Methods to Estimate the Cost Effectiveness Threshold for the NHS

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Acknowledgements

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Outline

- Two concepts of the threshold

- The importance of opportunity cost

- Changes in the threshold

- NICE's current position

- Estimating NICE threshold

- Ongoing work

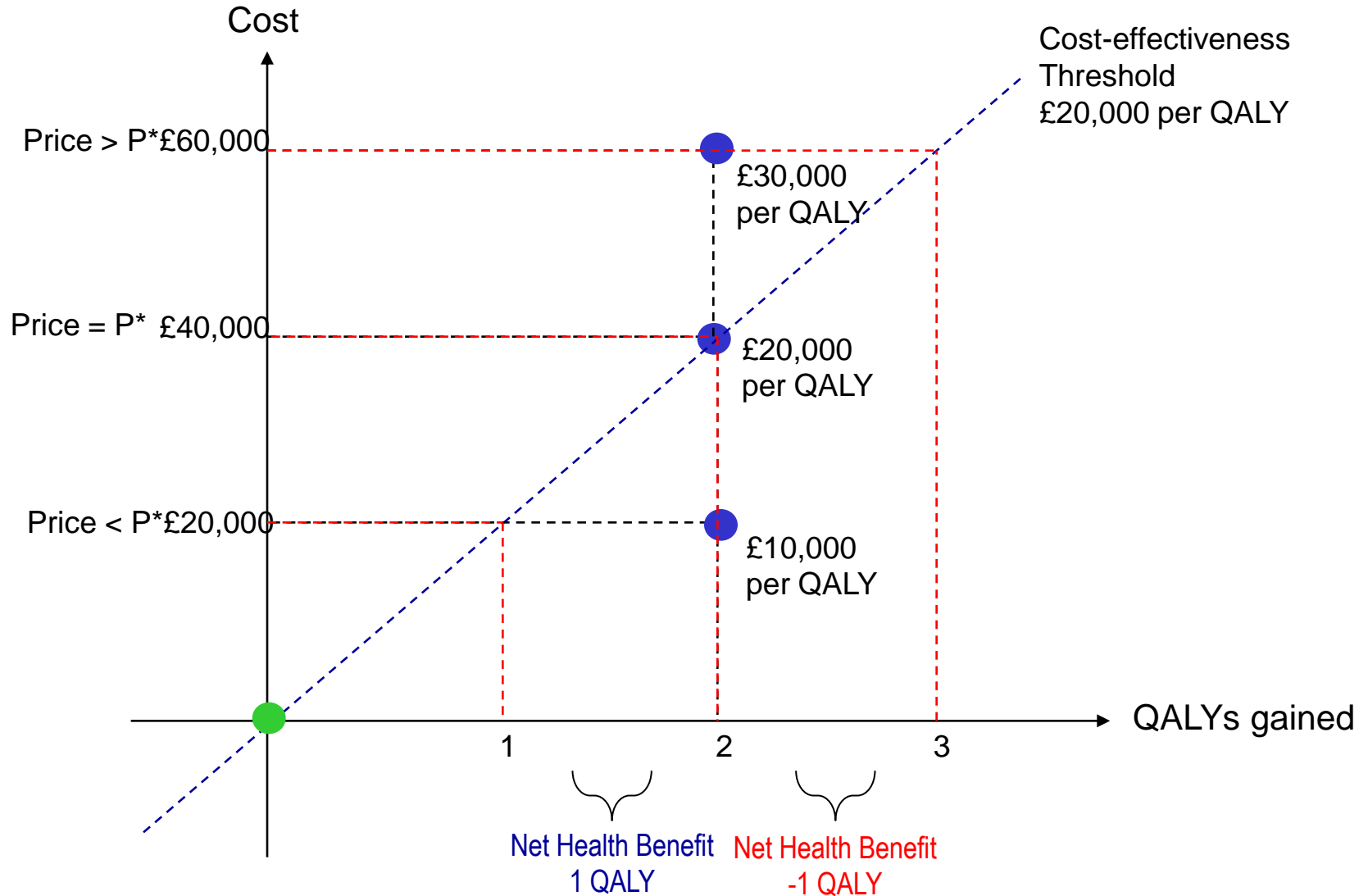# Two concepts of the value of a QALY (or the cost-effectiveness threshold)

Budget constrained systems → **Opportunity cost value of a QALY (k)**
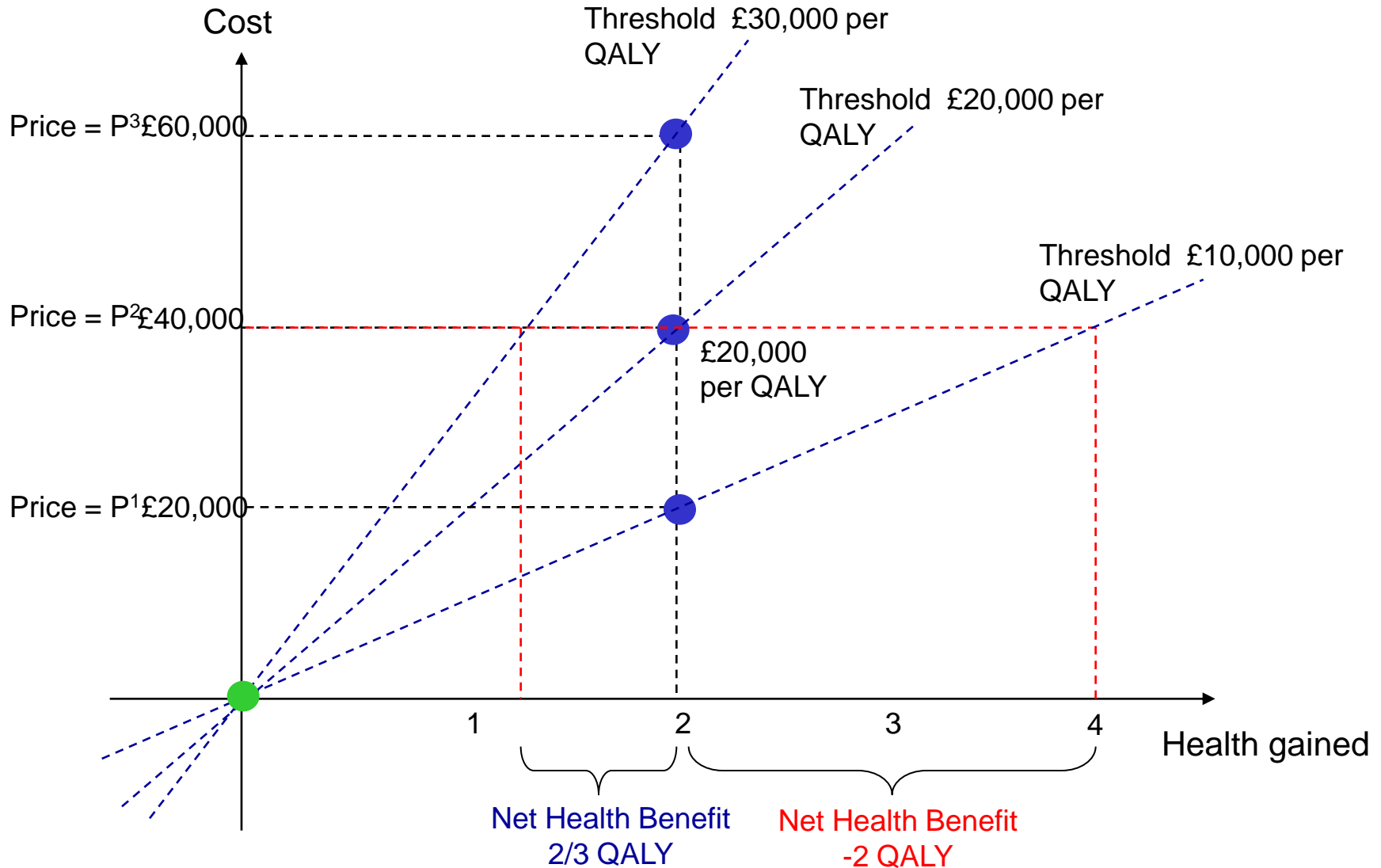What health is forgone as new (more costly) technologies displace existing services?

Freely funded systems → **Consumption value of a QALY (v)**
What value to individuals place on health in terms of their consumption of other good and services?

Cost-effectiveness and opportunity cost?

Cost

Cost-effectiveness
Threshold
£20,000 per QALY

Price > P*£60,000 — £30,000 per QALY

Price = P* £40,000 — £20,000 per QALY

Price < P*£20,000 — £10,000 per QALY

QALYs gained

1   2   3

Net Health Benefit
1 QALY

Net Health Benefit
-1 QALY

Why does *k* matter?

Cost

Threshold £30,000 per QALY

Threshold £20,000 per QALY

Threshold £10,000 per QALY

Price = P³ £60,000

Price = P² £40,000

£20,000 per QALY

Price = P¹ £20,000

1   2   3   4

Health gained

Net Health Benefit 2/3 QALY

Net Health Benefit -2 QALY

What it is and what its not

Health

An efficient NHS

$1/k_1$

Underestimate health effect of ΔB
(i.e., k_1 is too high)

Current NHS

$1/k_1$

H1

Average productivity would
overestimate health effect of ΔB
(i.e., $H1/B1 < k_1$)

B1
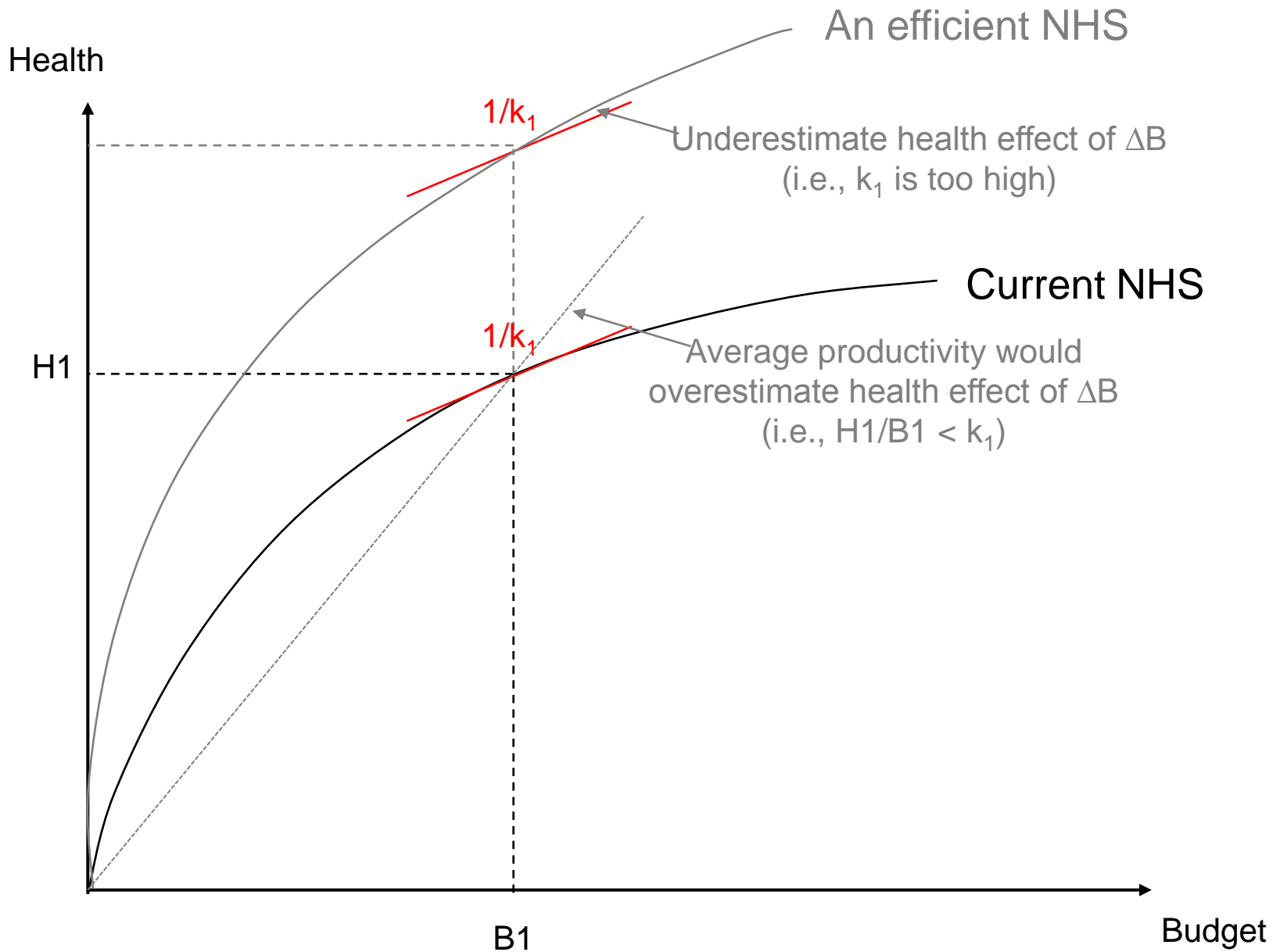
Budget

How does it change?

- Need *k* what ever view of social value
- What it's not
  - Consumption value of health (*v*)
  - Marginal productivity of ideal NHS
- No simple relationship to changes in budget and prices
  - Discretionary expenditure
  - Changes in productivity
    - Stop doing things the NHS shouldn't do (increase *k*)
    - Improve those things it should do (reduce *k*)
- Health production outside NHS
  - Complement, e.g., longer life expectancy (reduce *k*)
  - Substitute, e.g., reduced base line risk (increase *k*)

What NICE currently says (1)

Below a most plausible ICER of £20,000 per QALY gained, the decision to recommend the use of a technology is normally based on the cost-effectiveness estimate and the acceptability of a technology as an effective use of NHS resources.

Above a most plausible ICER of £20,000 per QALY gained, judgements about the acceptability of the technology as an effective use of NHS resources will specifically take account of the following factors.

• The degree of certainty around the ICER...
• Whether there are strong reasons to indicate that the assessment of the change in HRQL has been inadequately captured...
• The innovative nature of the technology...

What NICE currently says (2)

Above a most plausible ICER of £30,000 per QALY gained, the Committee will need to identify an increasingly stronger case for supporting the technology as an effective use of NHS resources, with regard to the factors listed above.

Source: National Institute for Health and Clinical Excellence (NICE). Guide to the Methods of Technology Appraisal. London: NICE; 2008.

# Prioritising NICE's methodological requirements
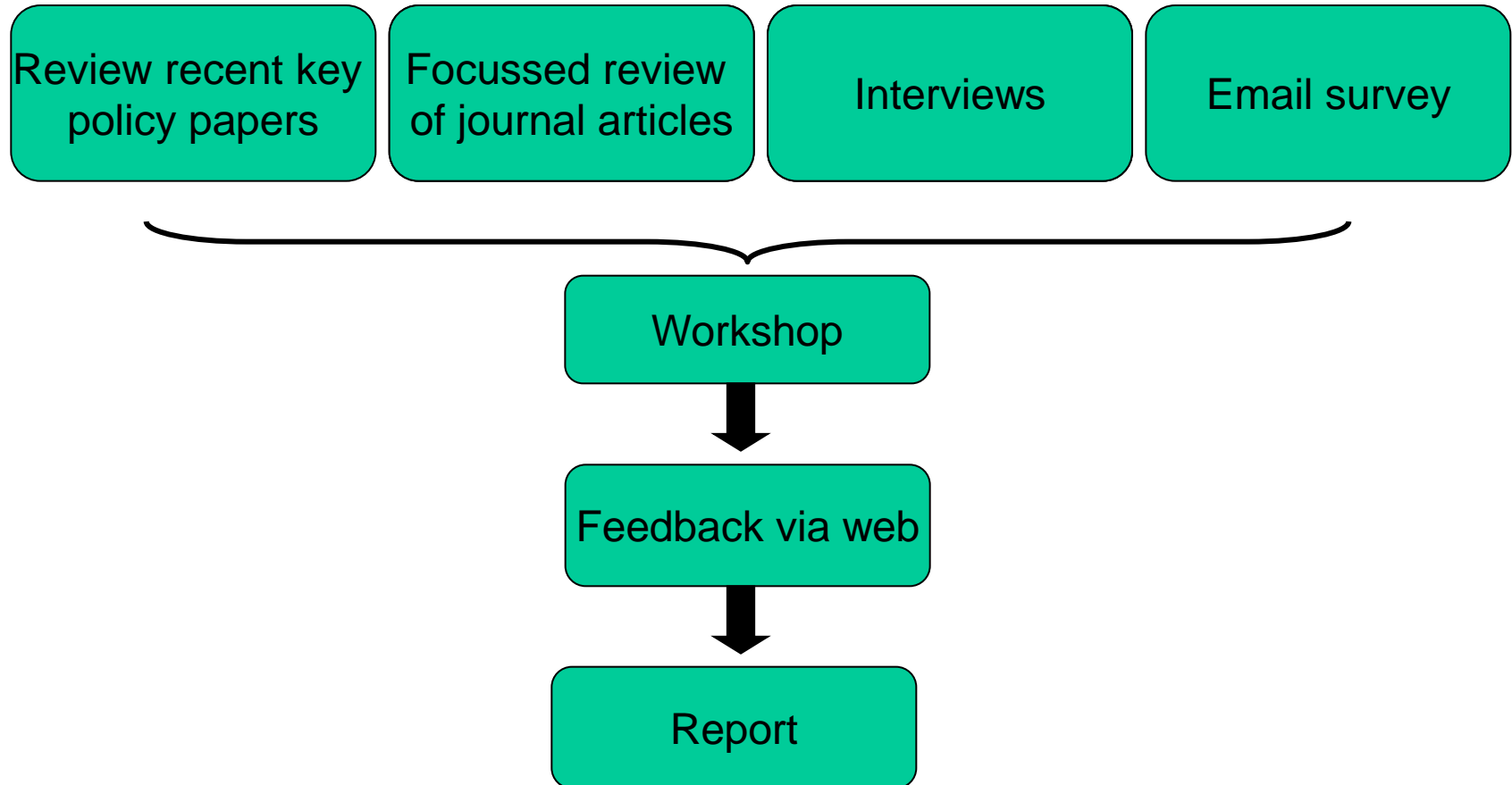
Longworth et al. MRC-NICE scoping project: identifying the national institute for health and clinical excellence's methodological research priorities and an initial set of priorities. CHE Research Report 51, 2009. http://www.york.ac.uk/che/publications/in-house/

How can we estimate it?

- Informed judgement of the cost-effectiveness of things the NHS does and doesn't do

- Infer a threshold from past decisions

- Find out what gets displaced and estimate its value

- Estimate the relationship between changes in expenditure and outcomes

Informed judgement
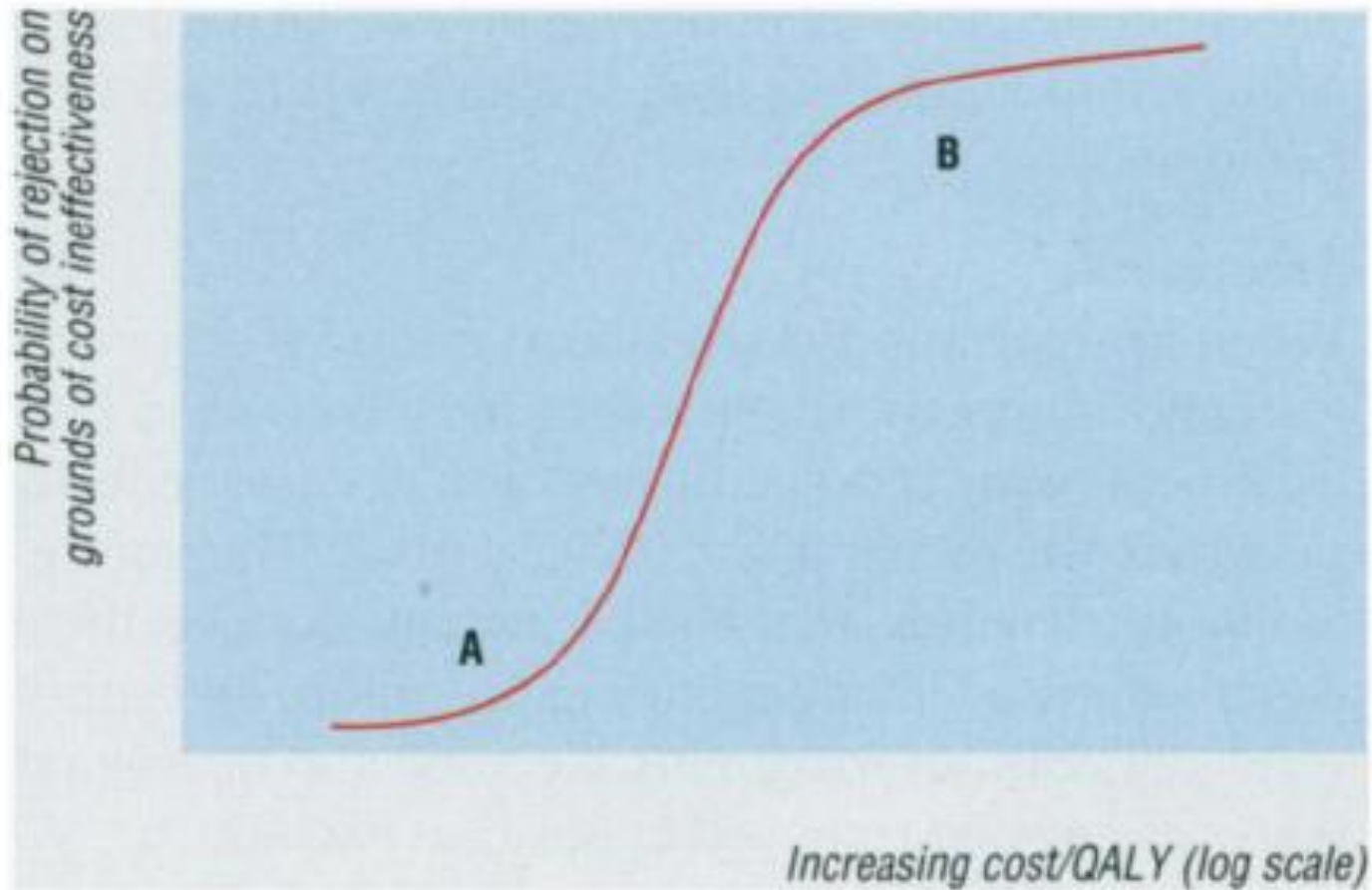
Relation between likelihood of a technology being considered as cost ineffective plotted against the log of the incremental cost effectiveness ratio

Problems with informed judgement

- Lacks transparency
- May have no link with real opportunity costs
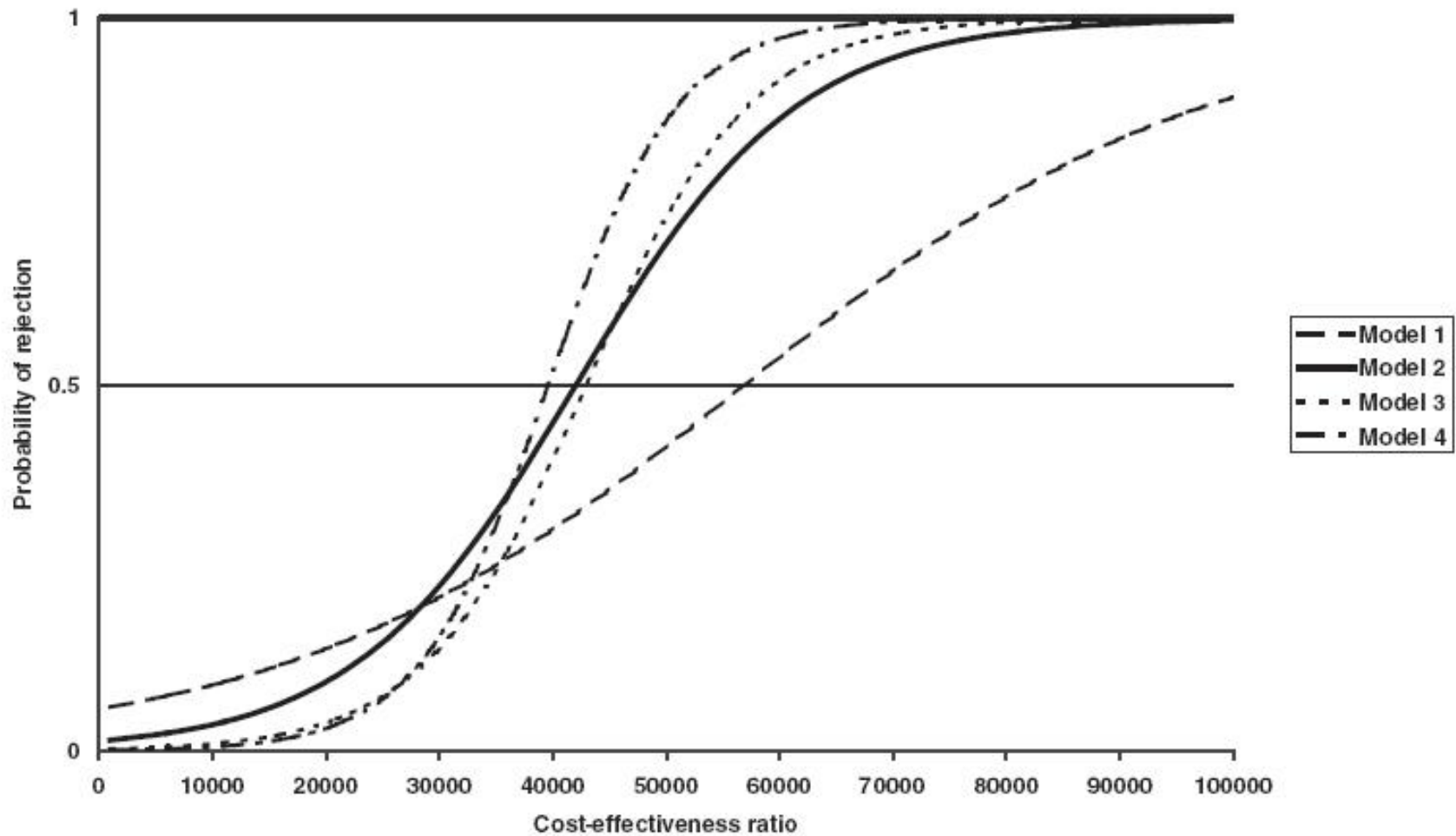
Inferring the threshold from past decisions

Figure 5. Probabilistic cost-effectiveness thresholds for NICE decisions

Issues with inference from past decisions

- More recent results confirm general findings

- Important use of formal methods

- As other criteria are used in decisions, threshold is not revealed

  - Decisions reflect (informal) weighting of QALYs gained

  - NICE may consider technologies for 'high priority' patients

Studying local decisions

- Opportunity costs fall on local decision makers
- Can we estimate the threshold by measuring:
    - What is displaced locally by new technologies?
    - The value (cost per QALY gained) of what is displaced?
- Few data collected routinely on displaced services
- Major research activity needing frequent review
- Poor data on cost effectiveness of services
- How relevant to NICE's decision?

A sample of 6 NHS commissioners and 16 providers

Discontinued/'Managed access'
Tonsillectomy [3,4,1,5,7]
Grommets [3,4,1,5,7]
Hysterectomy [4,1,5]
Plastics [4,1,5]
Removal of skin tags [4,5,2]
Tattoo removal [4]
Varicose veins [4,1,5,7]
Circumcision for non-medical reasons [2]
Homeopathy [5]
IVF – limit number of cycles to 2 [1] or 1 [2]
Cochlear implants [1,5]
Carpal tunnel syndrome [5]
Knee wash out [5]
Wisdom teeth extraction [5]
Carotid endarterectomy for symptomatic carotid stenosis [8]
Cognitive therapy for management of chronic pain [8]

Estimating relationship between expenditure and outcomes

- Variations in expenditure and outcomes within programmes

- Reflects what actually happens in the NHS

- Estimates the marginal productivity (on average) across the NHS

- Earlier work has provided initial estimates

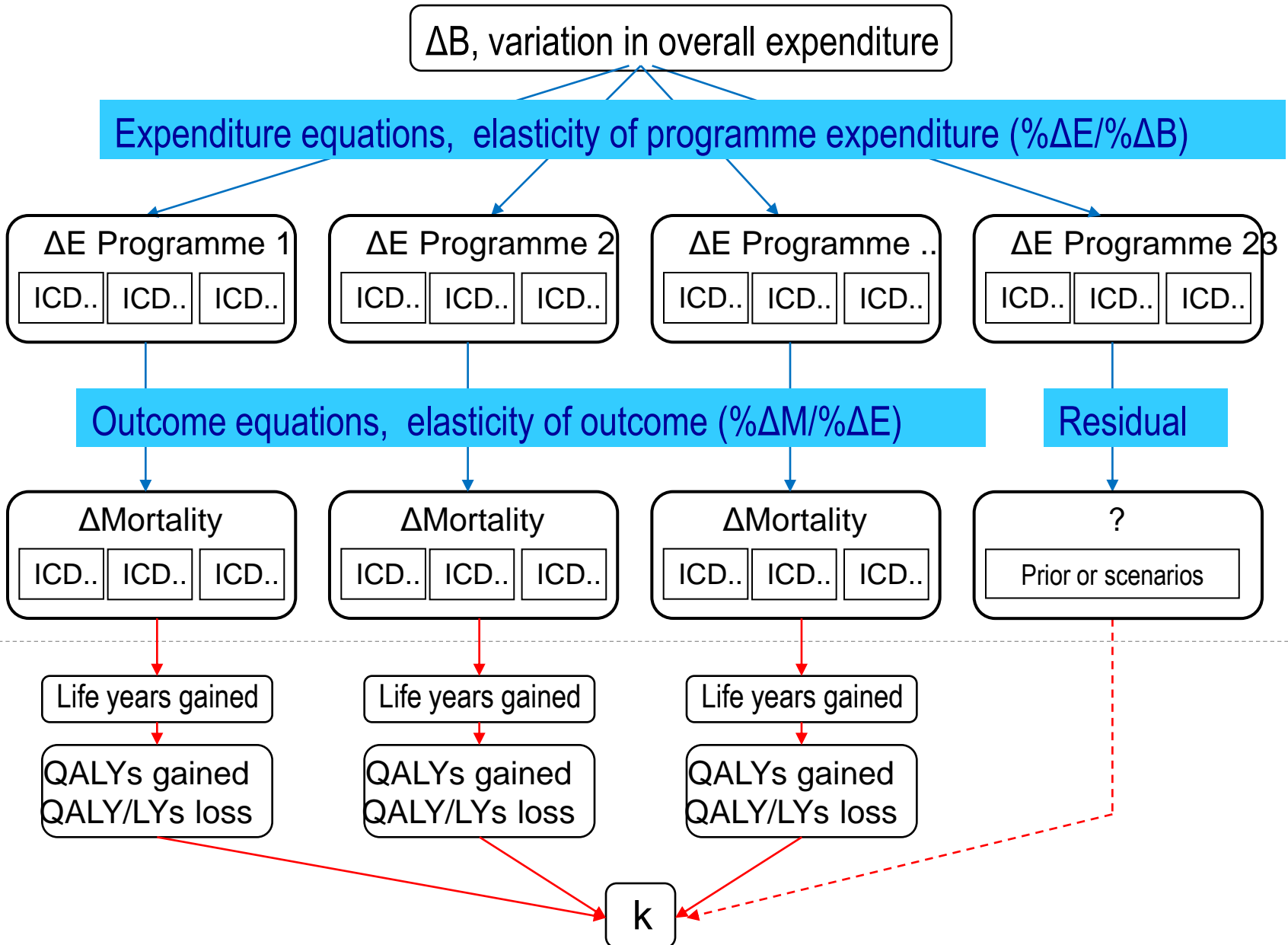# Relationship between expenditure and outcomes

- Earlier work has generated some initial estimates
    - Martin et al. The link between health spending and health outcomes for the new English primary care trusts. London: The Health Foundation; 2009.
    - Martin et al. The Link Between Health Care Spending and Health Outcomes for the New English Primary Care Trusts. Centre for Health Economics (CHE) Research Paper No. 42. York: CHE, University of York; 2008.
    - Martin et al. Does health care spending improve health outcomes? Evidence from English programme budgeting data. Journal of Health Economics. 2008;27:826–42.

		Cancer	Circulation	Respiratory	Gastro-int	Diabetes
04/05	per LY per QALY	£13,137 (£19,070)	£7,979 (£11,960)			
05/06	per LY	£13,931	£8,426	£7,397	£18,999	£26,453

Future work going forward

- More programmes
- How changes in overall expenditure gets allocated across all the programmes
- How changes in mortality might translate into QALYs gained
- How uncertain any overall estimate will be
- How it changes with scale of expenditure change
- How it changes over time (panel data)
- Workshop May 2011
- Completion June 2012
- http://www.york.ac.uk/che/research/teams/teehta/projects/methodological-research/

How can we estimate it?

ΔB, variation in overall expenditure

Expenditure equations, elasticity of programme expenditure (%ΔE/%ΔB)

ΔE Programme 1	ΔE Programme 2	ΔE Programme ..	ΔE Programme 23
ICD.. ICD.. ICD..	ICD.. ICD.. ICD..	ICD.. ICD.. ICD..	ICD.. ICD.. ICD..

Outcome equations, elasticity of outcome (%ΔM/%ΔE)   Residual

ΔMortality	ΔMortality	ΔMortality	?
ICD.. ICD.. ICD..	ICD.. ICD.. ICD..	ICD.. ICD.. ICD..	Prior or scenarios

Life years gained	Life years gained	Life years gained
QALYs gained QALY/LYs loss	QALYs gained QALY/LYs loss	QALYs gained QALY/LYs loss

k

Illustrative results

2006 expenditure and mortality data for 2006-08 (2MFFs)

	Share of change in total expenditure	Cost per life year gained	Cost per QALY gained (proportion of patients in ICD)	Cost per QALY gained (contribution to variance in PBC expenditure
Big 4 PBCs	14.93%	£12,824	£8,773	£9,613
11 PBCs (with mortality)	29.12%	£23,924	£13,621	£14,904
All 23 PBCs *	100%	£27,039	£15,395	£16,844

 *Assumes same health effects per £ as the 11 PBCs with outcome data for the remaining 11 PBC
  'Other' (GMS) is assumed to have no health effects.
  Any health effects of GMS expenditure is through other PBCs

What we still need to do?

- How do changes in mortality translate into QALYs gained?
    - DALY ratio overestimates QALYs gained
- What about PBCs with no mortality?
    - Which PBCs and ICDs matter most (effect on overall threshold)
    - Estimates of CE greater or less than overall estimate?
    - How might we use future routine data
- How uncertain is any overall estimate?
    - Estimated parameters, model identification and correlation
    - Certainty equivalent for the threshold
- How it changes with scale of expenditure change?
- How it changes over time
    - 7 years of expenditure and outcome data
    - Panel with more complex lag structure

Representing uncertainty in the estimates?