THE PRICE OF ONCOLOGY: UK PERSPECTIVE

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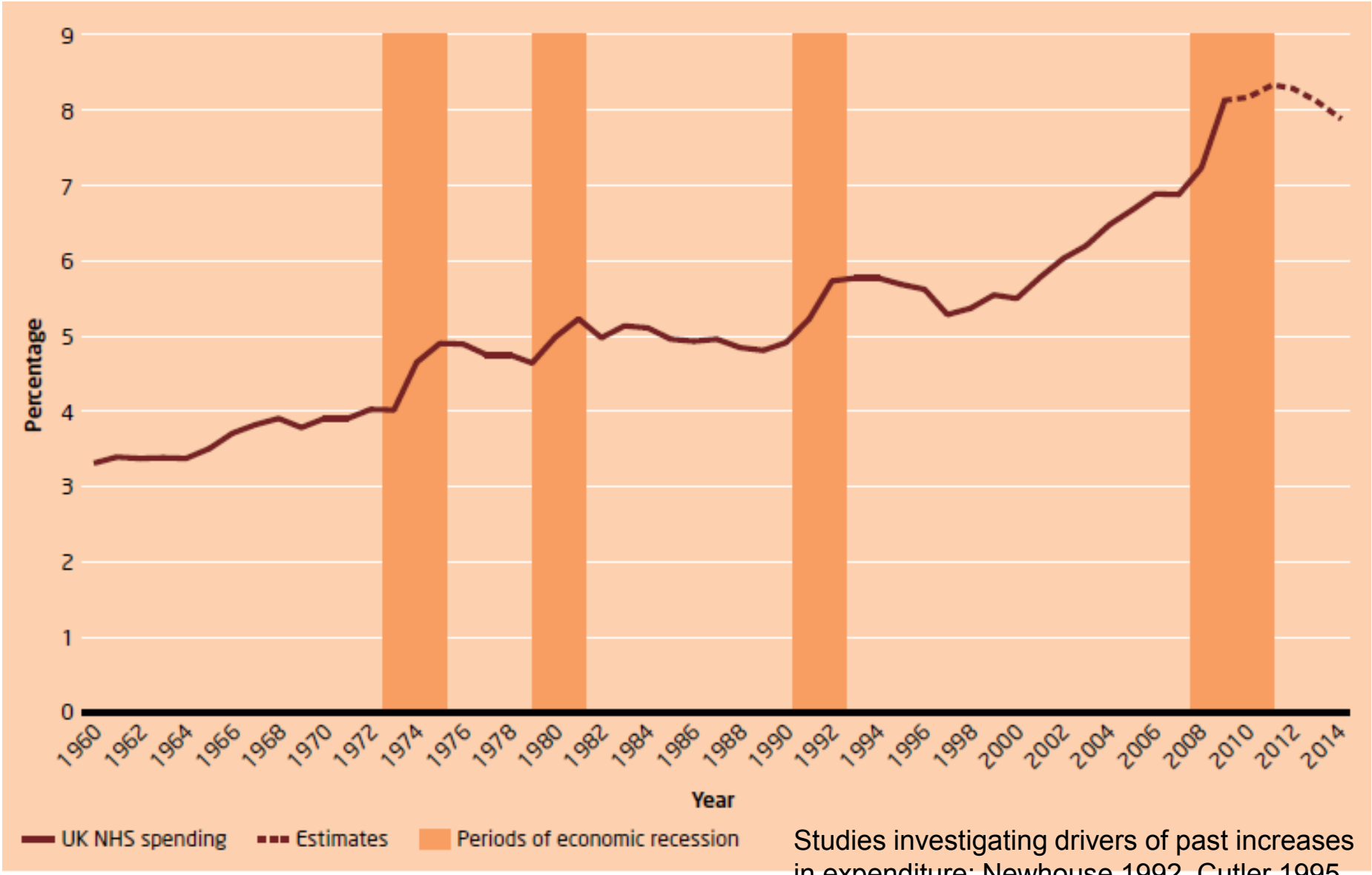
Total UK health expenditure

- Total UK health expenditure of **£180 billion** in 2014.
- This is **9.8%** of UK Gross Domestic Product (GDP).
  - Includes some elements of social care for health needs
- 80% of expenditure is public (NHS, local authority) and 20% is private (out of pocket, health insurance)

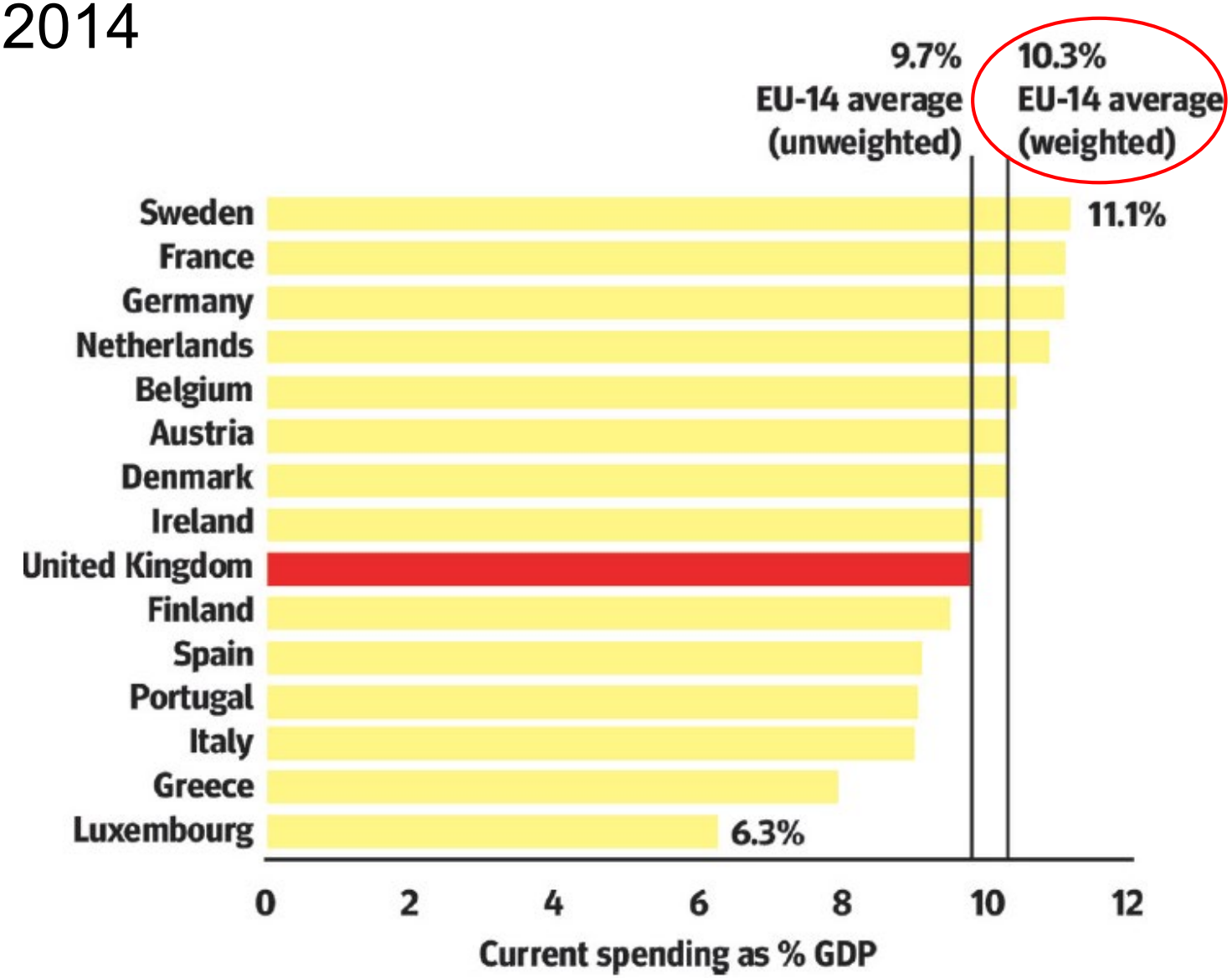
NHS spending as a percentage of GDP 1960-2014



Source: Appleby, King's Fund, 2013

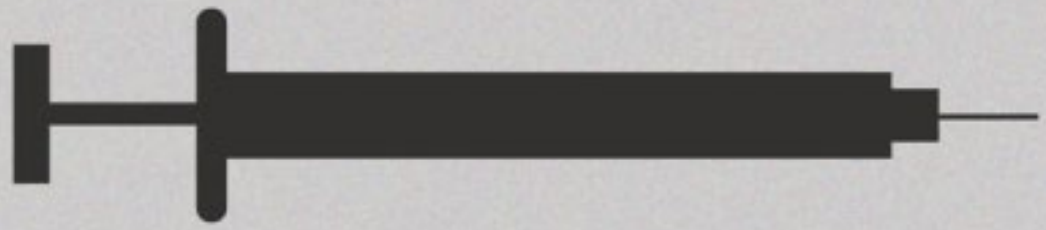
Studies investigating drivers of past increases in expenditure: Newhouse 1992, Cutler 1995 and Smith et al 2009

UK spending compared to European neighbours? 2014



Source: Appleby, BMJ, 2017

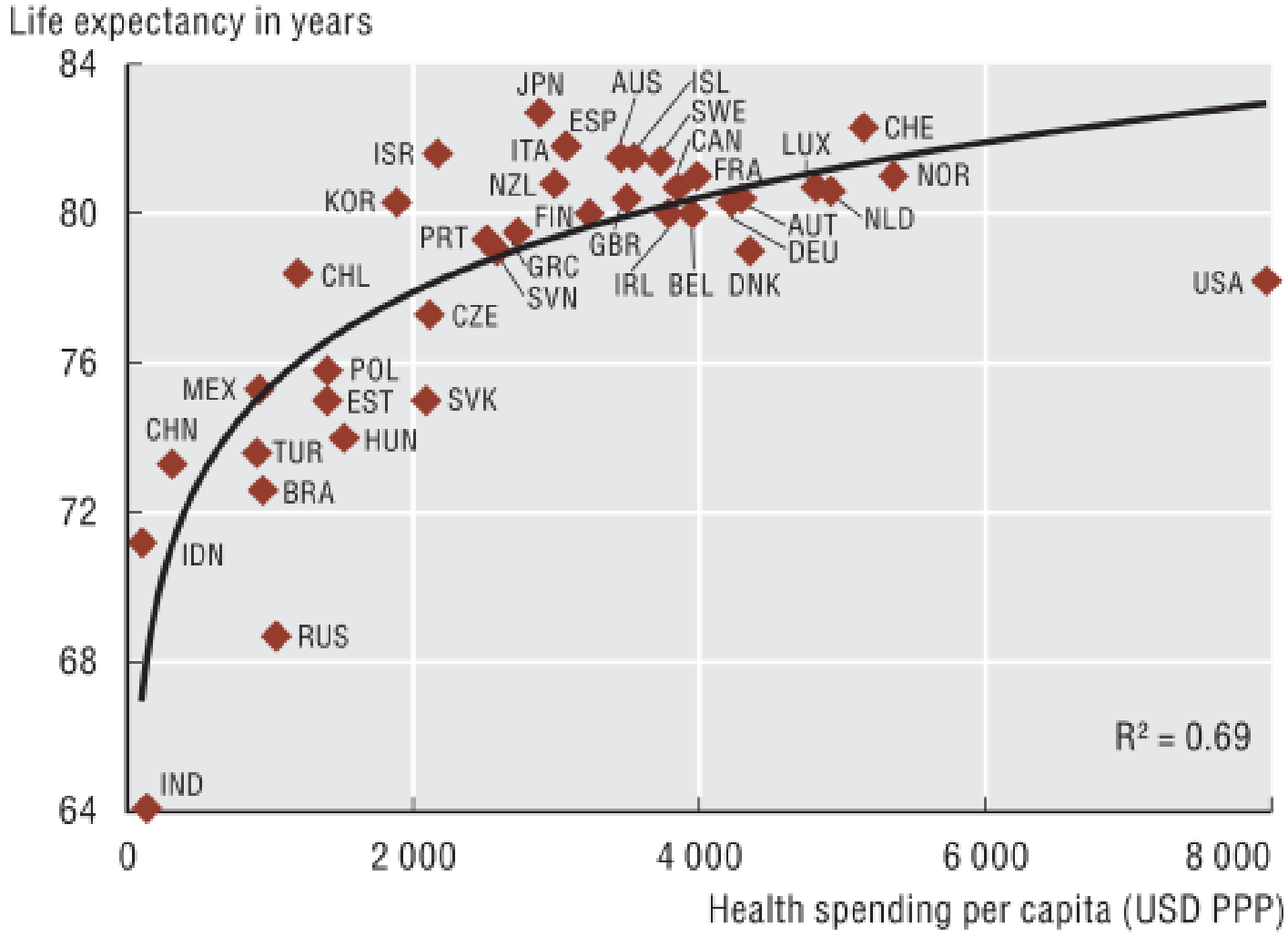
TOTAL NATIONAL HEALTH EXPENDITURES



USD 2.6 TRILLION

=17.9 percent of US GDP

1.1.3 Life expectancy at birth and health spending per capita, 2009 (or nearest year)



Source: OECD Health Data 2011; World Bank and national sources for non-OECD countries.

Why do we need to choose?

- Resources are finite
- We choose how to allocate our resources to best meet our objectives
- Health benefit may be missed if you choose one intervention over another

- Scarcity
- Utility
- Opportunity cost

Acceptable opportunity cost?

- Health economics
  - Measuring opportunity cost (or health benefit missed of one choice over another) in healthcare (NOT money!)
  - Valuing the benefits of healthcare
  - Cost-effectiveness analysis
    - Compares the costs and benefits of alternative courses of action
  - Cost-effectiveness threshold
    - Willingness to pay threshold
  - Health economists don't set the threshold!

Measuring health

- Length of life (= Life years)
- Quality of life (QoL weight [utility])
  - 1 = full health
  - 0 = death

QALY calculation

QALY: Quality-adjusted life-year

QALYs = LYs x QoL weight

e.g.

10 LYs

QoL weight = 0.8

10 x 0.8 = 8 QALYs

Measurement of cost-effectiveness

- **ICER** (Incremental Cost-effectiveness Ratio)
  - new intervention vs standard care

Additional costs / Additional health benefit

- Costs (£ / ¬ / $)
  - short term
  - long term
- Length of life
- Quality of life

→ **QALYs**

Some ICERs

- **Cost per QALY less than £3,000**
  - Neurosurgery for benign brain tumours
  - Laser treatment for diabetic retinopathy
  - Folic acid fortification of cereal grain products
- **Cost per QALY £3,000 to £30,000**
  - CABG for left main vessel disease
  - Neonatal ITU for very low birth weight
  - Haemodialysis
- **Cost per QALY > £30,000**
  - Anticholinesterases in mild AD
  - New drugs for Renal Cell Cancer
- **More harm than good**
  - PSA Screening?

NICE National Institute for Health and Care Excellence

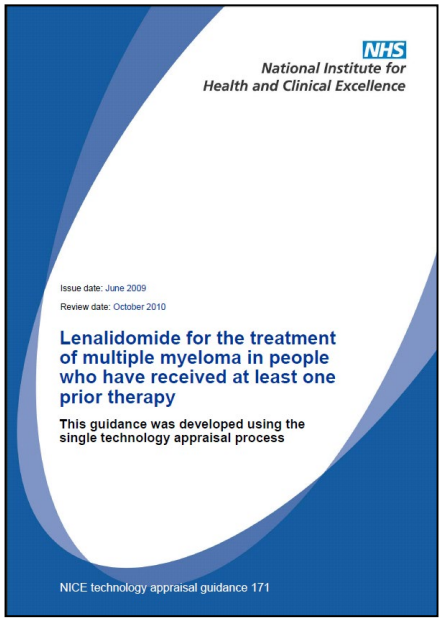
- Set up in 1999
- Objective to end the “postcode lottery”
- Reduce inequality (inequity?)

NICE Technology appraisal

- Provide guidance on selected health technologies
  - Pharmaceuticals
  - Medical devices

- Considers the evidence on health benefits and costs
  - Impact on quality of life
  - Effects on mortality
  - Associated costs, particularly on costs to the NHS and personal social services

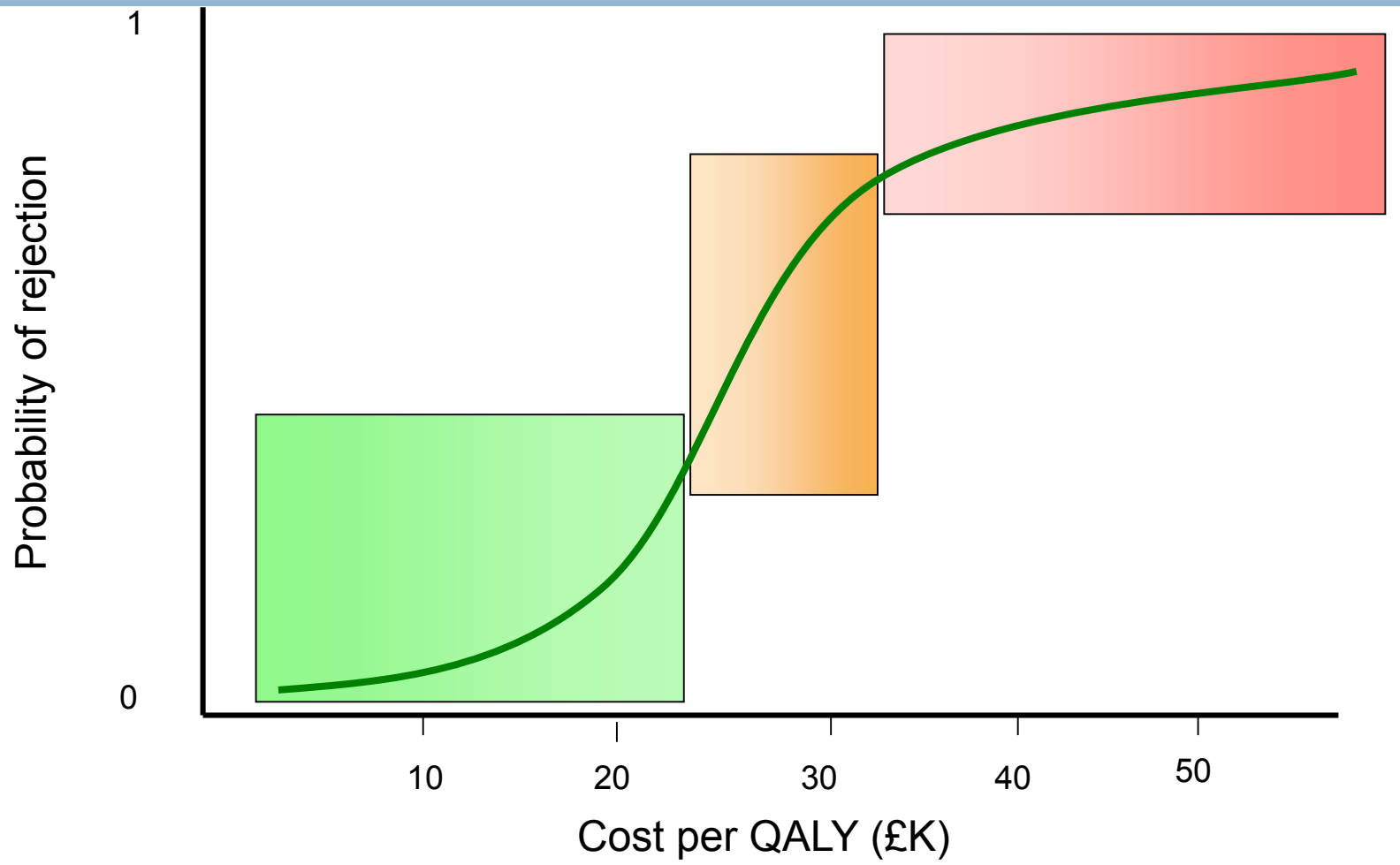
- Department of Health direction to NHS to make funding and resources available within 3 months



NICE Technology Appraisal

- Deliberative value assessment
  - expert **clinical** opinion
  - **public/patient** opinion
  - expert **statistical** opinion
  - expert health **economic** opinion
  - **industry** / **economy** considerations
  - safety
  - efficacy
  - cost-effectiveness

Seeking the threshold



Test case 2006

- New expensive drugs for advanced kidney cancer
  - Sunitinib
  - Bevacizumab
  - Everolimus
- Control disease for an extra 6 months
- ICER ~ £50,000 per QALY

→ REJECT

NICE and politics

Rule changes

- Special situations
  - End of life
  - Burden of disease
  - Small patient population (orphan drugs)
  - Unmet need
  - Particularly innovative technology

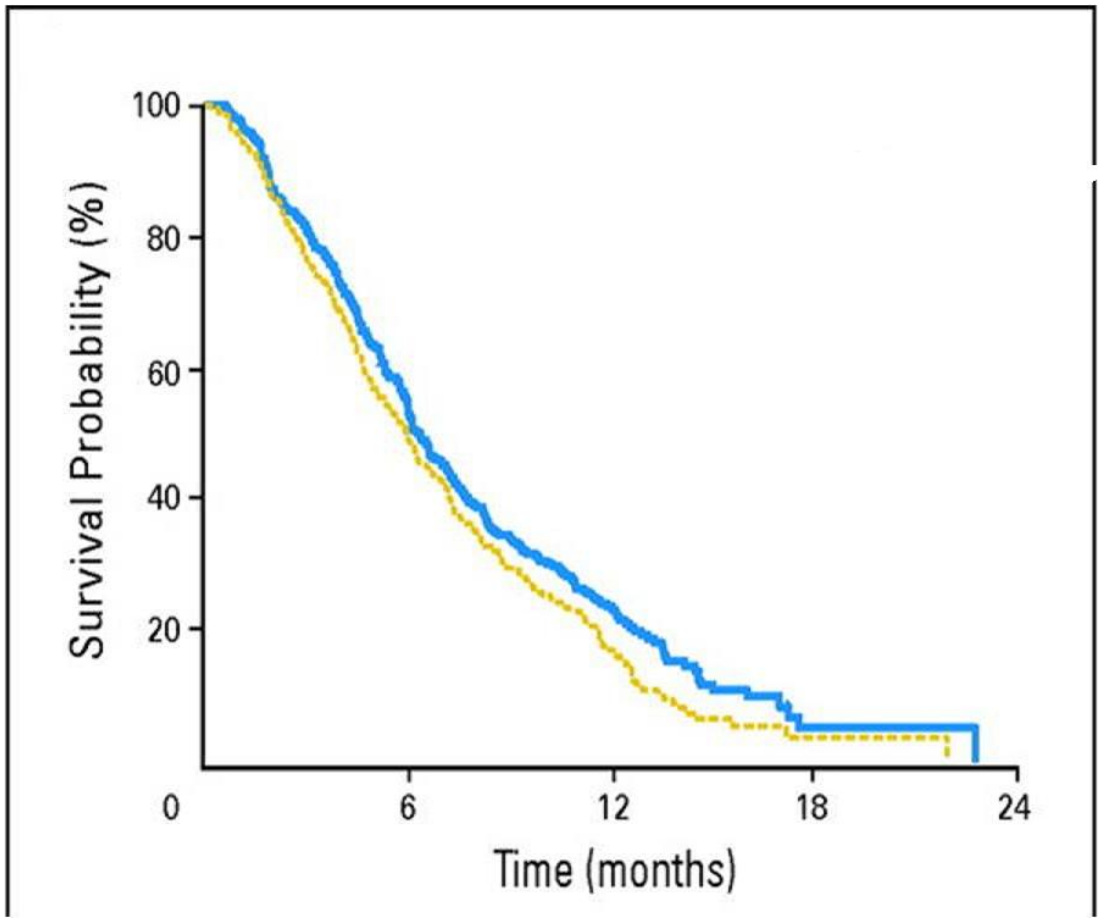
Kidney cancer drugs approved

Evidence from clinical trials

Getting the ICER from the evidence

Advanced cancer Overall survival

Erlotinib for advanced pancreatic cancer



HR 0.82
95% CI 0.69 to 0.99
p=0.038

= success!

→ positive licensing decision

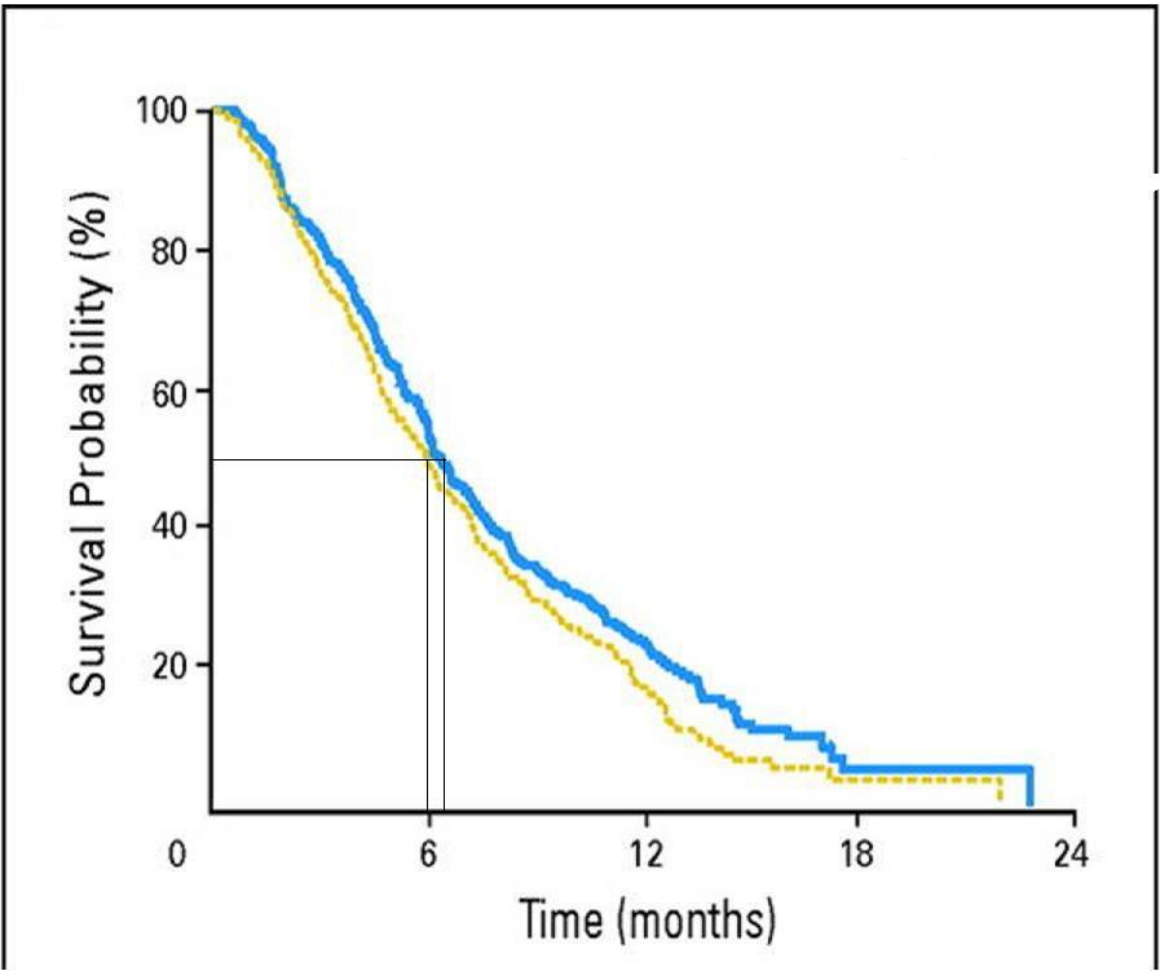
Advanced cancer Overall survival

Erlotinib for advanced pancreatic cancer

Reimbursement decision?

Advanced cancer Overall survival

Erlotinib for advanced pancreatic cancer



HR 0.82
95% CI 0.69 to 0.99
p=0.038

Median survival =
6.24 months vs.
5.91 months

increase in median survival
=11 days

Advanced cancer Overall survival

Erlotinib for advanced pancreatic cancer

- mean incremental LY per patient = 0.037
- Cost
  - incremental drug costs = £4000 (mean ~2 weeks)
  - incremental side effect costs = £400

- ICER = £4400/0.037
  = **£118,919** per LY gained

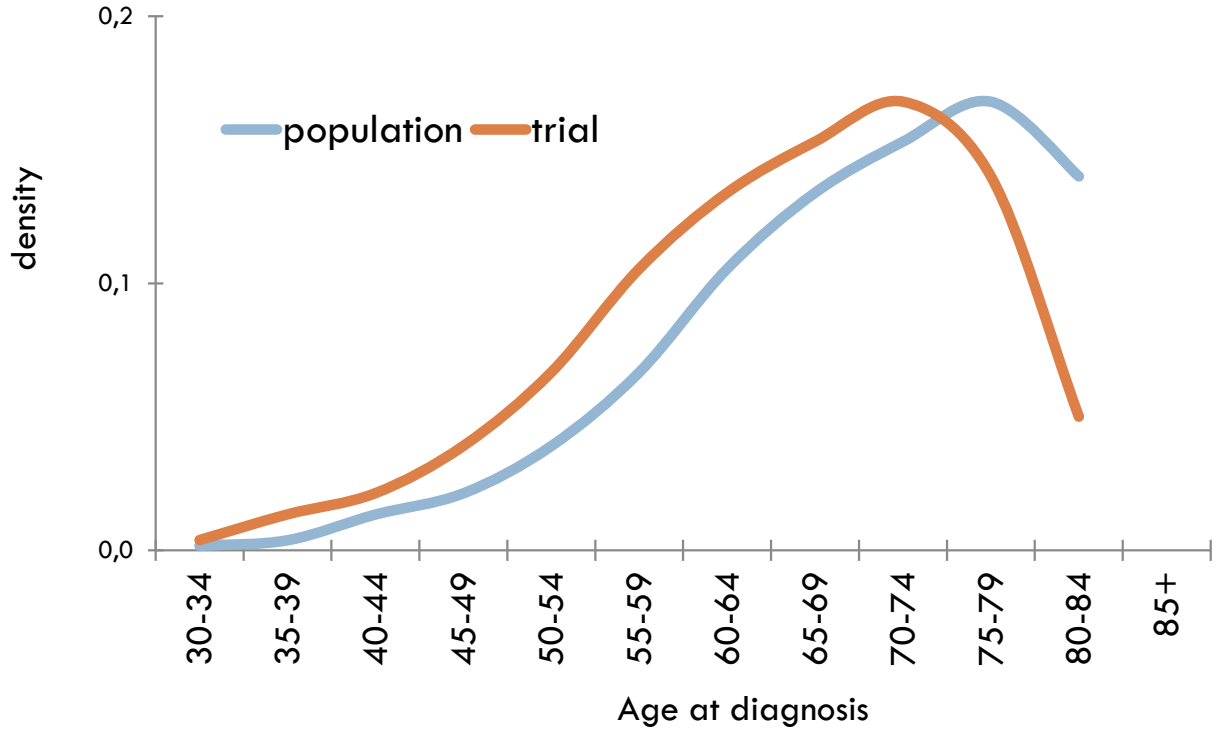
Advanced cancer Overall survival

Erlotinib for advanced pancreatic cancer

QoL / cost per QALY ??

Advanced cancer Overall survival

Erlotinib for advanced pancreatic cancer – age distribution

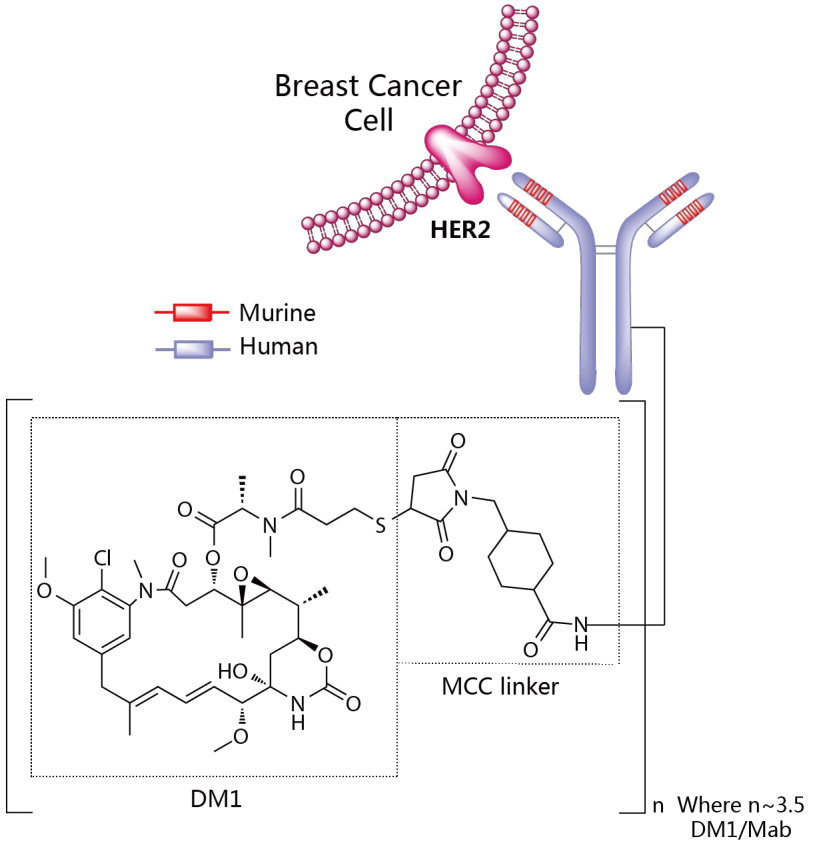


Erlotinib – NICE decision

- £118,919 per LY gained
- £ ??.?? per QALY gained
- wrong patient population

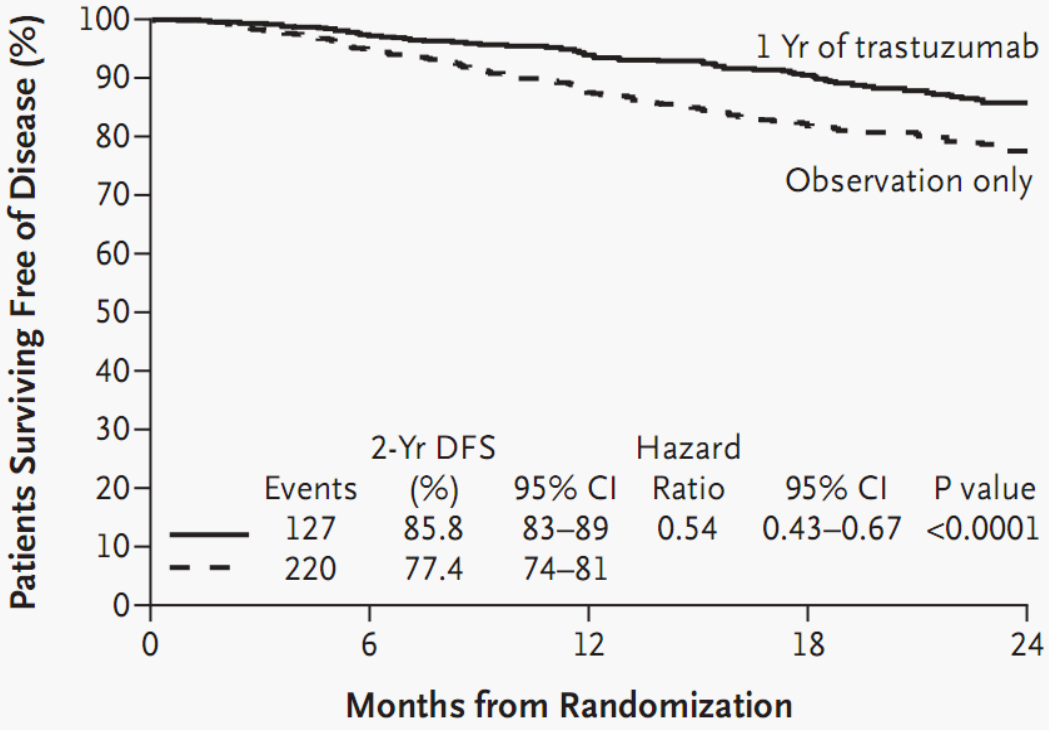
→ **rejected**

Example:
Early HER2 +ve breast cancer



Efficacy

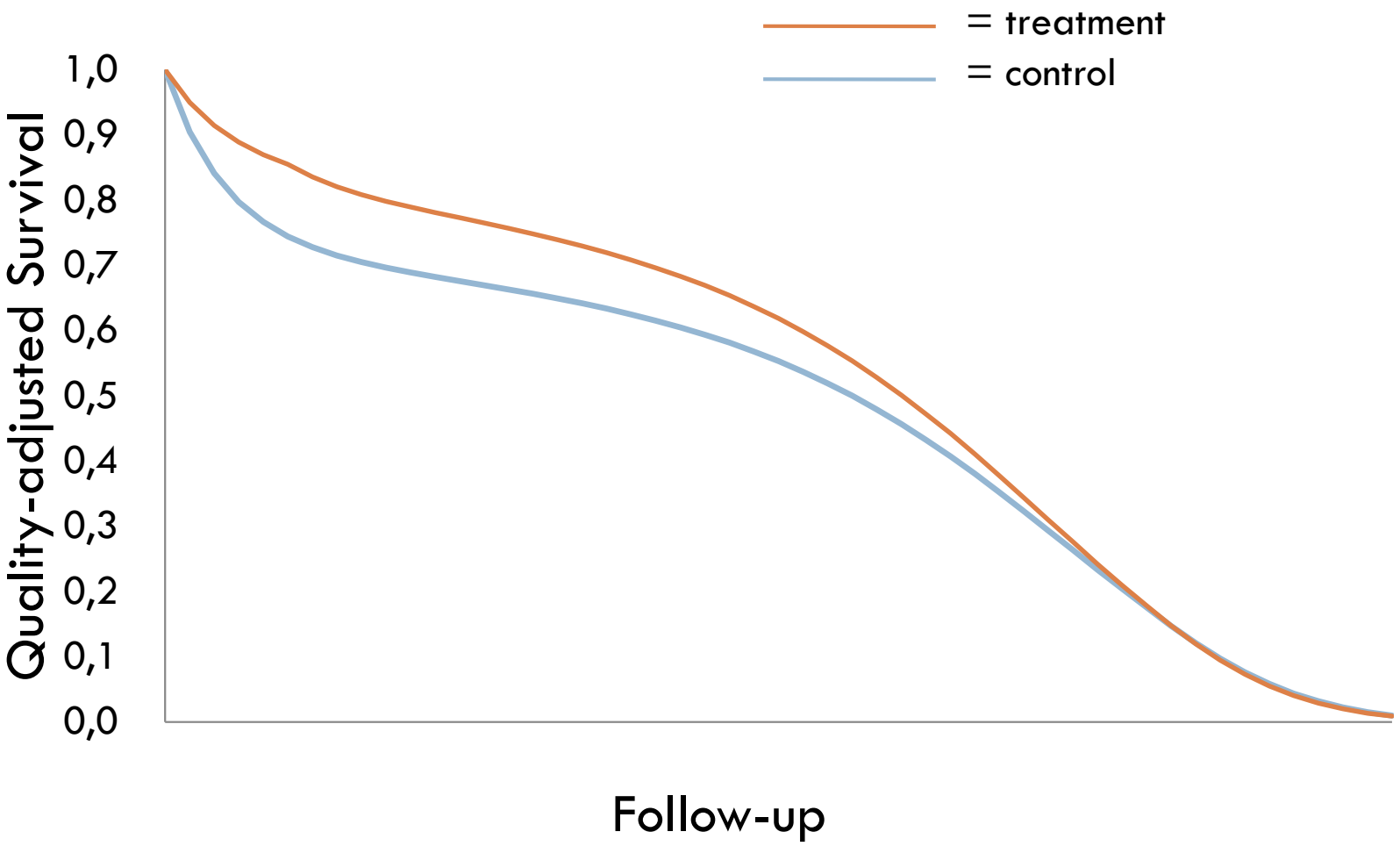
Primary endpoint = disease free survival



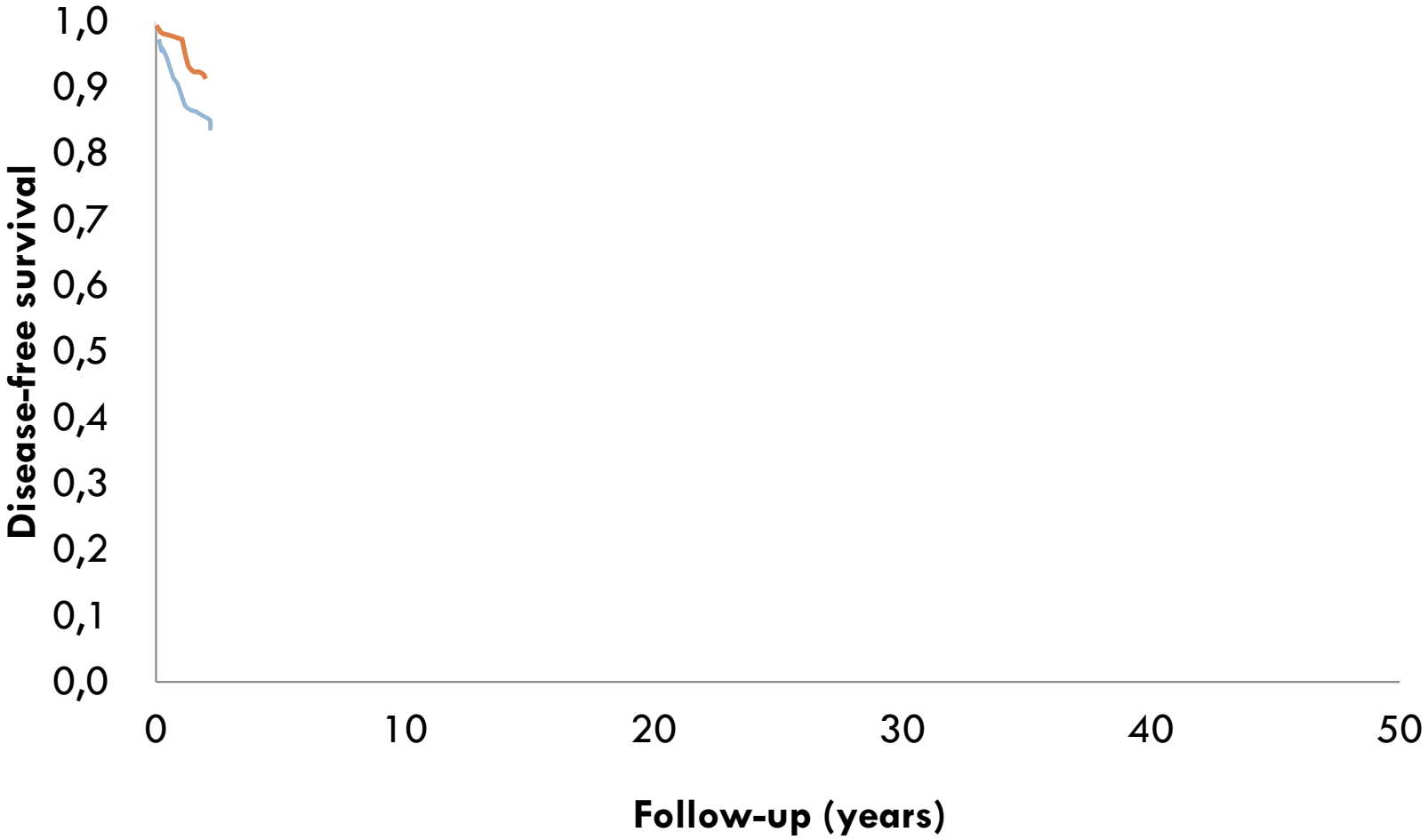
	Events	2-Yr DFS (%)	95% CI	Hazard Ratio	95% CI	P value
1 Yr of trastuzumab	127	85.8	83–89	0.54	0.43–0.67	<0.0001
Observation only	220	77.4	74–81			

No. at Risk					
1 Yr of trastuzumab	1694	1172	885	532	268
Observation only	1693	1108	767	445	224

QALY calculation



Disease-free survival



Is Trastuzumab Cost-effective?

- 2006 estimate accepted by NICE:
  - **ICER = £18,500** per QALY (threshold £20 – 30k)
  - 90% CI £12,250 - >£50,000

- 2011 update* :
  - **ICER = £25,803** per QALY
  - 90% CI £15,000 - £59,000

*Hall et al. Pharmacoeconomics 2011 29(5);415-432

Summary

- Rising healthcare expenditure
- Limited resources - efficient allocation is key
- Cost-effectiveness analysis is a method for comparing the costs and benefits of alternative interventions
- A necessary part of evidence based medicine, health economic assessment must be built into clinical trials!