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Welcome to the InstEAD Annual Lecture 2014
Professor Karl Claxton, Centre for Health
Economics, University of York

Health (and ethics) Needs Economics: Which
Health Technologies, at What Price and for
Whom?



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Inst
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Institute for
Economic Analysis
of Decision-making.

Health (and ethics) needs economics: which health technologies, at what price and for whom?

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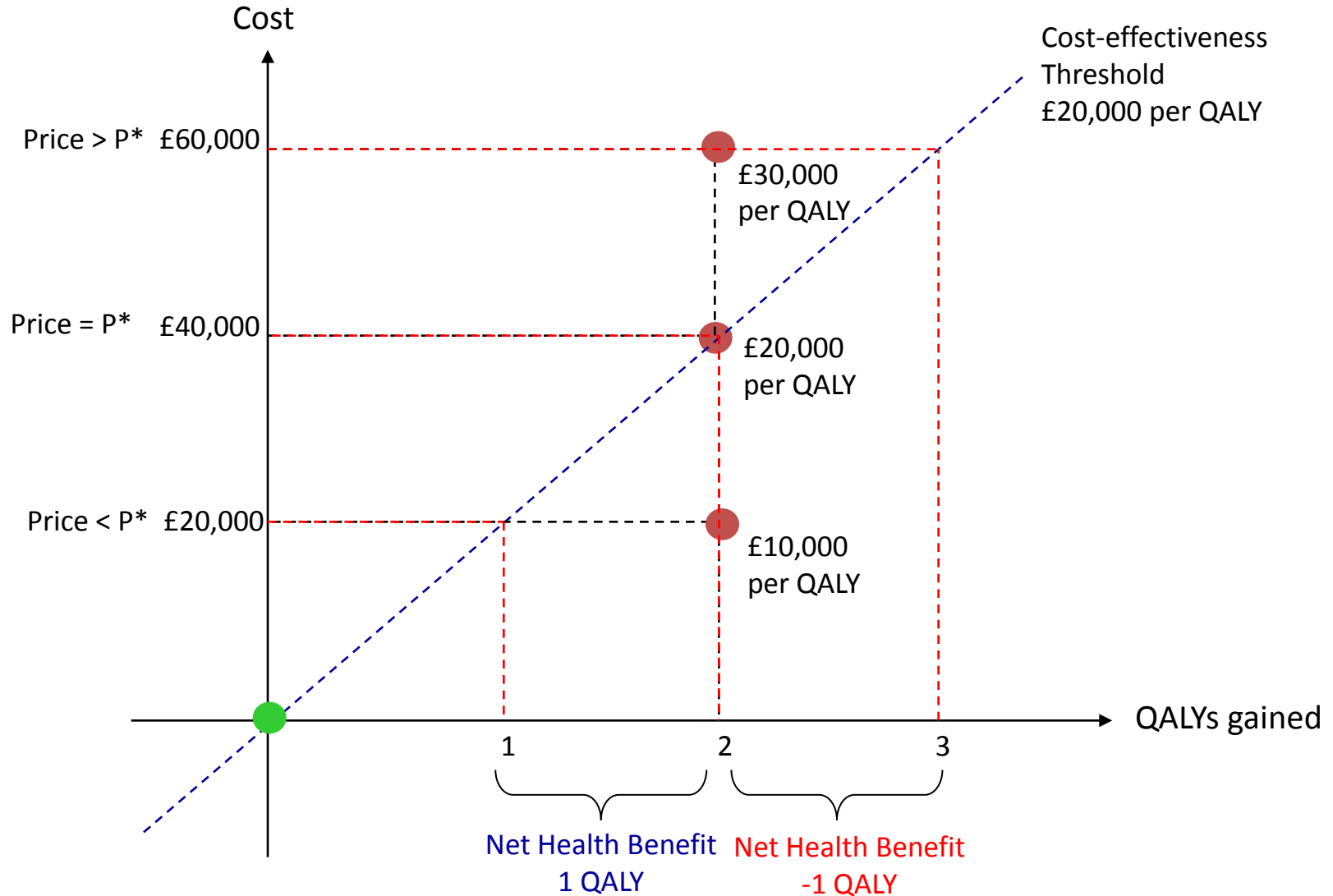
Some principles

- Primary purpose of health care is to improve health
- The NHS budget is an expression of how much we wish to spend on health care
- Everyone's health matters

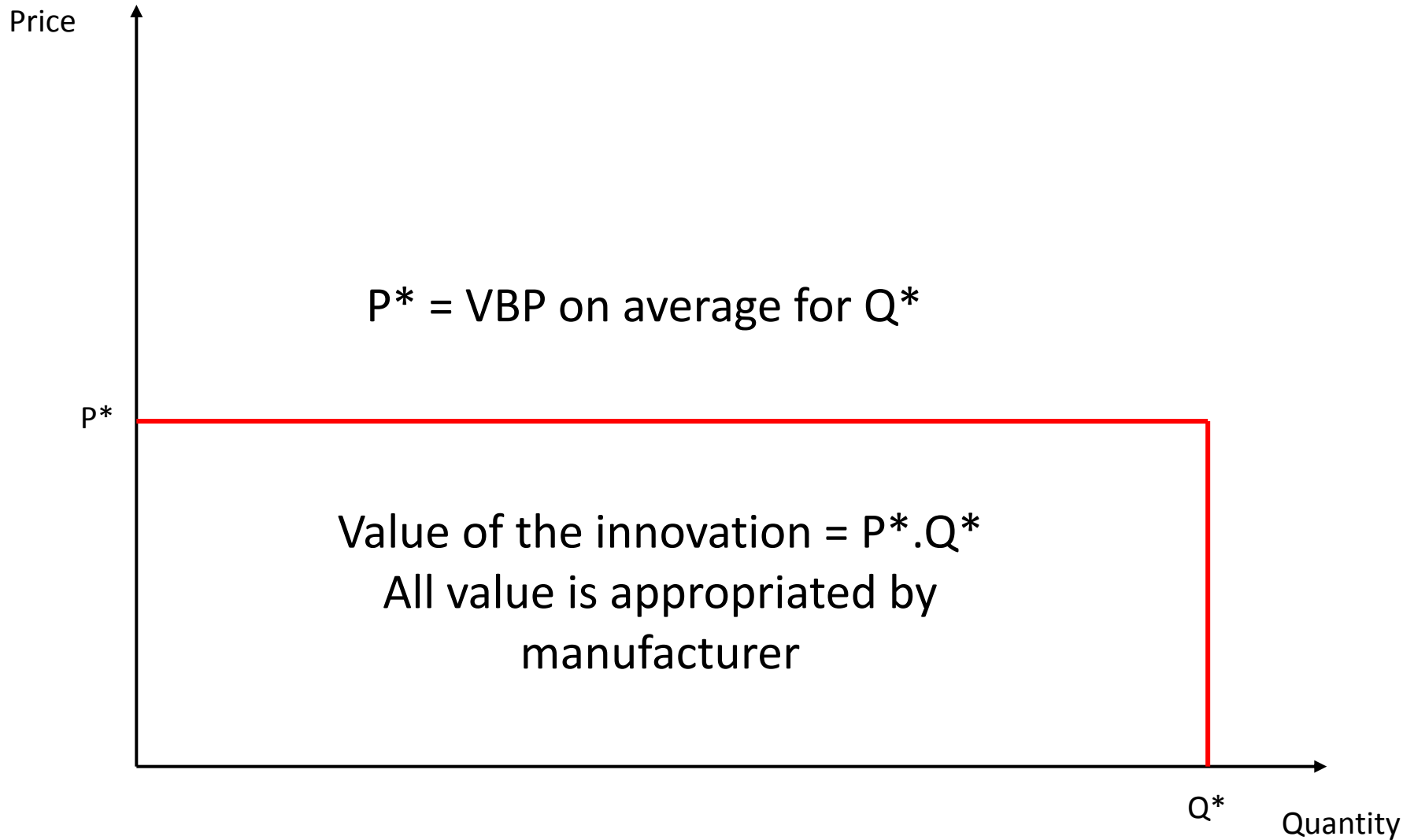
Some implications

- Ethical decisions are impossible without economics
- Some effective technologies should be rejected because the costs are too high

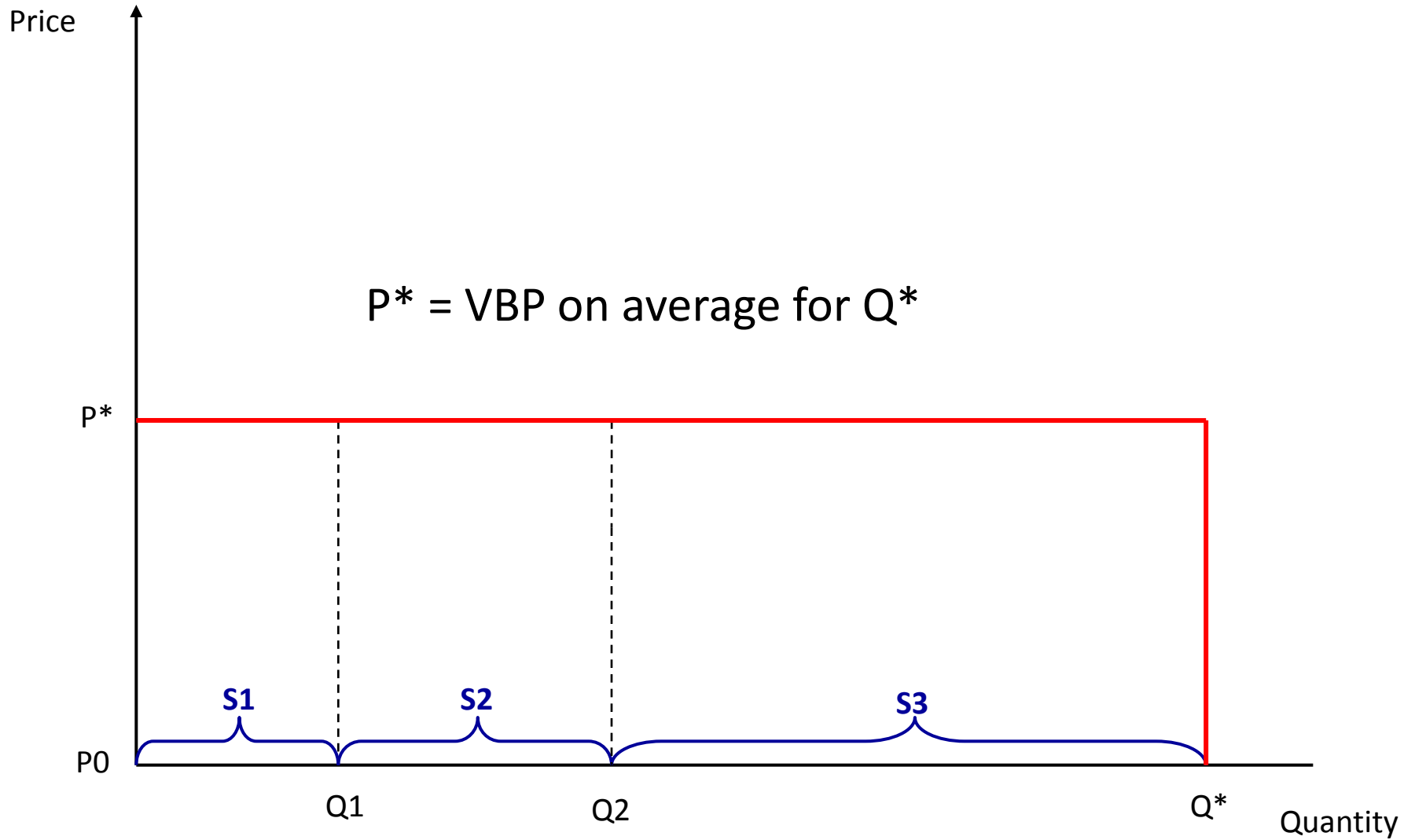
Which technologies?



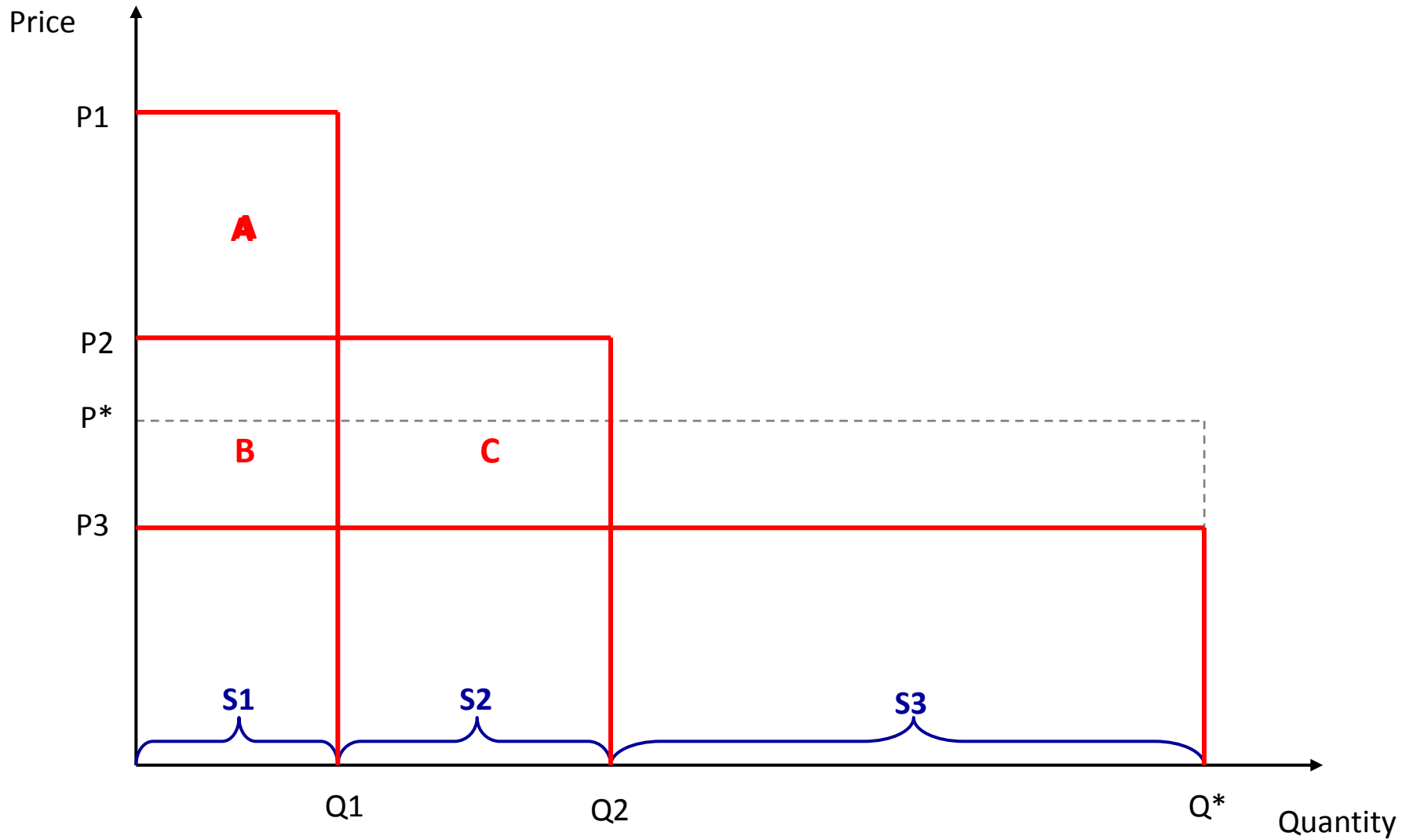
At what price?



For whom?



For whom?



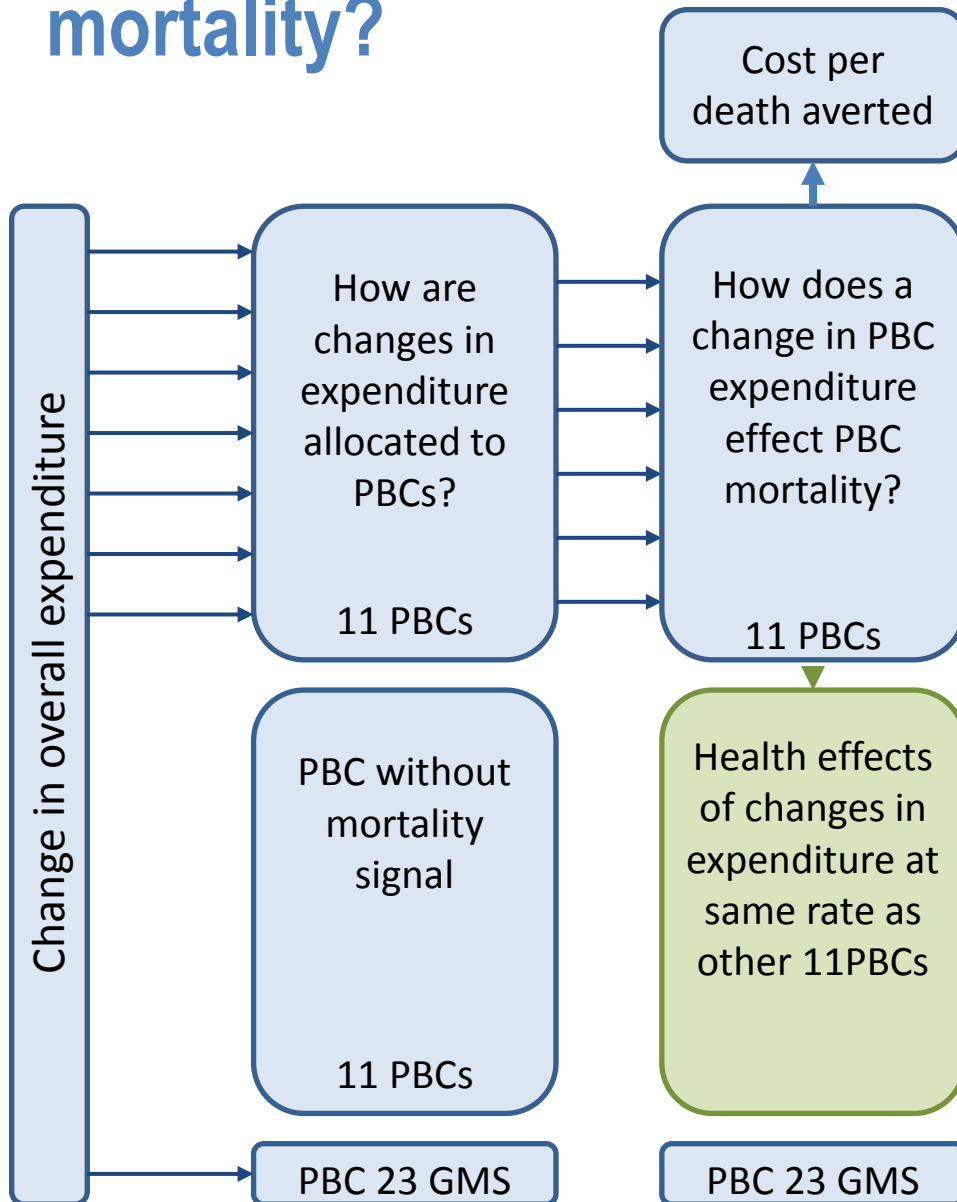
What do we need?

- Estimate health *expected* to be gained
- Estimate additional (net) costs *expect* to impose
- Health *expected* to be lost due to these additional costs
 - Expected health effects of changes in NHS expenditure

How can we estimate it?

- Implied value from past decisions based on informal judgements
 - NICE threshold range (2004)
 - £20,000 to £30,000 per QALY
- Estimate the relationship between changes in expenditure and outcomes
 - 23 Programme Budget Categories (PBCs)
 - Disease areas (groups of ICD codes)
 - All expenditure allocated to each PBC
 - 152 Primary Care Trusts (PCTs)
 - Local expenditure within each PBC
 - Local mortality within each PBC

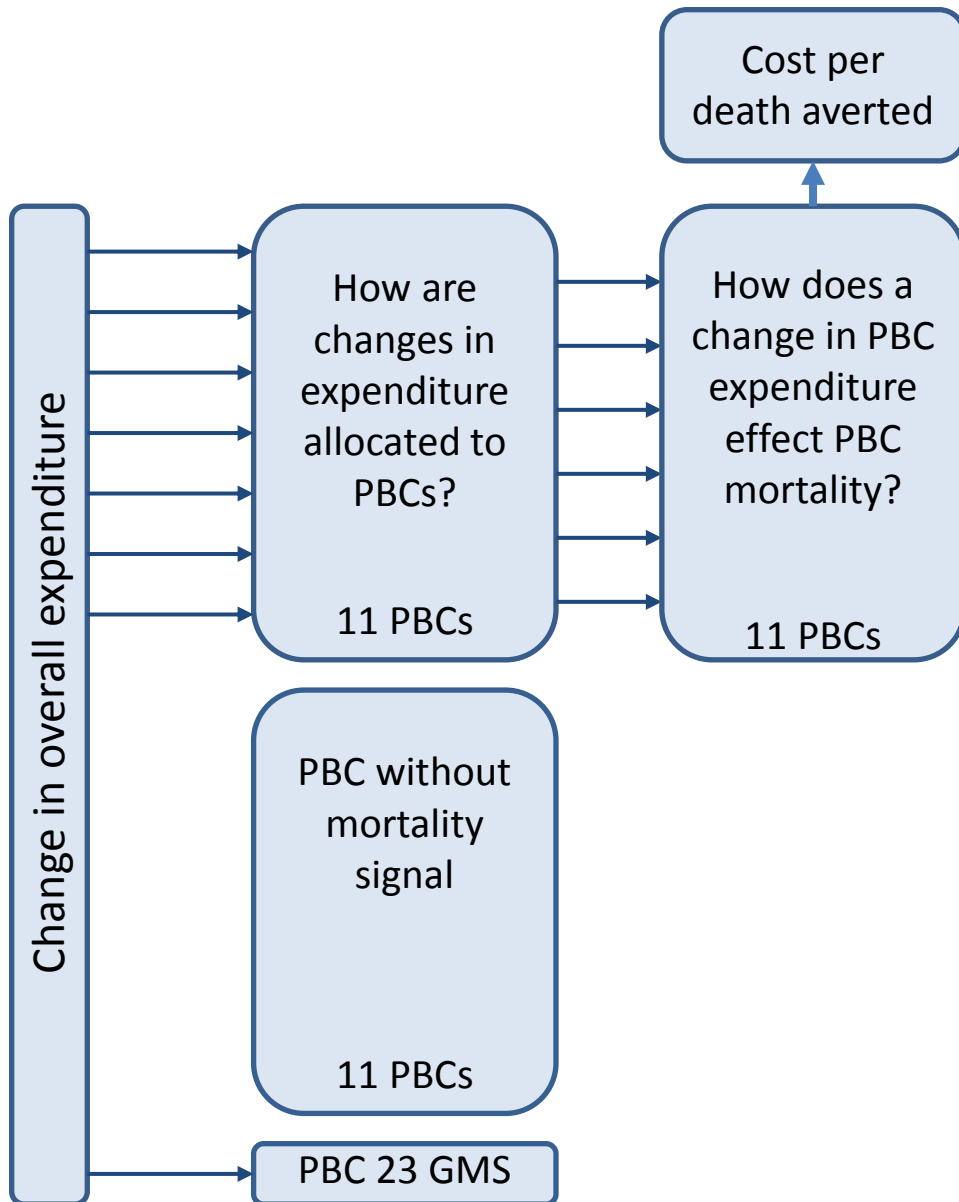
How can we estimate effects of expenditure on mortality?



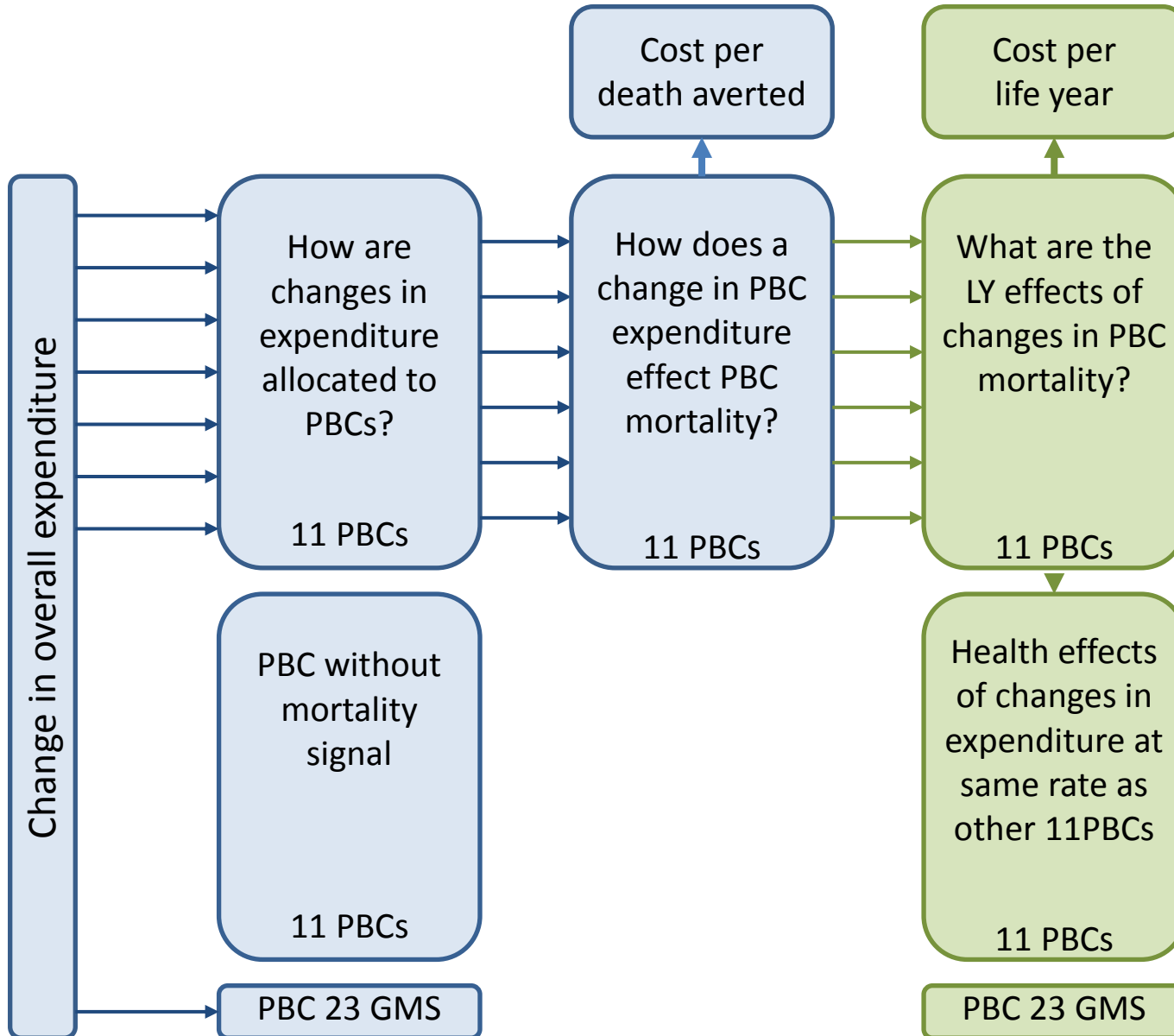
Estimates of the threshold (2008-09)

| | Cost per death averted |
|--------------------------------|------------------------|
| <i>Qol associated with LYs</i> | - |
| <i>Qol during disease</i> | - |
| <i>YLL per death averted</i> | - |
| <i>QALYs per death averted</i> | - |
| 11 PBCs (with mortality) | £105,872 |
| All 23 PBCs | £114,272 |

How can we estimate effects on life years



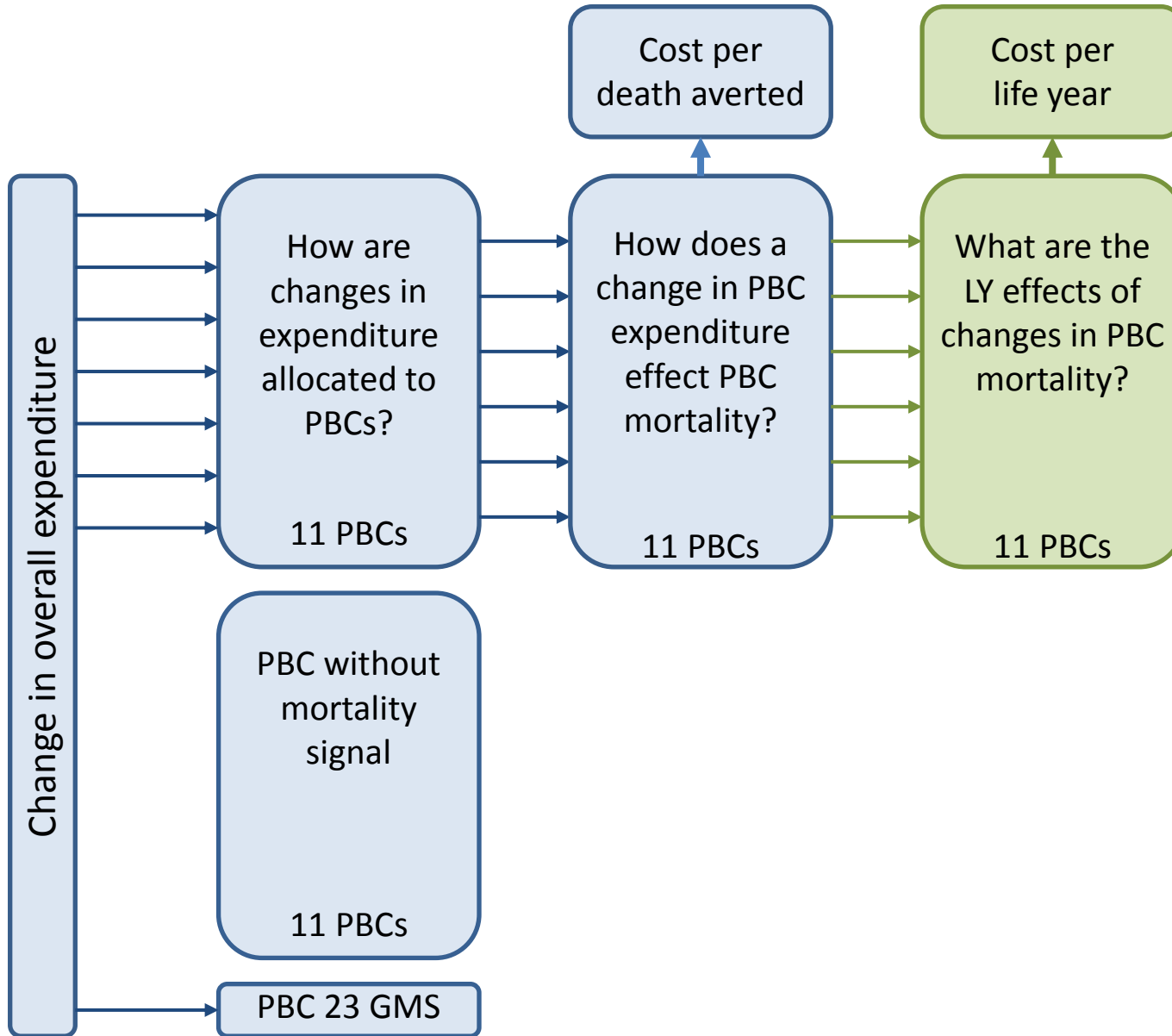
How can we estimate effects on life years



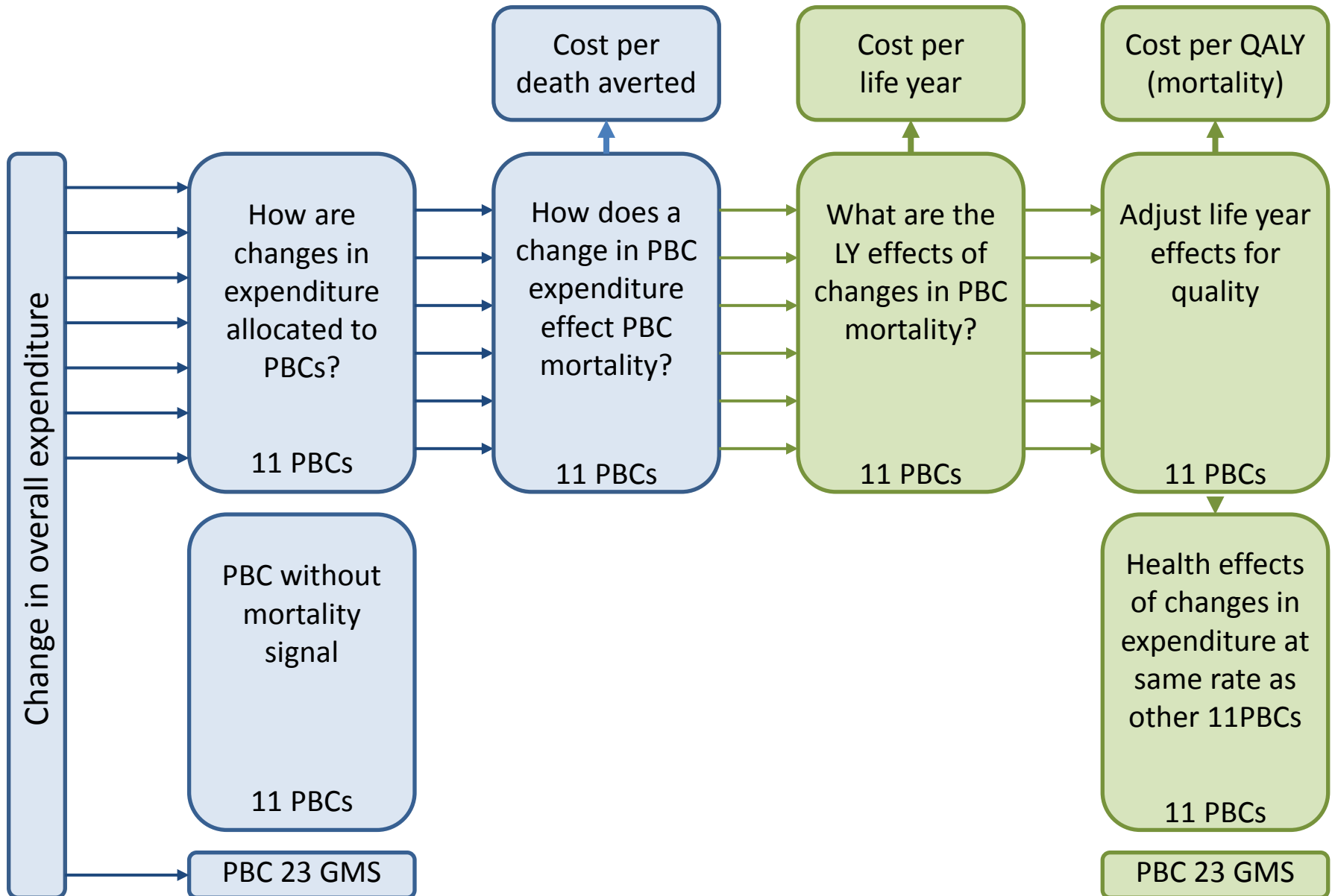
Estimates of the threshold (2008-09)

| | Cost per death averted | Cost per life year |
|--------------------------------|------------------------|--------------------|
| <i>Qol associated with LYs</i> | - | 1 |
| <i>Qol during disease</i> | - | 0 |
| <i>YLL per death averted</i> | - | 4.5 YLL |
| <i>QALYs per death averted</i> | - | 4.5 YLL |
| 11 PBCs (with mortality) | £105,872 | £23,360 |
| All 23 PBCs | £114,272 | £25,214 |

How can we adjust life years for quality?



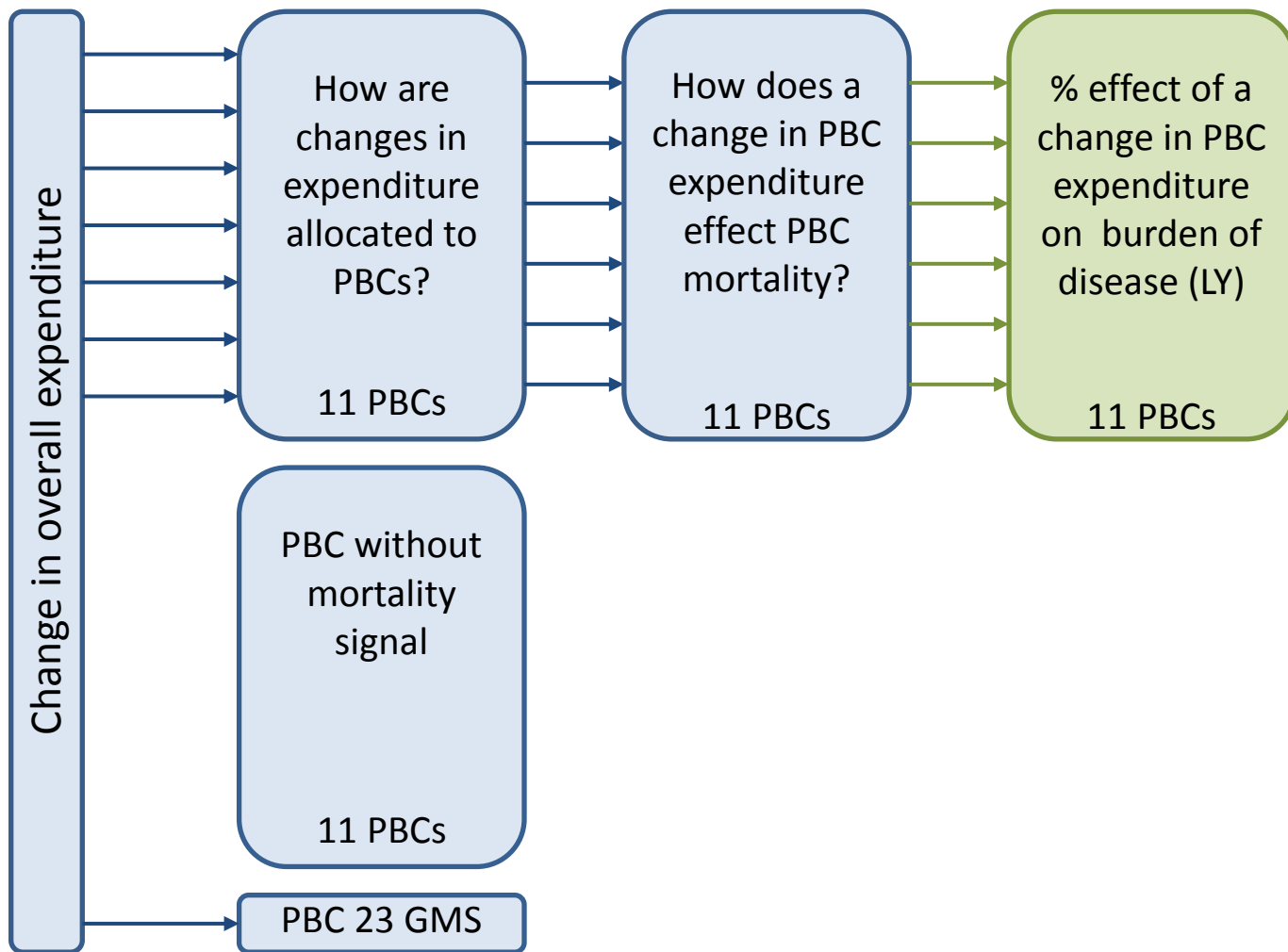
How can we adjust life years for quality?



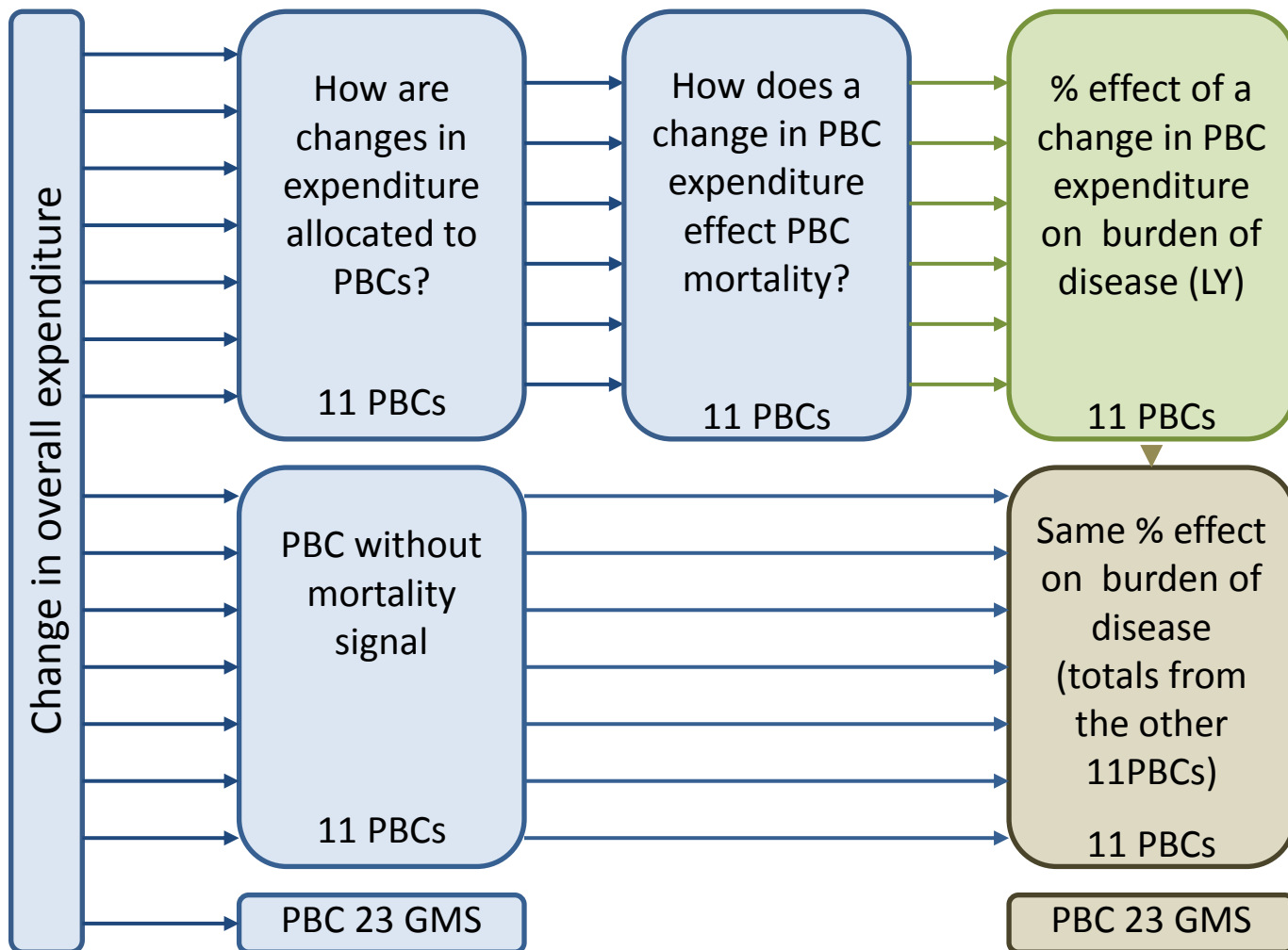
Estimates of the threshold (2008-09)

| | Cost per death averted | Cost per life year | Cost per QALY (mortality effects) |
|--------------------------------|------------------------|--------------------|-----------------------------------|
| <i>Qol associated with LYs</i> | - | 1 | <i>Norms</i> |
| <i>Qol during disease</i> | - | 0 | 0 |
| <i>YLL per death averted</i> | - | 4.5 YLL | 4.5 YLL |
| <i>QALYs per death averted</i> | - | 4.5 YLL | 3.8 QALY |
| 11 PBCs (with mortality) | £105,872 | £23,360 | £28,045 |
| All 23 PBCs | £114,272 | £25,214 | £30,270 |

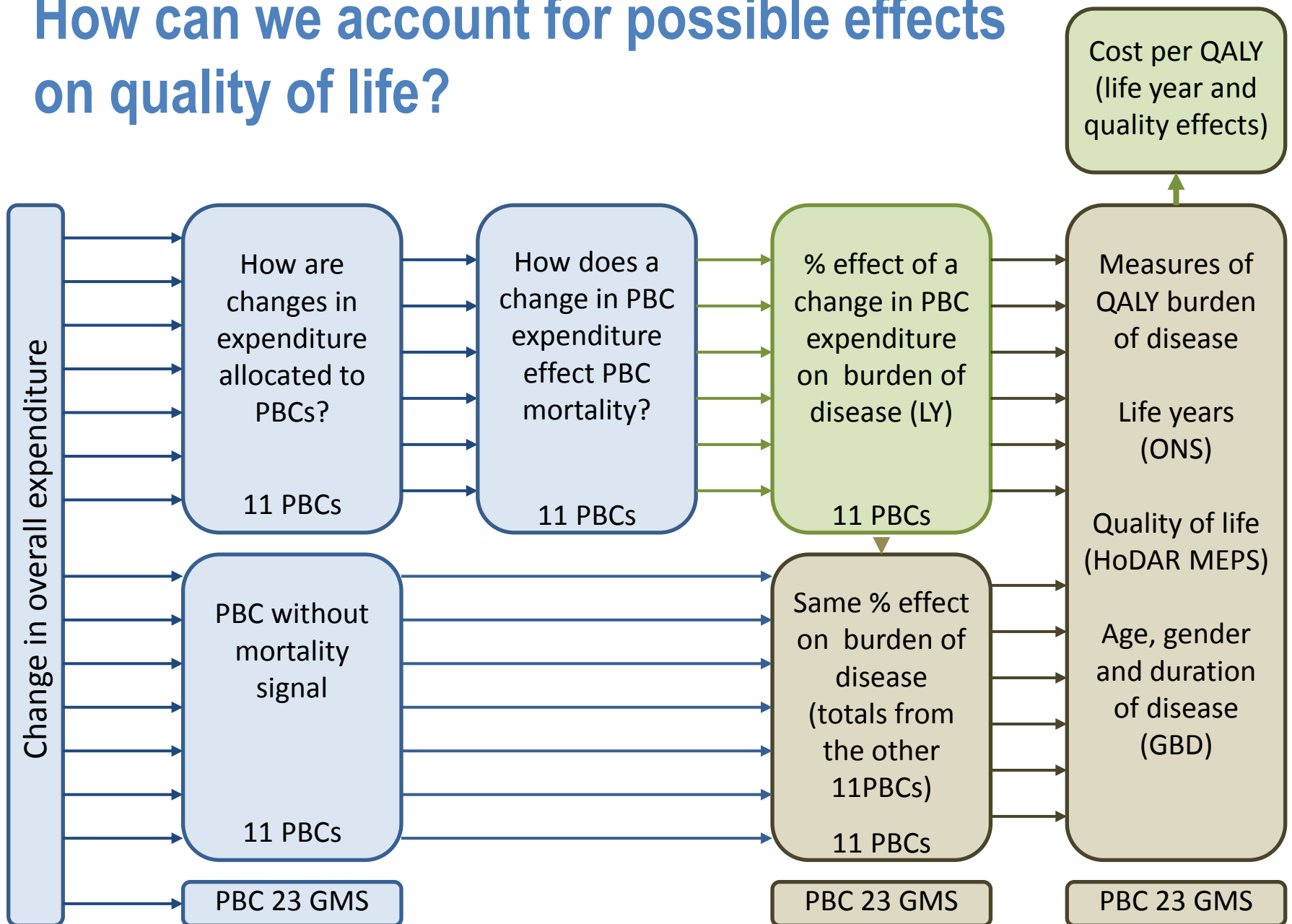
How can we account for possible effects on quality of life?



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Estimates of the threshold (2008-09)

| | Cost per death averted | Cost per life year | Cost per QALY (mortality effects) | Cost per QALY |
|--------------------------------|------------------------|--------------------|-----------------------------------|------------------------|
| <i>Qol associated with LYs</i> | - | 1 | <i>Norms</i> | <i>Based on burden</i> |
| <i>Qol during disease</i> | - | 0 | 0 | <i>Based on burden</i> |
| <i>YLL per death averted</i> | - | 4.5 YLL | 4.5 YLL | 4.5 YLL |
| <i>QALYs per death averted</i> | - | 4.5 YLL | 3.8 QALY | 12.7 QALY |
| 11 PBCs (with mortality) | £105,872 | £23,360 | £28,045 | £8,308 |
| All 23 PBCs | £114,272 | £25,214 | £30,270 | £12,936 |

What are the expected health consequences of £10m?

| | Change in spend | Additional deaths | LY lost | Total QALY lost | Due to premature death | Quality of life effects |
|-----------------------|-----------------|-------------------|------------|-----------------|------------------------|-------------------------|
| Totals | 10 (£m) | 51 | 233 | 773 | 150 | 623 |
| Cancer | 0.45 | 3.74 | 37.5 | 26.3 | 24.4 | 1.9 |
| Circulatory | 0.76 | 22.78 | 116.0 | 107.8 | 73.7 | 34.1 |
| Respiratory | 0.46 | 13.37 | 16.1 | 229.4 | 10.1 | 219.3 |
| Gastro-intestinal | 0.32 | 2.62 | 24.7 | 43.9 | 16.2 | 27.7 |
| Infectious diseases | 0.33 | 0.72 | 5.3 | 15.7 | 3.6 | 12.1 |
| Endocrine | 0.19 | 0.67 | 5.0 | 60.6 | 3.2 | 57.3 |
| Neurological | 0.60 | 1.21 | 6.5 | 109.1 | 4.3 | 104.8 |
| Genito-urinary | 0.46 | 2.25 | 3.3 | 10.6 | 2.1 | 8.5 |
| Trauma & injuries* | 0.77 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| Maternity & neonates* | 0.68 | 0.01 | 0.4 | 0.2 | 0.2 | 0.1 |
| Disorders of Blood | 0.21 | 0.36 | 1.7 | 21.8 | 1.1 | 20.7 |
| Mental Health | 1.79 | 2.83 | 12.8 | 95.3 | 8.3 | 87.0 |
| Learning Disability | 0.10 | 0.04 | 0.2 | 0.7 | 0.1 | 0.6 |
| Problems of Vision | 0.19 | 0.05 | 0.2 | 4.2 | 0.2 | 4.1 |
| Problems of Hearing | 0.09 | 0.03 | 0.1 | 14.0 | 0.1 | 13.9 |
| Dental problems | 0.29 | 0.00 | 0.0 | 6.8 | 0.0 | 6.8 |
| Skin | 0.20 | 0.24 | 1.1 | 1.9 | 0.7 | 1.2 |
| Musculo skeletal | 0.36 | 0.39 | 1.8 | 23.2 | 1.2 | 22.1 |
| Poisoning and AE | 0.09 | 0.04 | 0.2 | 0.8 | 0.1 | 0.7 |
| Healthy Individuals | 0.35 | 0.03 | 0.2 | 0.7 | 0.1 | 0.6 |
| Social Care Needs | 0.30 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other (GMS) | 1.01 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |

Accounting for other aspects of value?

- How much and what type of health and for whom?
 - Life years and quality of life effects
 - By age, gender and ICD code
- Severity, unmet need and burden
 - Burden of disease
 - Expected QALE without and with disease
 - Absolute and proportionate shortfall
- Wider social benefits
 - Net production effects of a change in health
 - Marketed and non market production
 - Net of marketed and non marketed consumption

| Proportionate Shortfall (% QALY loss) | | | Absolute Shortfall (QALY loss) | | | Wider Social Benefits (net production) | | |
|---------------------------------------|-------------------------------------|-----------|--------------------------------|-------------------------------------|-------------|--|-------------------------------------|----------------|
| C22 | Liver cancer | 73% | C22 | Liver cancer | 10.70 | M05 | Rheumatoid arthritis | £30,034 |
| C25 | Pancreatic cancer | 73% | C25 | Pancreatic cancer | 9.97 | E11 | Diabetes | £27,421 |
| C34 | Lung cancer | 71% | C34 | Lung cancer | 9.68 | M45 | Ankylosing spondylitis | £26,190 |
| C92 | Myeloid leukaemia | 38% | F20 | Schizophrenia | 7.62 | F30 | Depression | £23,489 |
| G20 | Parkinson's disease | 31% | G35 | Multiple sclerosis | 6.18 | F20 | Schizophrenia | £22,697 |
| C90 | Myeloma | 31% | C92 | Myeloid leukaemia | 6.15 | J45 | Asthma | £20,100 |
| C64 | Kidney cancer | 22% | G20 | Parkinson's disease | 4.60 | M81 | Osteoporosis | £17,910 |
| G35 | Multiple sclerosis | 18% | C90 | Myeloma | 4.45 | G35 | Multiple sclerosis | £15,482 |
| J43 | Emphysema and COPD | 17% | J43 | Emphysema and COPD | 3.80 | J43 | Emphysema and COPD | £14,525 |
| G30 | Alzheimer's disease | 14% | C64 | Kidney cancer | 3.75 | G40 | Epilepsy | £14,245 |
| F03 | Dementia | 14% | F30 | Depression | 3.63 | L40 | Psoriasis | £11,890 |
| F20 | Schizophrenia | 12% | M05 | Rheumatoid arthritis | 2.83 | Displaced | Average of displaced QALYs | £11,611 |
| M05 | Rheumatoid arthritis | 11% | E11 | Diabetes | 2.68 | E66 | Obesity | £8,138 |
| C61 | Prostate cancer | 11% | Displaced | Average of displaced QALYs | 2.07 | C53 | Cervical cancer | £6,912 |
| I26 | Embolisms, fibrillation, thrombosis | 11% | J45 | Asthma | 1.86 | K50 | Irritable Bowel Syndrome | £6,284 |
| E11 | Diabetes | 11% | G30 | Alzheimer's disease | 1.68 | J30 | Allergic rhinitis | £5,234 |
| C18 | Colon cancer | 10% | F03 | Dementia | 1.68 | G20 | Parkinson's disease | £3,102 |
| I21 | Acute myocardial infarction | 9% | G40 | Epilepsy | 1.32 | C50 | Breast cancer | £2,888 |
| I64 | Stroke | 8% | C18 | Colon cancer | 1.28 | G30 | Alzheimer's disease | £351 |
| Displaced | Average of displaced QALYs | 8% | I26 | Embolisms, fibrillation, thrombosis | 1.16 | A40 | Streptococcal septicaemia | -£513 |
| F30 | Depression | 6% | C61 | Prostate cancer | 1.06 | F03 | Dementia | -£2,430 |
| G40 | Epilepsy | 4% | I21 | Acute myocardial infarction | 1.00 | I64 | Stroke | -£6,949 |
| J45 | Asthma | 4% | I64 | Stroke | 0.83 | C18 | Colon cancer | -£8,061 |
| C50 | Breast cancer | 3% | C53 | Cervical cancer | 0.60 | C61 | Prostate cancer | -£10,602 |
| C53 | Cervical cancer | 3% | C50 | Breast cancer | 0.55 | C64 | Kidney cancer | -£13,211 |
| L40 | Psoriasis | 2% | A40 | Streptococcal septicaemia | 0.38 | I21 | Acute myocardial infarction | -£14,395 |
| J10 | Influenza | 2% | J30 | Allergic rhinitis | 0.30 | I26 | Embolisms, fibrillation, thrombosis | -£16,752 |
| M81 | Osteoporosis | 2% | M81 | Osteoporosis | 0.28 | J10 | Influenza | -£21,568 |
| J30 | Allergic rhinitis | 2% | K50 | Irritable Bowel Syndrome | 0.26 | C90 | Myeloma | -£23,382 |
| A40 | Streptococcal septicaemia | 2% | J10 | Influenza | 0.19 | C92 | Myeloid leukaemia | -£24,813 |
| K50 | Irritable Bowel Syndrome | 1% | L40 | Psoriasis | 0.19 | C22 | Liver cancer | -£32,709 |
| E66 | Obesity | 0% | E66 | Obesity | 0.18 | C34 | Lung cancer | -£36,067 |
| M45 | Ankylosing spondylitis | 0% | M45 | Ankylosing spondylitis | 0.11 | C25 | Pancreatic cancer | -£53,860 |

Accounting for other aspects of value?

- Set of weights
 - Relative value of different types of health (burden)
 - Consumption value of health (WSBs)
- Cost per QALY threshold
 - Basic threshold
- Cost per weighted QALY threshold
 - Burden, WSB or both
- Adjust the basic threshold
 - Weight on health gained/weight on health displaced

Consequences of recent proposals?

- Recent proposals
 - No explicit weights
 - Upper bound extended to £50,000
- Evidence of acceptance creep
 - No technologies rejected ICER under £30,000
 - Lower bound has become irrelevant
 - ICERs of £39,417 to £43,949 = 0.5 probability of rejection
- Health consequences (every £10m NHS costs)
 - Threshold of £20,000 or lower
 - Every £10m means loss of at least 500 QALYs

| ICER | Health gained | Health lost | Net loss |
|---------|---------------|-------------|-----------|
| £30,000 | 334 QALYs | 500 QALYs | 166 QALYs |
| £50,000 | 200 QALYs | 500 QALYs | 300 QALYs |

Accountable deliberation

- Appraisal of ranibizumab (Lucentis) for diabetic macular oedema 2011
 - Retinal thickness ≥ 400 subgroup before PAS
 - Additional costs = £3,506 per patient
 - Incremental cost-effectiveness = £25,000 per QALY
 - 23,000 eligible patients each year

| Attributes | Investment | Disinvestment |
|-------------------------|--|-----------------------------|
| | Lucentis for diabetic macular oedema (£80m pa) | Expected effects of £80m pa |
| Deaths | 0 | -411 |
| Life years | 0 | - 1,864 |
| QALYs | 3,225 | - 6,184 |
| Burden of disease | | |
| Absolute QALY loss | 2.68 | 2.07 |
| Proportionate QALY loss | 11% | 8% |
| Net production effects | | |
| Consumption (£) | 85.2m | - 49.8m |
| QALY equivalent | 1,420 | - 830 |

Implications for policy

- NICE
 - Upper bound of the NICE threshold is certainly too high
 - NICE guidance is currently doing more harm than good
 - Paying too much not to little for new drugs
- Pharmaceutical pricing
 - Rational, predictable, accountable evidence based pricing
 - Mechanisms for differential global prices
- Accountable and ethical decisions
 - Makes unidentified NHS patients more real
 - Exposes reality of the choices face with current resources
 - Contribute to informed debate and social change