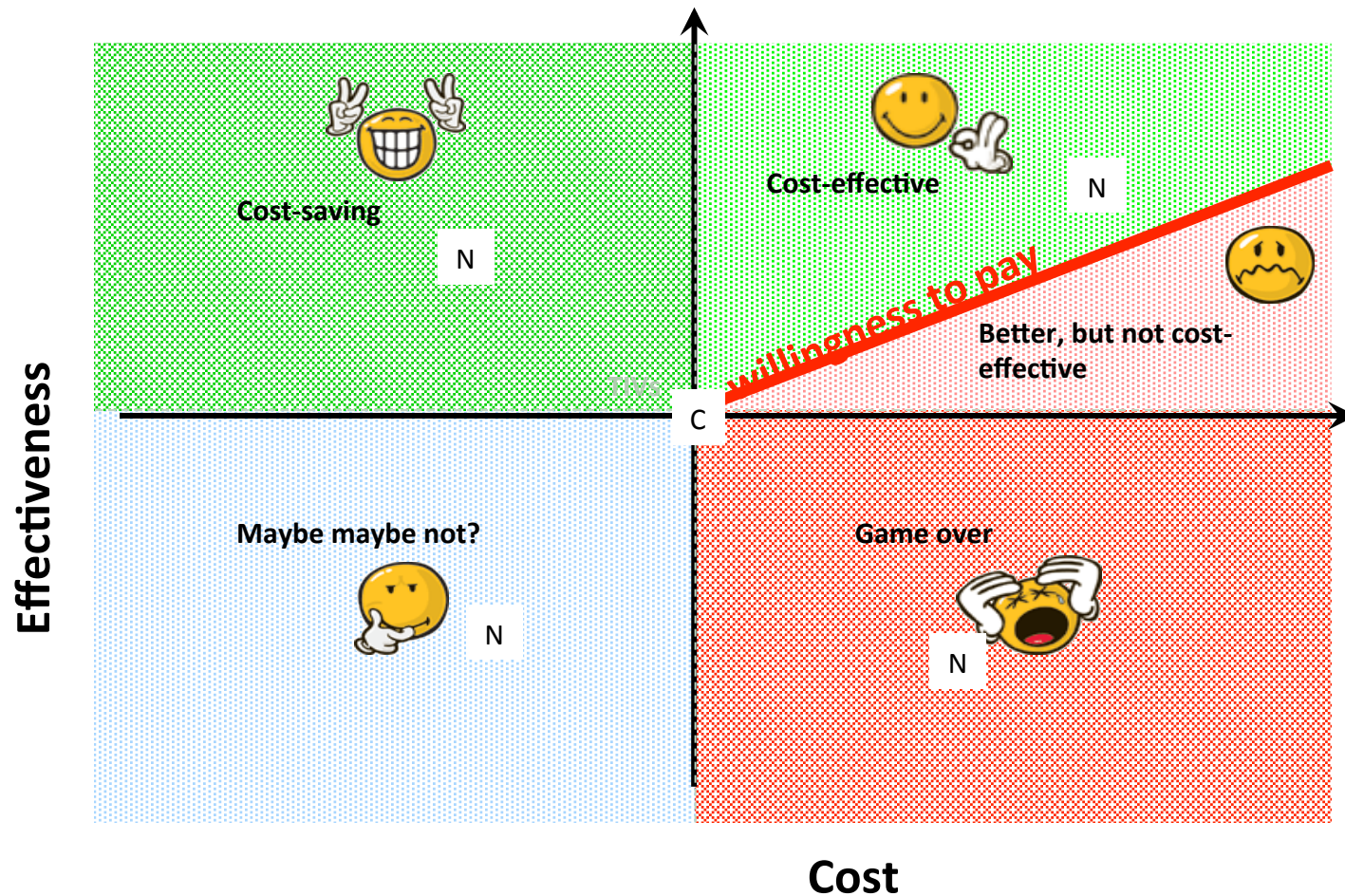
$$\text{ICER} = \frac{\Delta C}{\Delta E}$$

$$\text{ICER} = \frac{\Delta C}{\text{QALY}}$$

$$\frac{\text{Cost}}{\text{QALY gained}}$$

Threshold value

Positioning a new treatment (N) with the current treatment (C)



The threshold Value

Country	Currency	Threshold local currency	Threshold in Euro (Aug 2007)
USA	USD	50000-100000	36600-73200
UK	GBP	30000	44500
Sweden	SEK	500000	54000
The Netherlands	EURO	20000	20000
New Zealand	NDZ	20000	11200

Ref: Jolain B. 2006

Threshold Value WHO:

- Cost/QALY < 1 GDP per capita = very cost-effective
- Cost/QALY between 1 and 3 GDP/capita = cost-effective
- Cost/QALY > 3 GDP per capita = not cost-effective

According to the International Monetary Fund (2010)

GDP per capita:

Belgium= 42 630 USD

UK = 36 120 USD

Clinical trials vs health economics assessment

Clinical Trial:

- ✓ Efficacy
- ✓ Time horizon: short time effect
- ✓ Multi-country trials
- ✓ Purpose = Authorization
- ✓ Strict protocol instructions
- ✓ Protocol induced resource use
- ✓ Protocol induced findings

Health Economics Assessment

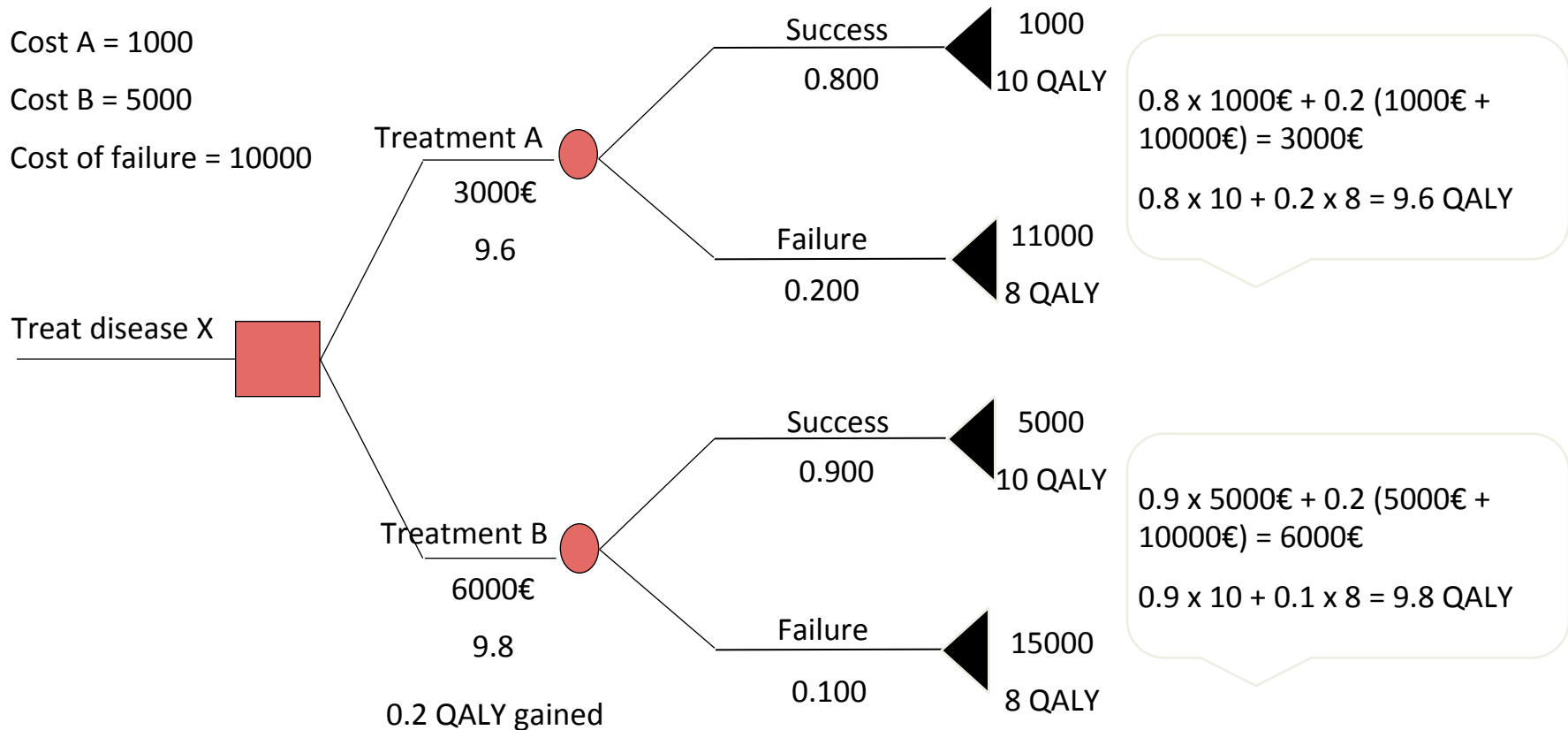
- ✓ Effectiveness
- ✓ Time horizon: long enough to capture all cost and effect associated to the treatment
- ✓ Country specific assessment
- ✓ Purpose = reimbursement
- ✓ “Do what you normally do”
- ✓ Real resource use
- ✓ Real clinical findings

Models

- ❑ Mathematical models are required to estimate the total impact of the product **over time** on health benefit (individual and societal levels)
- ❑ The results of such modeling exercises are especially important **for decision makers at product launch**, when only data on efficacy and safety from short-term, randomised clinical trials are available
- ❑ Modelling uses efficacy data to estimate an intervention's effectiveness in situations closer to reality by integrating epidemiological and local disease-management data
- ❑ Different modelling approaches exist to evaluate the total impact of new interventions

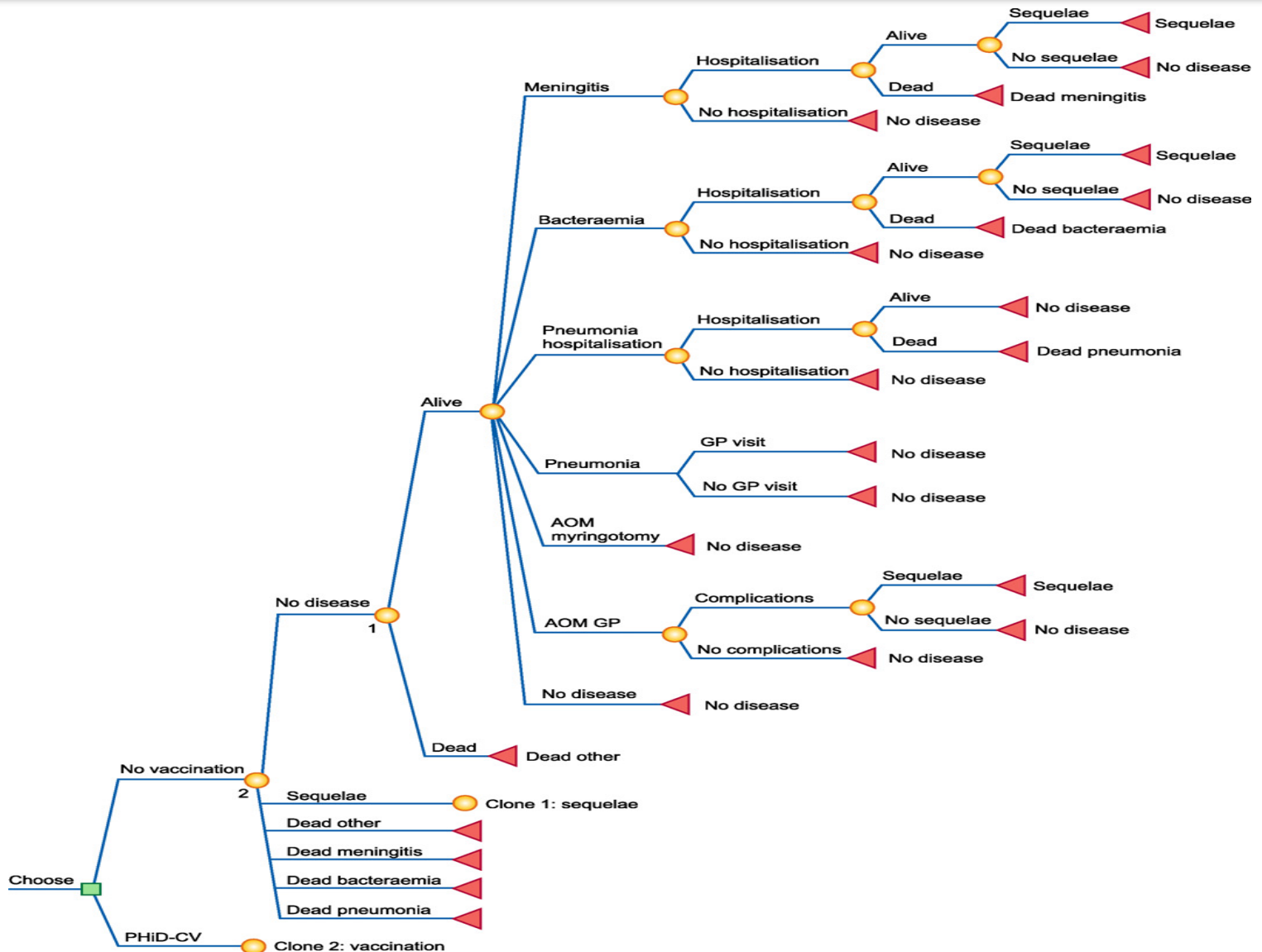
We need models to assess the long term costs and QALYs

Medical decision tree



$$\text{ICER} = (6000\text{€} - 3000\text{€}) / (9.8 - 9.6) = 15000\text{€/QALY gained}$$

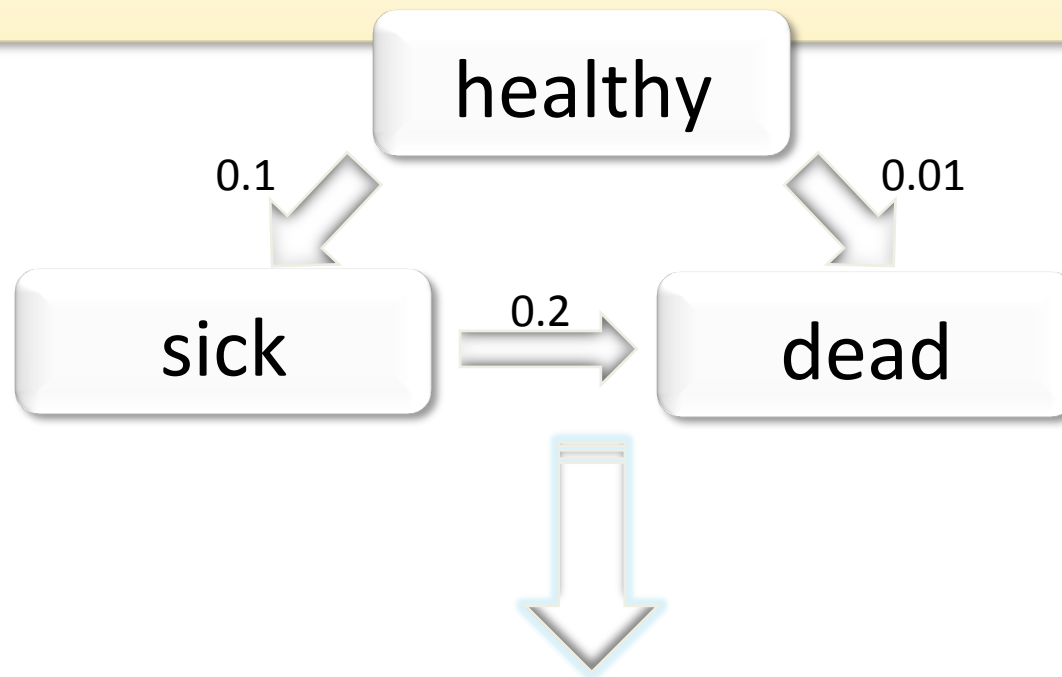
Medical decision tree



Markov Models

- ❑ Model diseases in which risks are continuous over time and timing of events is important
- ❑ Different defined health states for the patients
- ❑ “transition probability” between the states
- ❑ Periods (cycles) during which the transition probability will take place

Simple Markov model presentation



Transition probabilities
change over time

	Upon start	After 1 year	After 2 years	After 3 years
healthy	1000	890	792	705
sick	0	100	169	214
dead	0	10	39	81
total	1000	1000	1000	1000

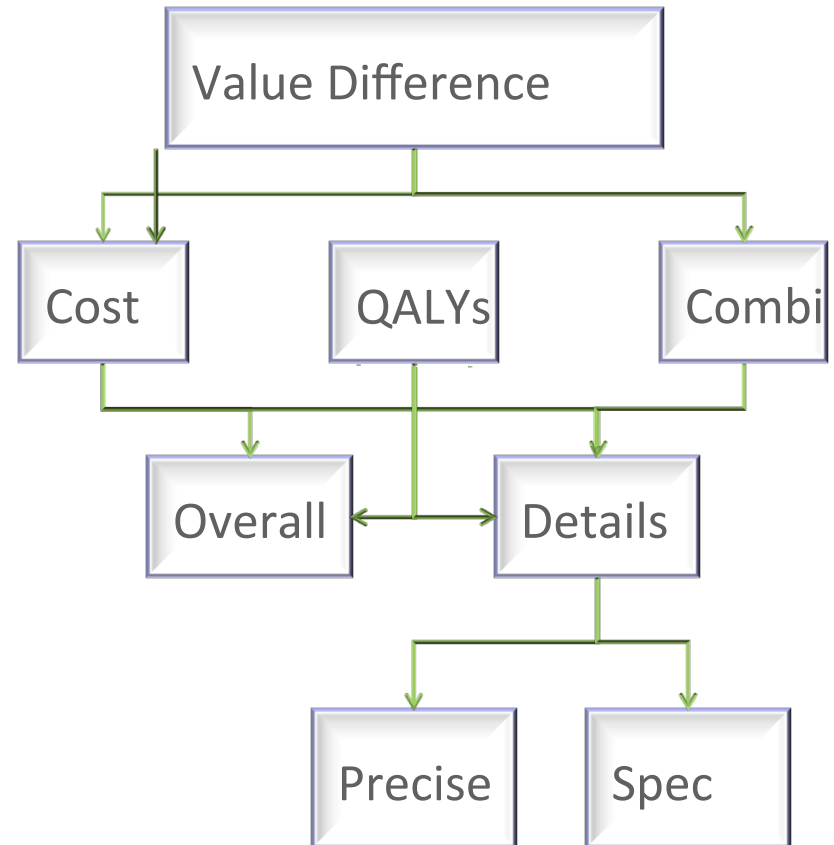
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Competitive environment: find the difference

- ❑ Difference in Value:
 - ✓ or in cost
 - ✓ or in QALYs
 - ✓ or combined
- ❑ Value can be measured at different levels:
 - ✓ overall
 - ✓ in the details
- ❑ If overall with no difference in side-effects: easy winner
- ❑ In the details only due to Innovation (2 versus 3 doses; oral versus IM; less side-effects) be precise and specific
- ❑ Cost difference can be a price difference only !



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Affordability or Budget Impact Analysis

Even if a new healthcare intervention is cost-effective, **can it be afforded?**



Who will pay what, when, how from which budget?



Incremental cost (= numerator of ICER) for eligible population at different time points provides estimate of budget impact over time

Total budget impact with and without vaccination

