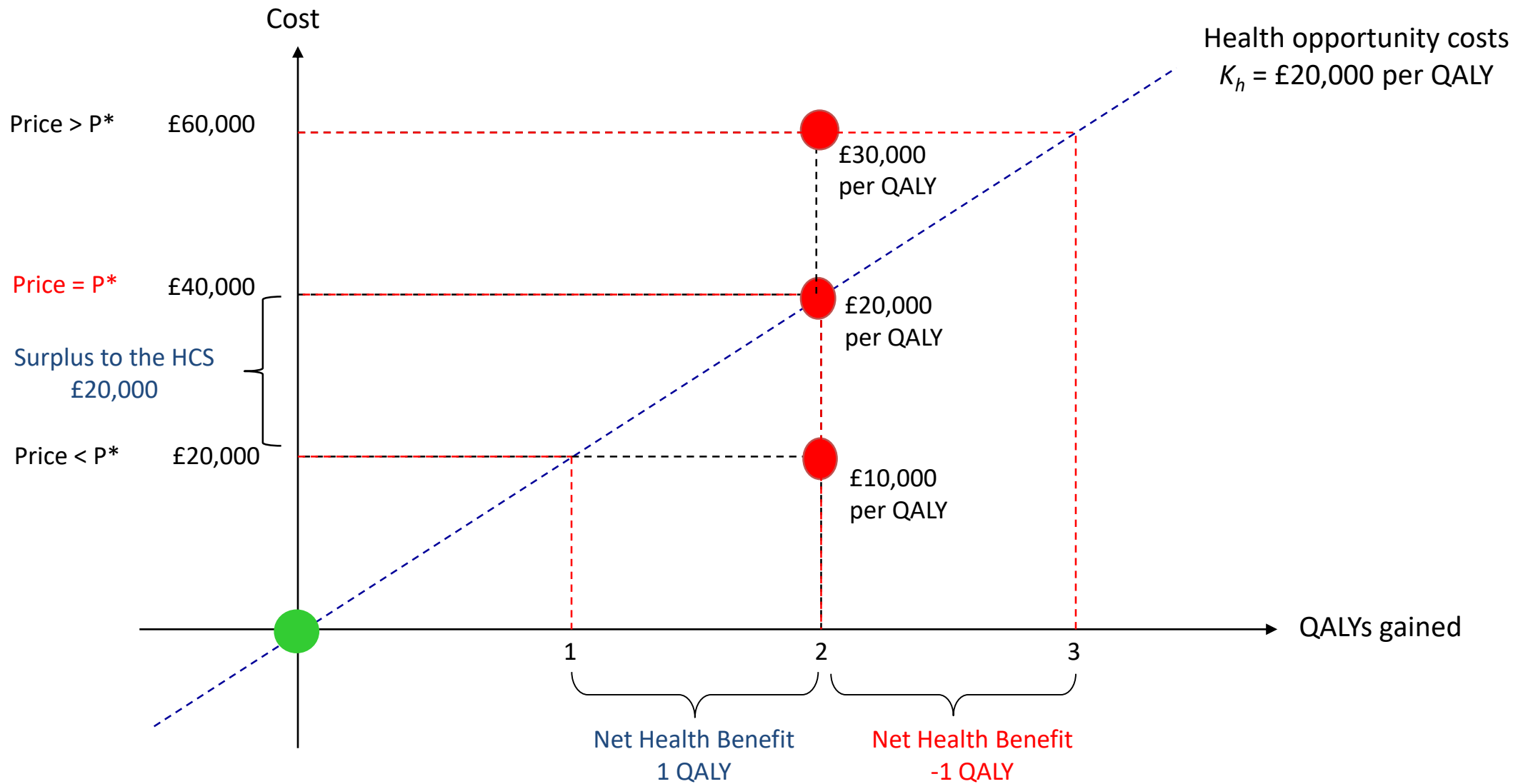


Fair prices, fair access and future innovation

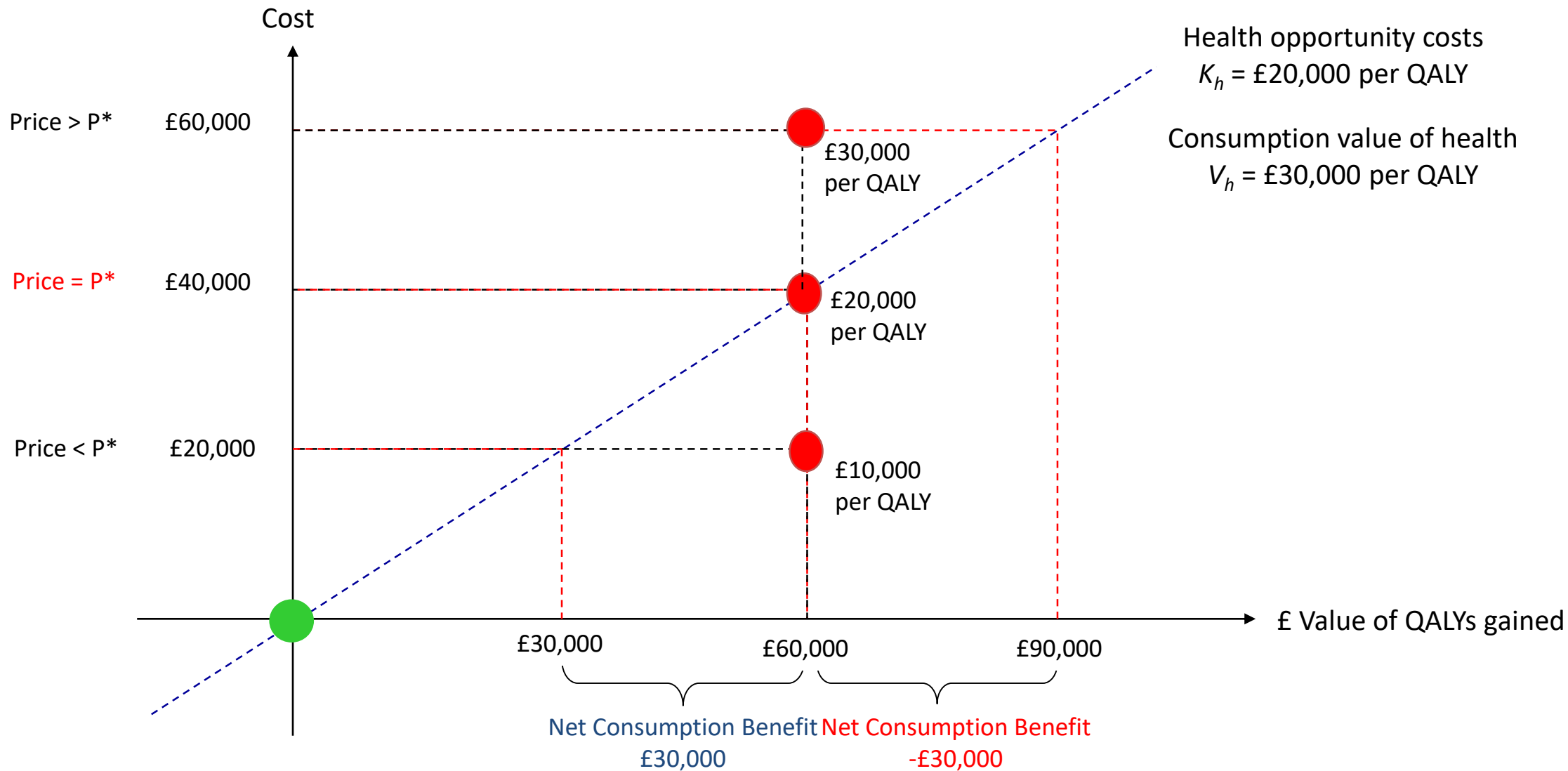
Karl Claxton

26/7/2019

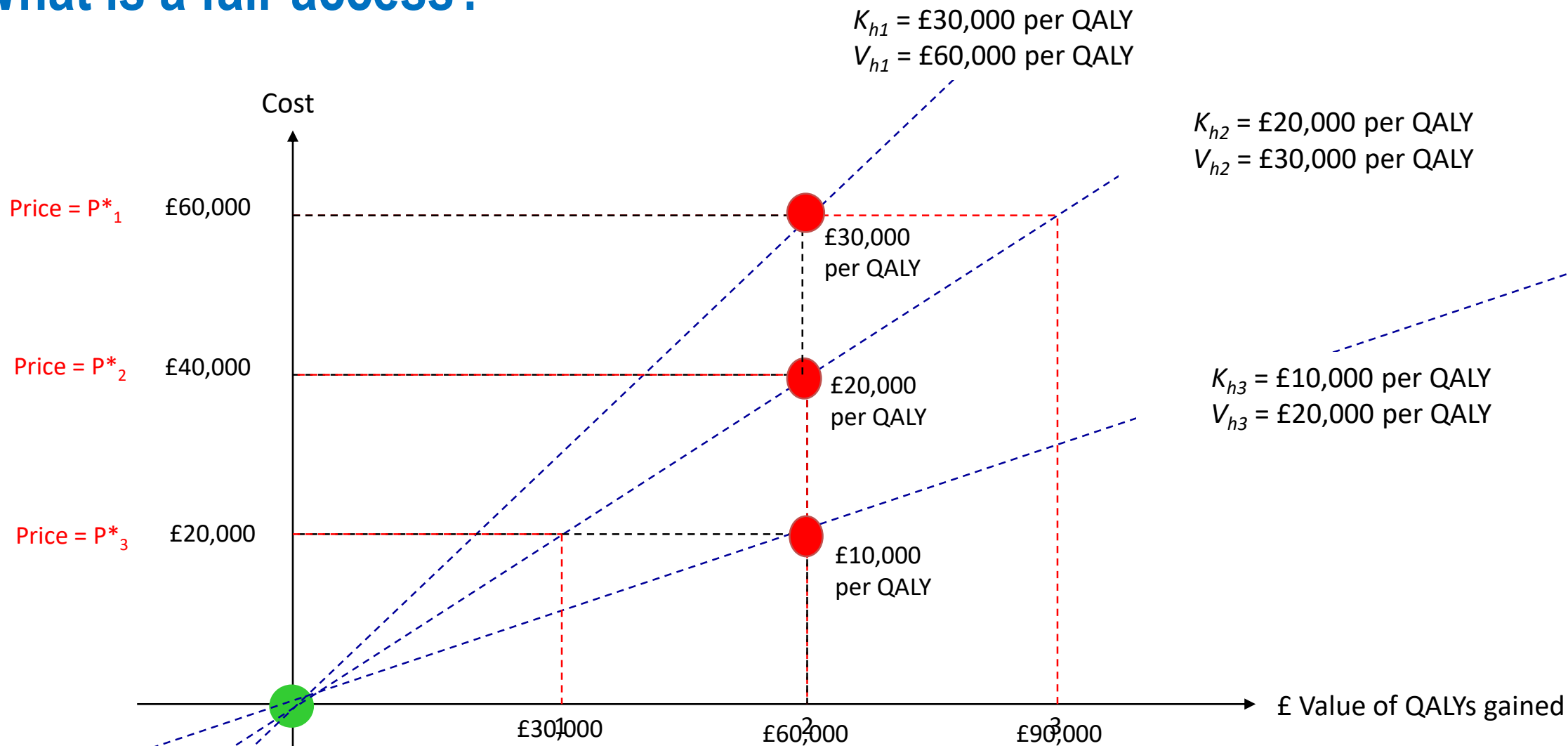
What is a fair price?



What is a fair price?

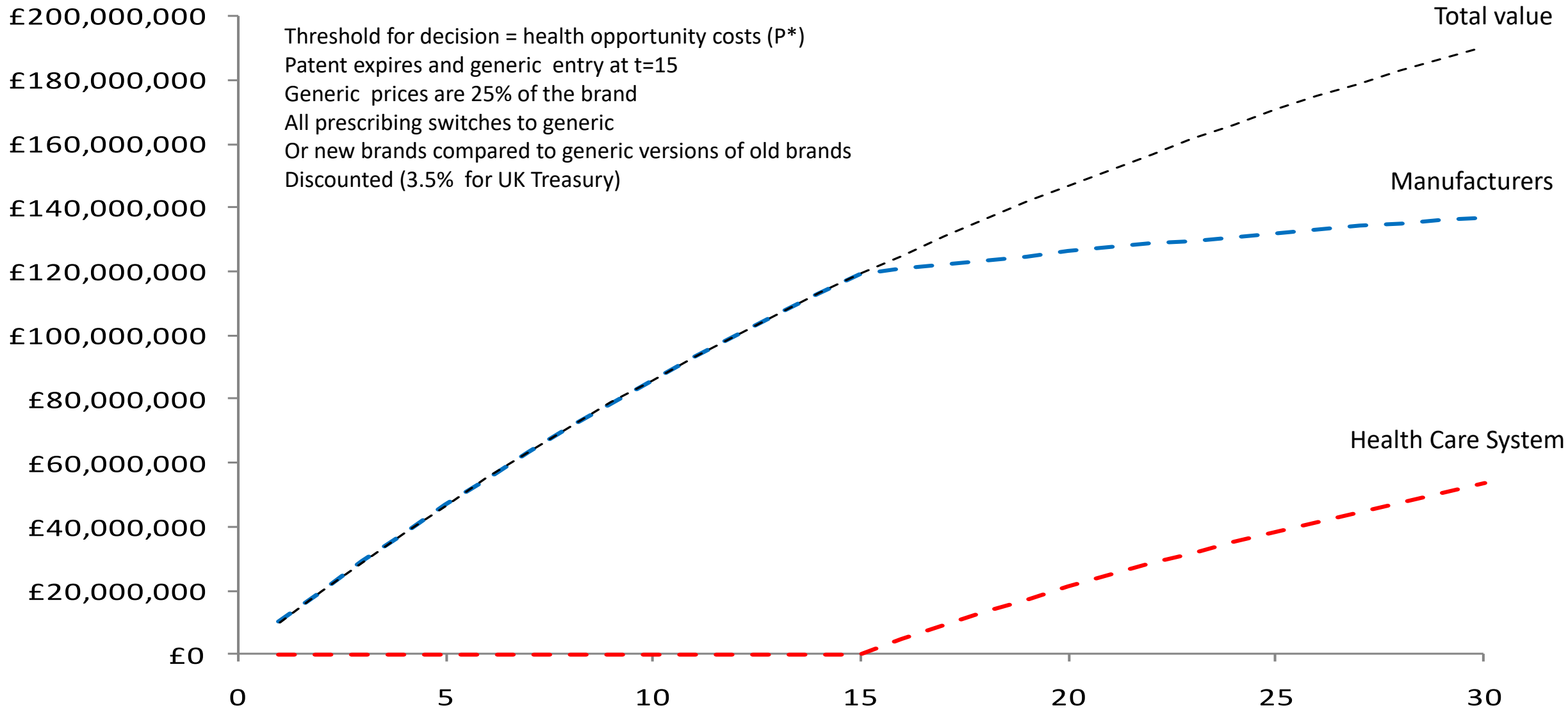


What is a fair access?

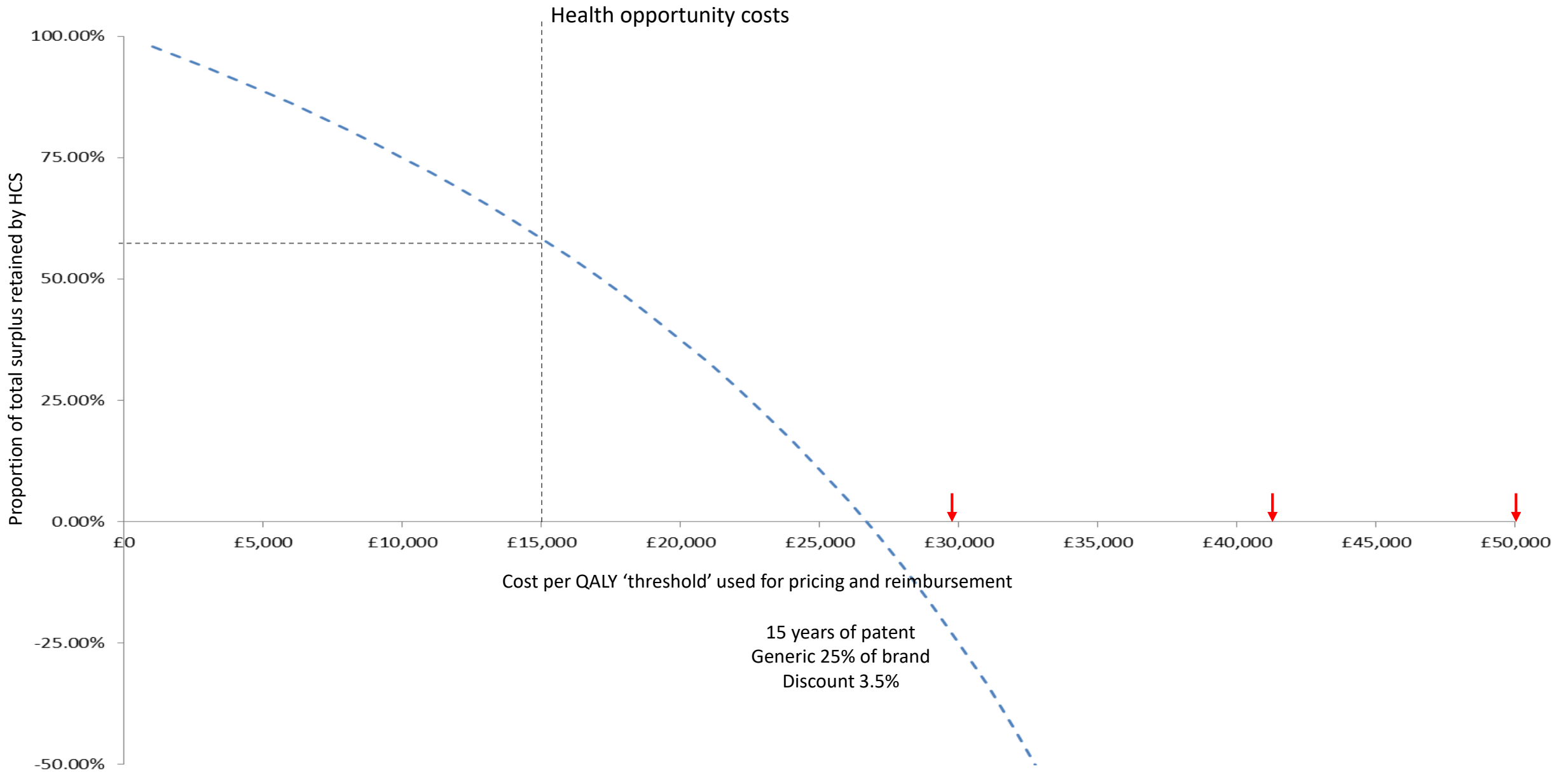


| Thresholds | Plan 1 | Plan 2 | Plan 3 | Totals |
|-----------------------|--|---|---|-------------------------|
| K_{h1} and V_{h1} | $2 * \text{£}60,000 - 2 * \text{£}60,000 = 0$ | $2 * \text{£}30,000 - 3 * \text{£}30,000 = -\text{£}30,000$ | $2 * 20,000 - 6 * \text{£}20,000 = -\text{£}80,000$ | -5 QALYs or -£110,00 |
| K_{h2} and V_{h2} | $2 * \text{£}60,000 - 1.333 * \text{£}60,000 = \text{£}52,000$ | $2 * \text{£}30,000 - 2 * \text{£}30,000 = 0$ | $2 * 20,000 - 4 * \text{£}20,000 = -\text{£}40,000$ | -1.333 QALYs or £12,000 |
| K_{h3} and V_{h3} | $2 * \text{£}60,000 - 0.666 * \text{£}60,000 = \text{£}80,000$ | $2 * \text{£}30,000 - 1 * \text{£}30,000 = \text{£}30,000$ | $2 * 20,000 - 2 * \text{£}20,000 = 0$ | 2.333 QALYs or £110,000 |

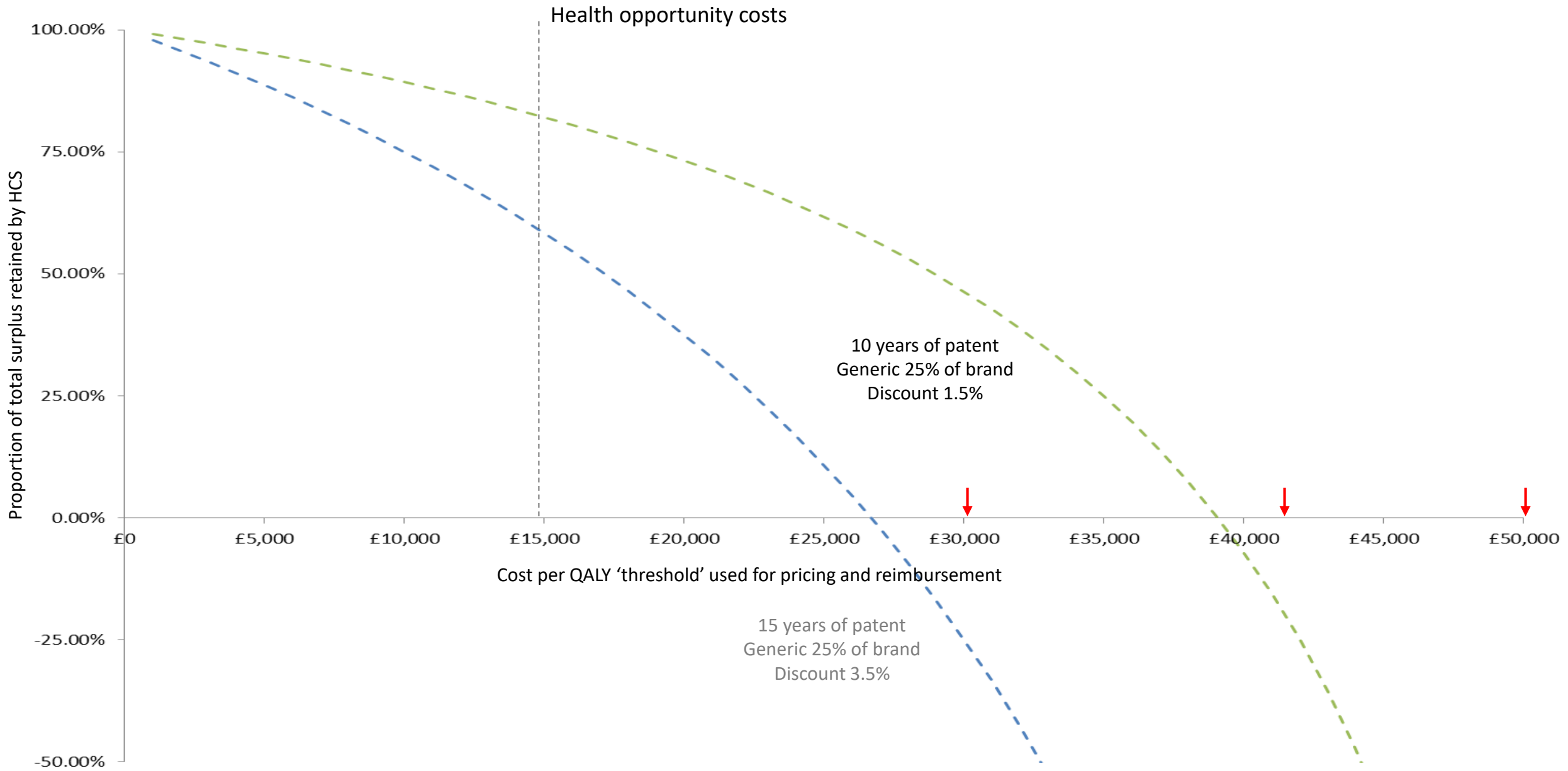
What about future innovation?



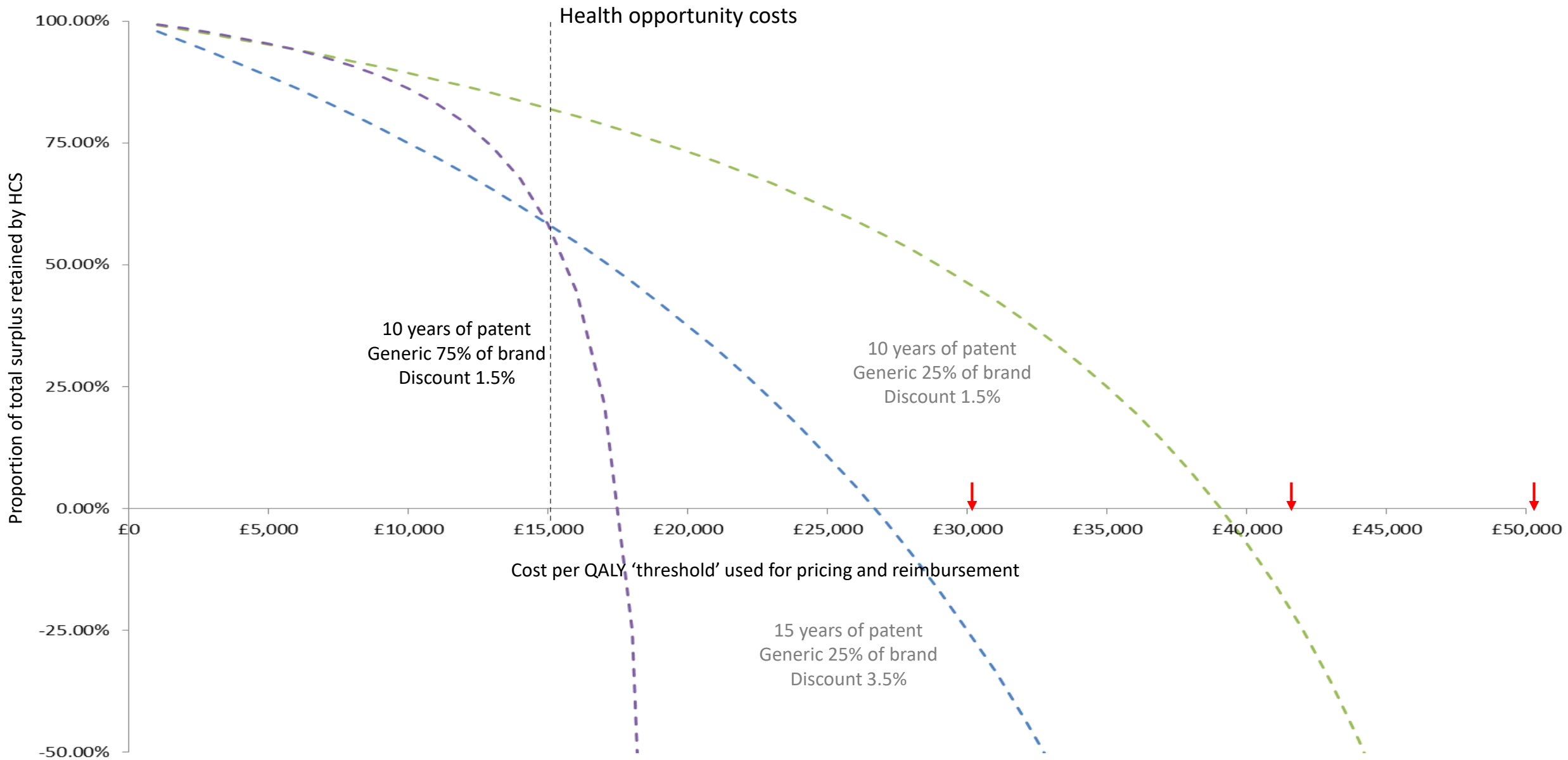
How is value shared?



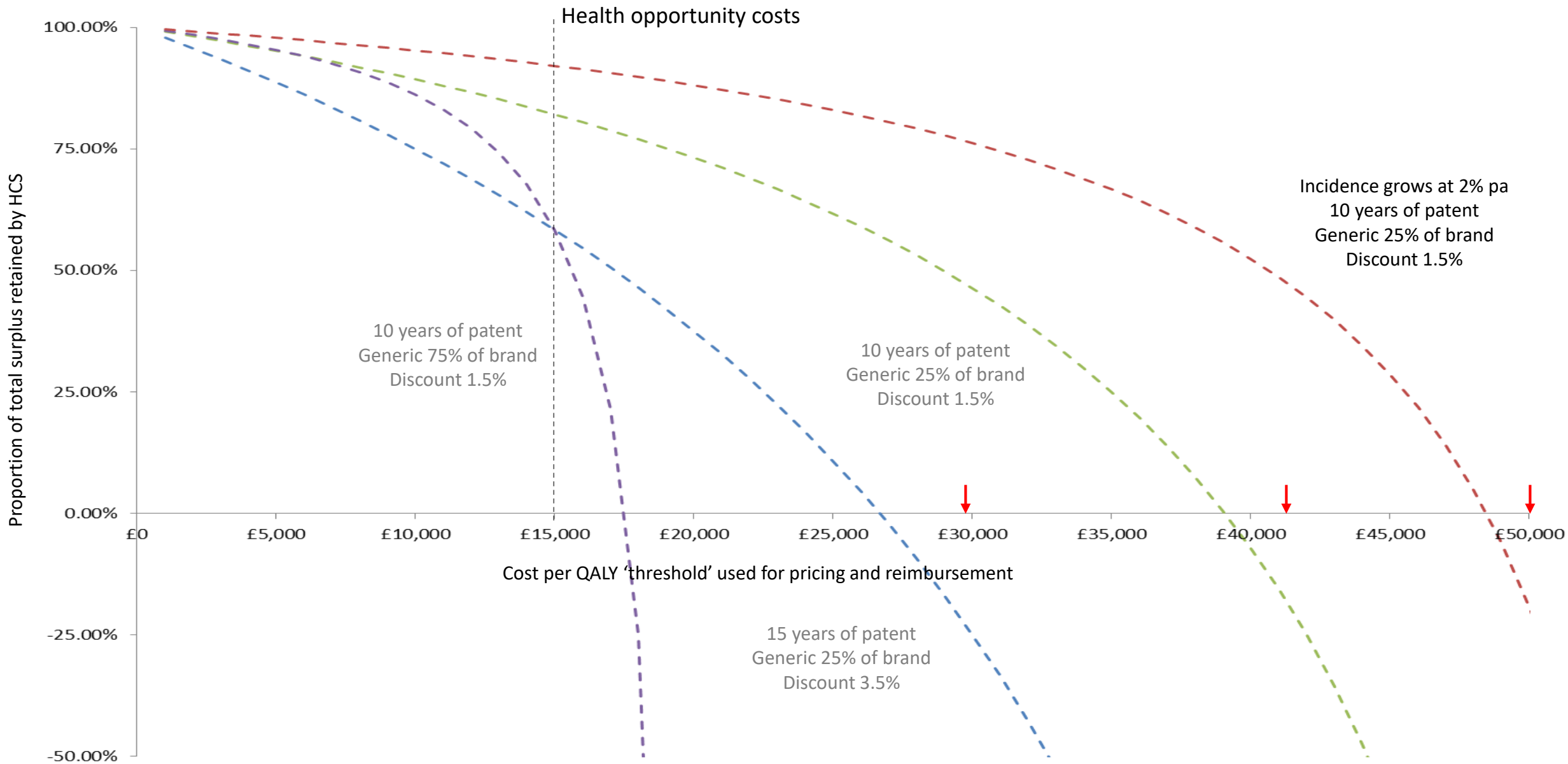
How is value shared?



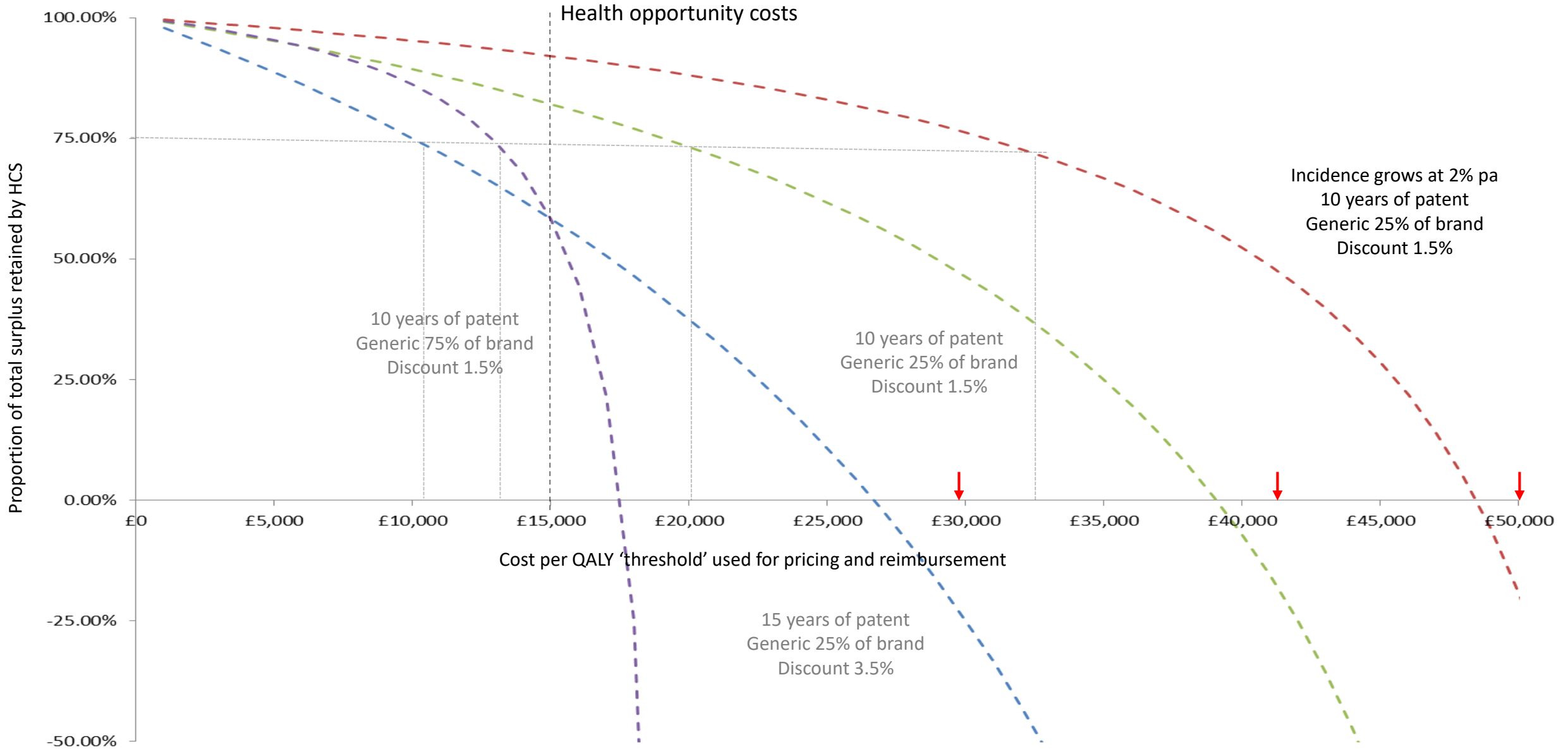
How is value shared?



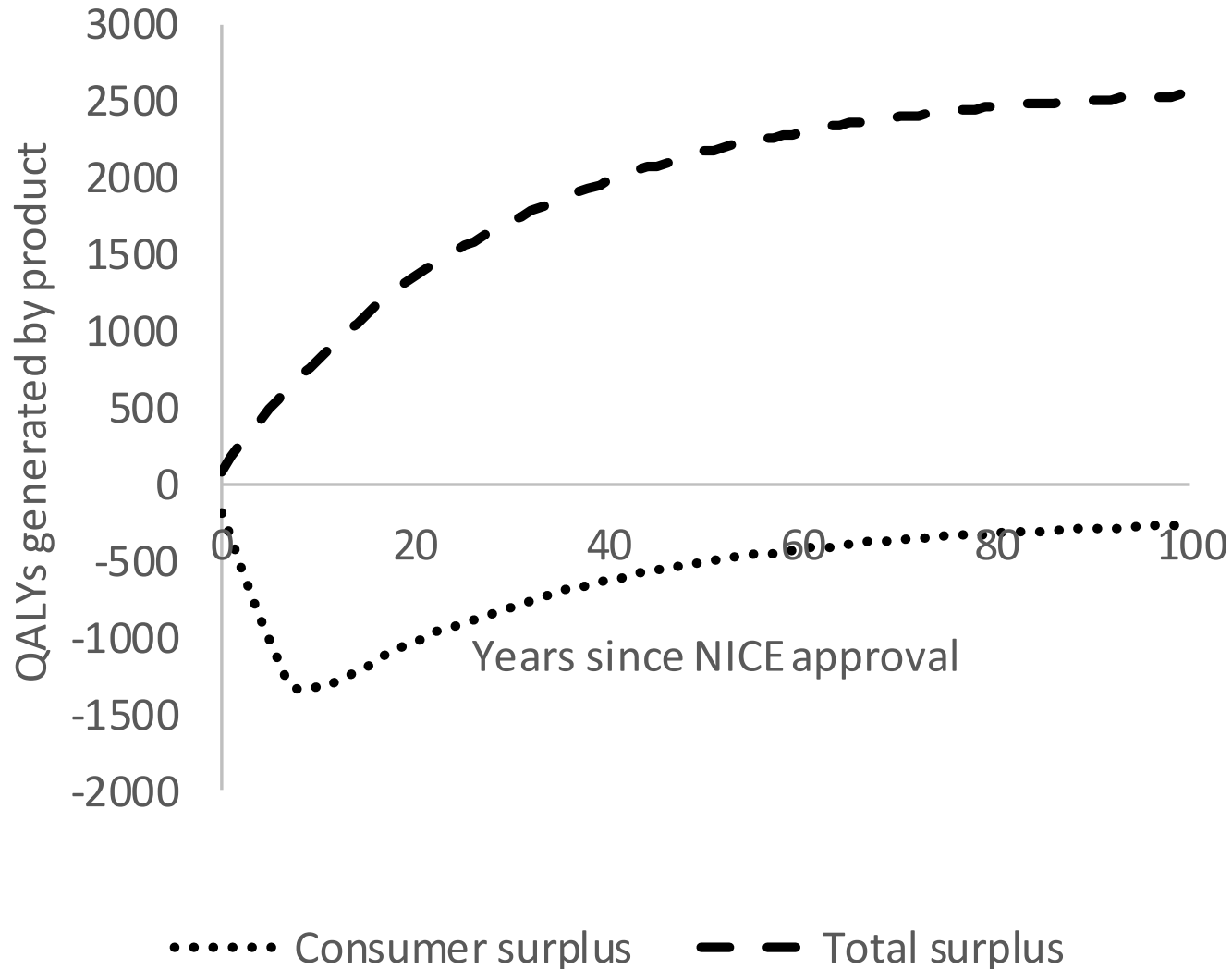
How is value shared?



How should value be shared?



TA391 Cabazitaxel for prostate cancer



- Consumer surplus does not rise above zero due to high approval norm
- Consumer surplus will be lower if initial approval within the Cancer Drugs Fund taken in to account

Recent UK estimates

- Scale of health opportunity costs
- Type of health effects (mortality, survival and morbidity)
- Where these are likely to occur (disease, age, gender)
- Severity of disease (burden, absolute and proportional)
- Net production effects (marketed and non marketed)
- Impact on health inequality
- Affordability and the scale of budget impact
- Elicitation from clinical and policy experts (surrogacy and extrapolation assumptions)
- Re-estimated for all waves of data
- Other categories of non NHS expenditure (public health, social care)

- Claxton, K., Martin, S., Soares, M., et al.. Methods for the estimation of the NICE cost effectiveness threshold. Health Technology Assessment, 2015; 19(14) (see web page for more materials about this research <https://www.york.ac.uk/che/research/teehta/thresholds/>)
- Claxton K, Sculpher M, Palmer S, Culyer AJ. Causes for concern: is nice failing to uphold its responsibilities to all NHS patients? Health Economics. 2015 Jan 7;24(1):1-7. Available from, DOI: 10.1002/hec.3130
- Love-Koh J, Cookson R, Claxton K, Griffin S. Who gains most from public healthcare spending? Estimated health impacts of changes in English NHS expenditure by age, sex and socioeconomic status. Re-submission MDM
- Lomas J, Claxton K, Martin S, Soares M. Resolving the 'cost-effective but unaffordable' 'paradox': estimating the health opportunity costs of non-marginal budget impacts: Estimating the Health Opportunity Costs of Non marginal Budget Impacts. Value in Health. 2018 Mar;21(3):266-275. Available from, DOI: 10.1016/j.jval.2017.10.006.
- Soares M, Sculpher M, Claxton K (2018) Health Opportunity Costs: Assessing the Implications of Uncertainty Using Elicitation Methods with Experts. Policy Research Unit in Economic Evaluation of Health and Care Interventions. Universities of Sheffield and York. Resubmitted to MDM

What are the expected health consequences of £10m?

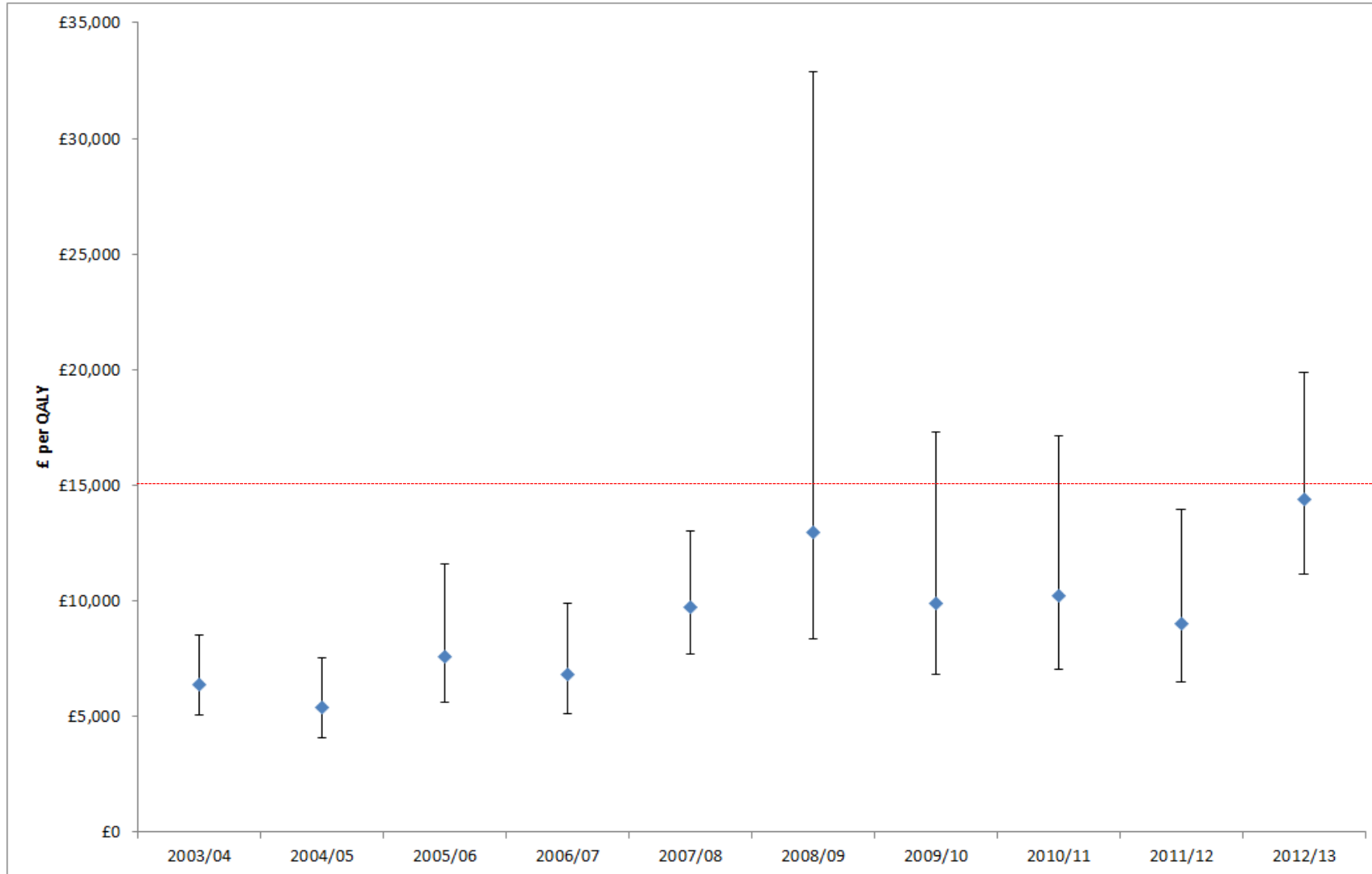
| | Change in spend | Additional deaths | LY lost | Total QALY lost | Due to premature death | Quality of life effects |
|-----------------------|-----------------|-------------------|------------|-----------------|------------------------|-------------------------|
| Totals | 10 (£m) | 51 | 233 | 773 | 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 |

What type of QALYs are lost/gained and what are the other effects of changes in expenditure?

The effects of 1 QALY gained or lost in each ICD code

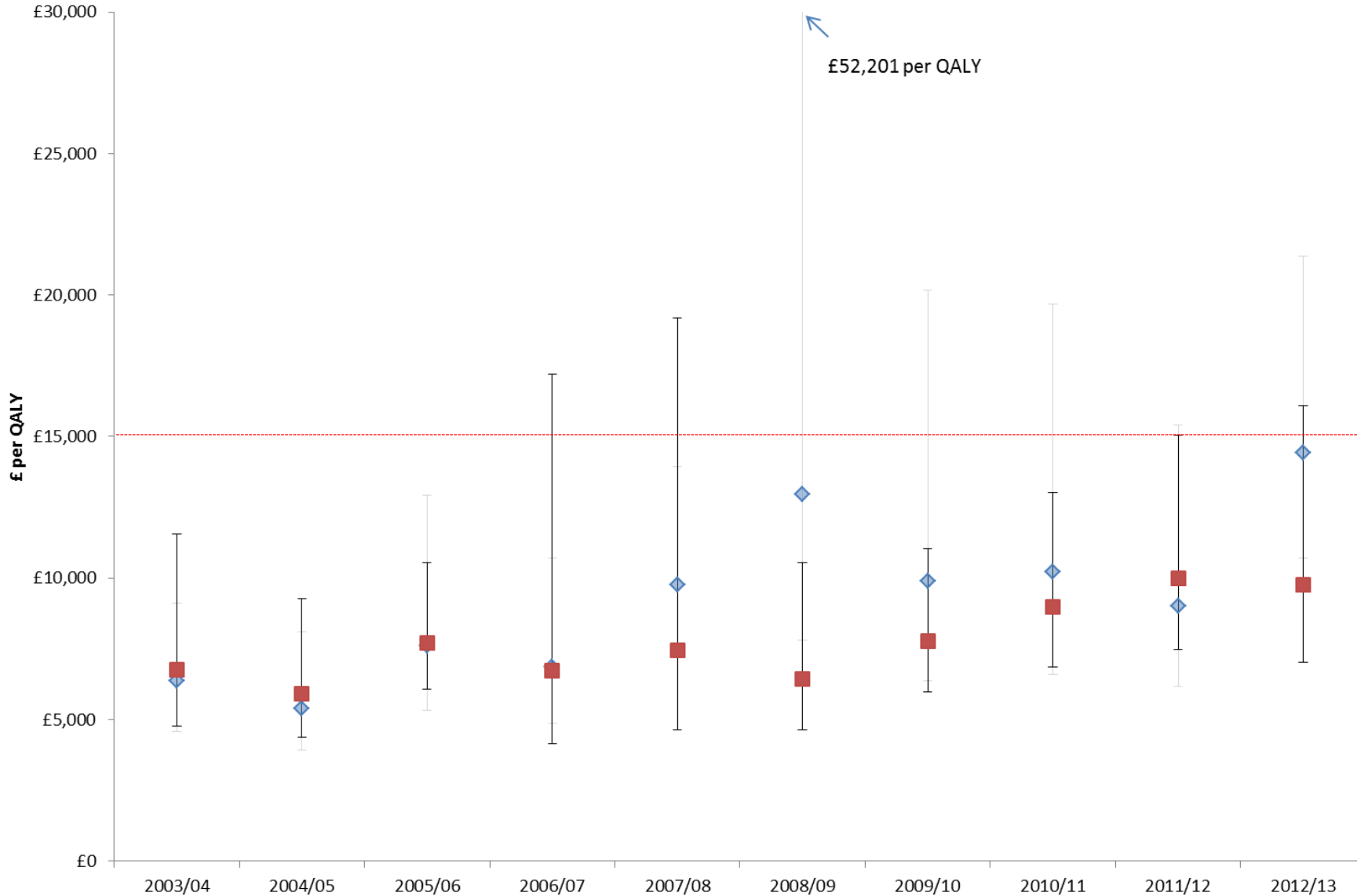
| Proportionate Shortfall (% QALY loss) | | | Absolute Shortfall (QALY loss) | | | Wider Social Benefits (net production) | | |
|---------------------------------------|-------------------------------------|-----------|--------------------------------|-------------------------------------|-------------|--|--|-----------------|
| 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 |

Re-estimated for all waves of data



Lomas J, Martin S and Claxton K. Estimating the marginal productivity of the English National Health Service from 2003/04 to 2012/13. Forthcoming, Value in Health 2019

Alternative approach to identification



Lomas J, Martin S and Claxton K. Estimating the marginal productivity of the English National Health Service from 2003/04 to 2012/13. Forthcoming, Value in Health 2019

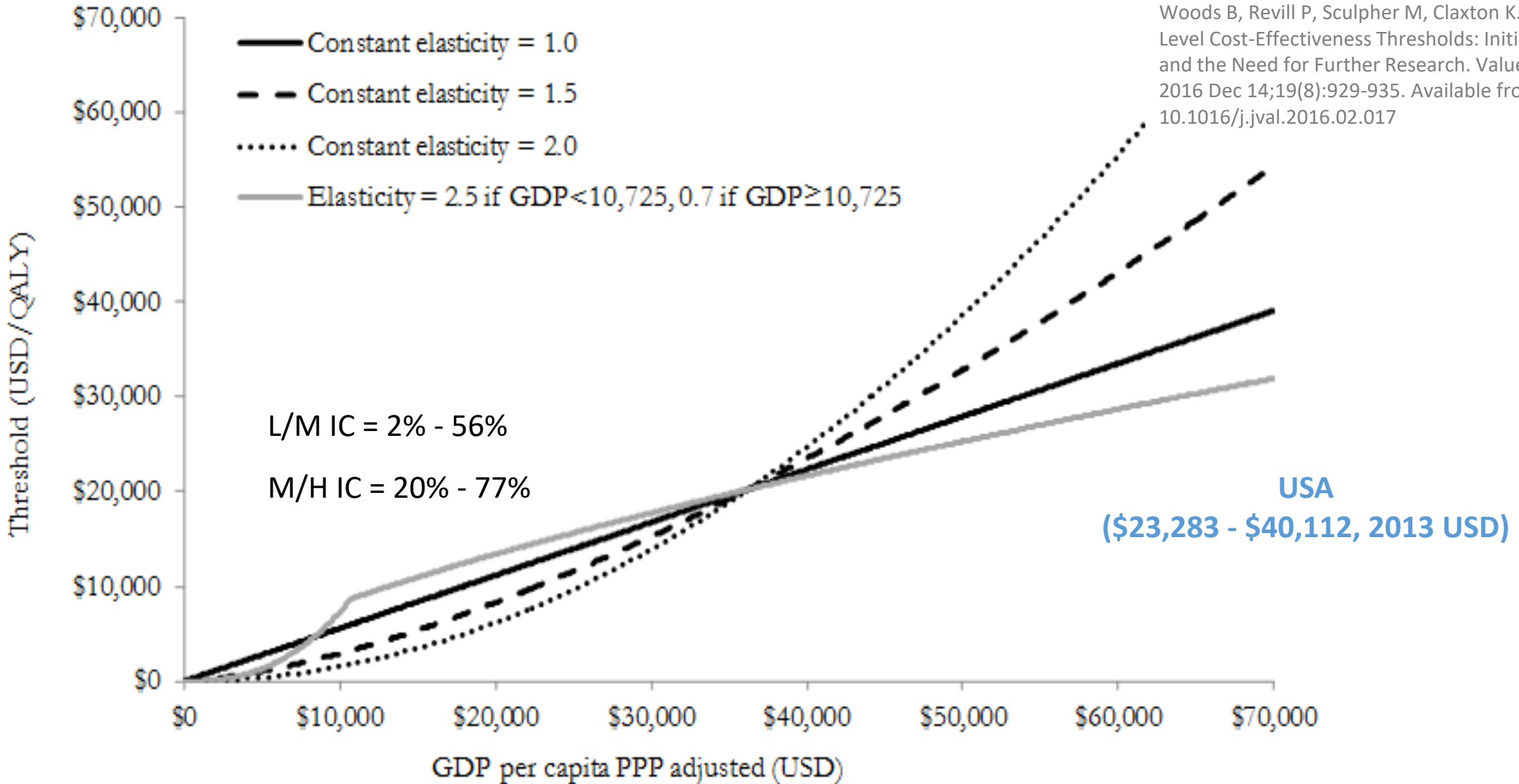
Martin S, Lomas J and Claxton K. How effective is marginal health care expenditure? Evidence from England for 2003/04 to 2012/13. Submitting of Royal Statistical Society July 2019

Claxton K, Lomas J, Martin S. The impact of NHS expenditure on health outcomes in England: Alternative approaches to identification in all-cause and disease specific models of mortality. Health Economics. 2018 Apr 2. Available from, DOI: 10.1002/hec.3650

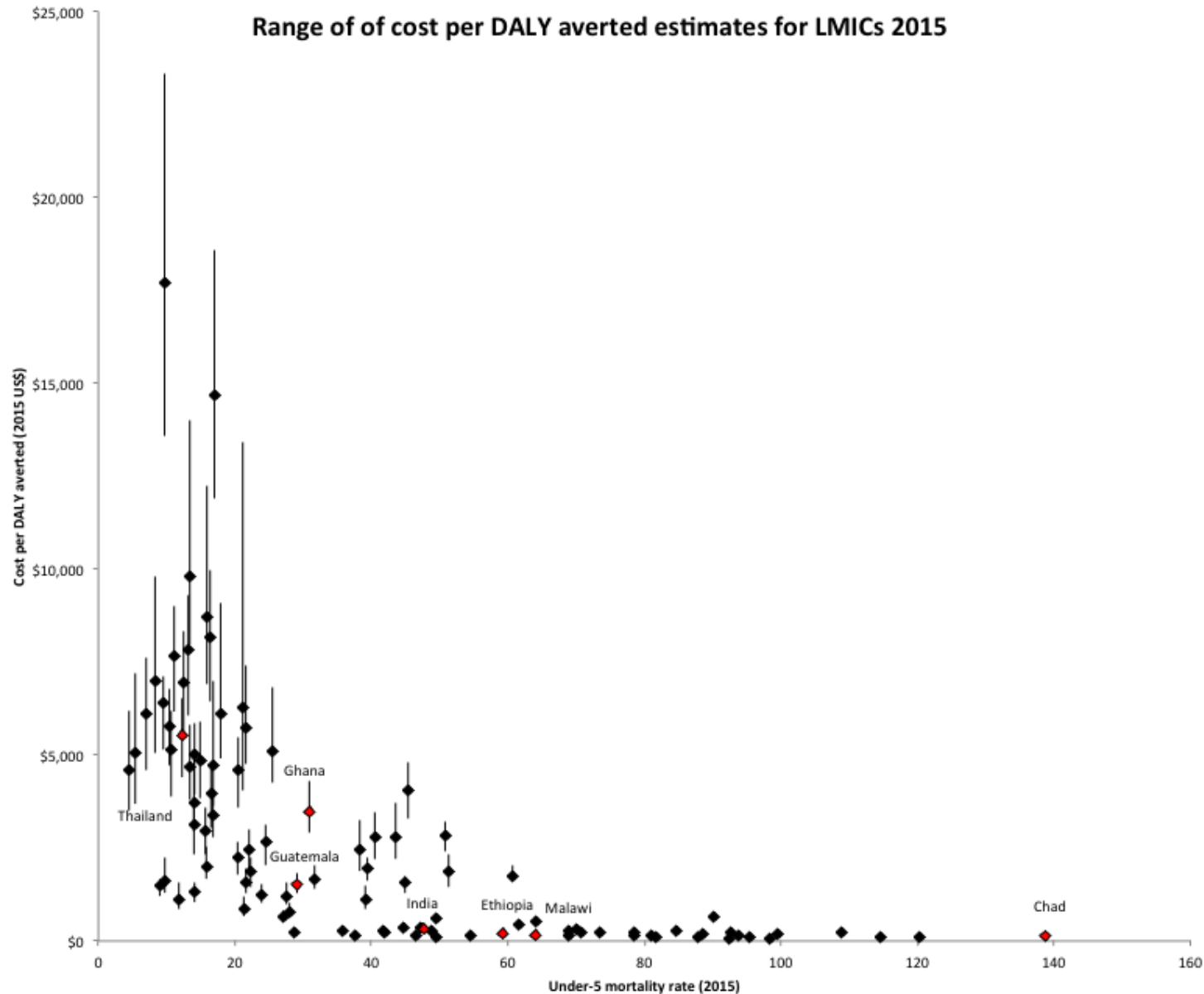
Other estimates using within country data

- Australia (Edney et al)
 - \$28,033 per QALY AUD (\$20,758 to \$37,667)
- Spain (Vallejo-Torres et al)
 - 22,000€ to 25,000€ per QALY
- Netherlands (van Baal)
 - 41,000€ per QALY (CVD hospital care only)
- Sweden (Siverskog and Henriksson)
 - 39,000€ per QALY
- Indonesia (Kreif et al)
 - \$331 per DALY averted (USD)
- South Africa (Edoka and Hofman)
 - \$3,000 per DALY averted (USD)

Evidence of health opportunity costs



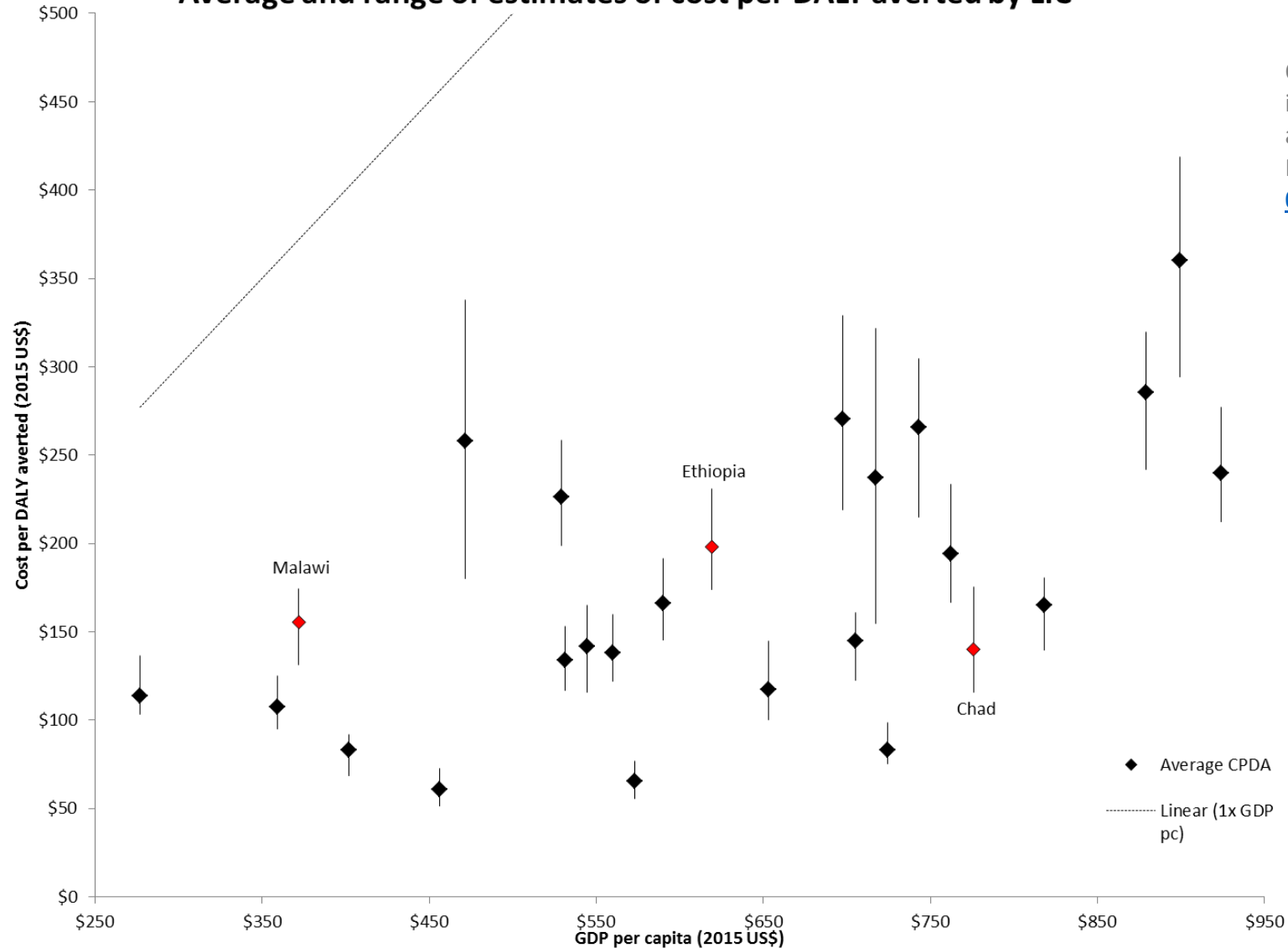
Evidence of health opportunity costs



Ochalek J, Lomas J, Claxton K. Estimating health opportunity costs in low-income and middle-income countries: a novel approach and evidence from cross-country data. *BMJ Global health*. 2018 Nov 5;3(6):e000964. <https://doi.org/10.1136/bmjgh-2018-000964>

Evidence of health opportunity costs

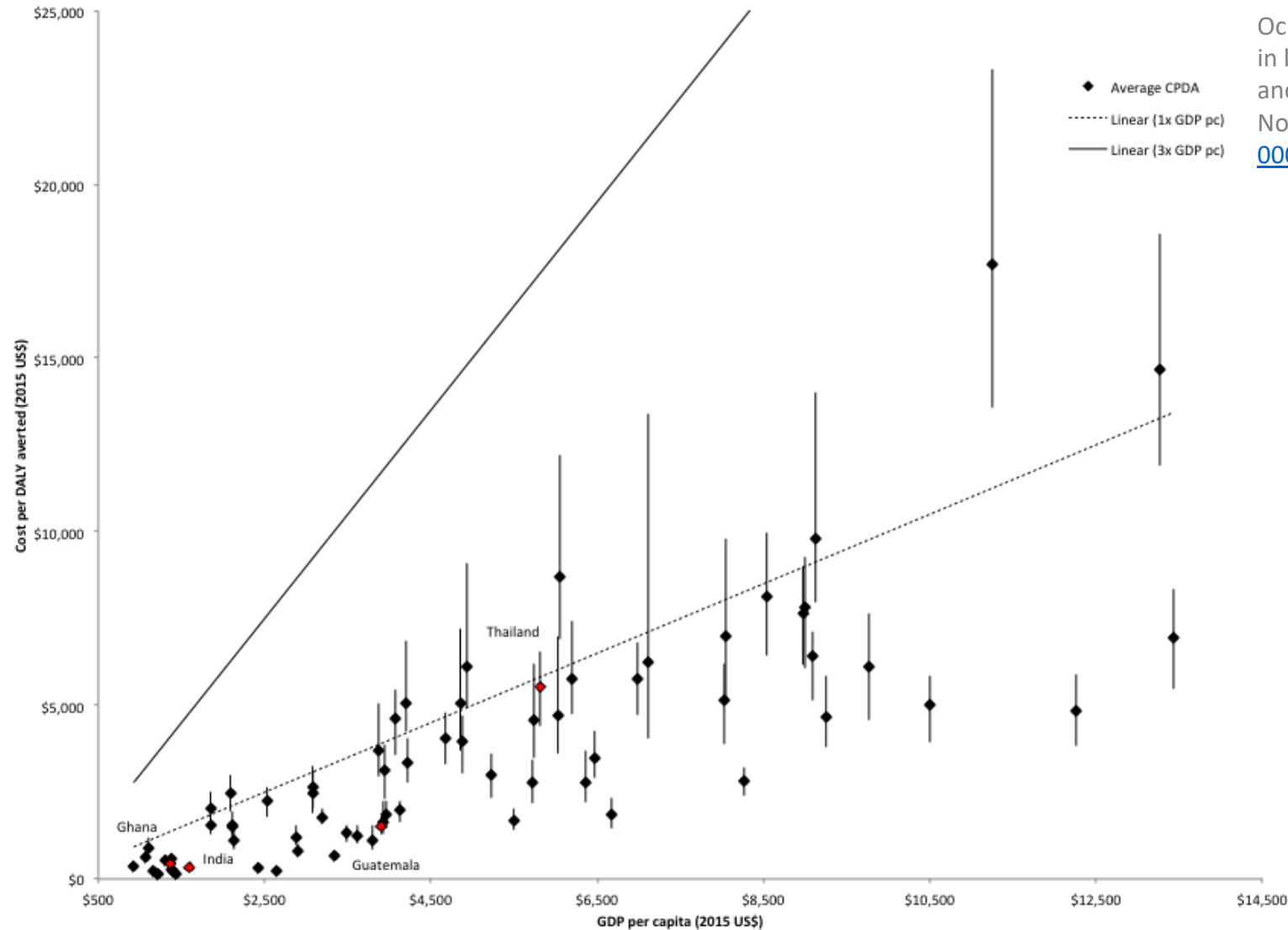
Average and range of estimates of cost per DALY averted by LIC



Ochalek J, Lomas J, Claxton K. Estimating health opportunity costs in low-income and middle-income countries: a novel approach and evidence from cross-country data. *BMJ Global health*. 2018 Nov 5;3(6):e000964. <https://doi.org/10.1136/bmjgh-2018-000964>

Evidence of health opportunity costs

Range of cost per DALY averted estimates for MICs 2015



Ochalek J, Lomas J, Claxton K. Estimating health opportunity costs in low-income and middle-income countries: a novel approach and evidence from cross-country data. *BMJ Global health*. 2018 Nov 5;3(6):e000964. <https://doi.org/10.1136/bmjgh-2018-000964>

USA ###
(### -### US\$ 20##)

Estimating health opportunity costs in Canada

Cost per DALY averted ≈ QALY gained for (2013 C\$)

| | Claxton et al | Andrews et al | Bokhari et al |
|---------------------------|-----------------|-----------------|-----------------|
| | (-1.028) | (-0.705) | (-0.193) |
| Canada | \$19,914 | \$29,032 | \$97,321 |
| Alberta | \$26,060 | \$37,991 | \$125,997 |
| British Columbia | \$19,227 | \$28,029 | \$96,042 |
| Manitoba | \$21,722 | \$31,667 | \$104,498 |
| New Brunswick | \$18,265 | \$26,628 | \$90,166 |
| Newfoundland and Labrador | \$21,392 | \$31,186 | \$104,902 |
| Northwest Territories | \$52,191 | \$76,087 | \$249,536 |
| Nova Scotia | \$18,002 | \$26,244 | \$89,814 |
| Nunavut | \$41,776 | \$60,903 | \$177,375 |
| Ontario | \$19,606 | \$28,582 | \$95,706 |
| Prince Edward Island | \$16,425 | \$23,945 | \$82,939 |
| Quebec | \$17,936 | \$26,147 | \$87,446 |
| Saskatchewan | \$20,804 | \$30,329 | \$99,467 |
| Yukon | \$30,633 | \$44,659 | \$155,899 |

Cost per DALY averted ≈ QALY gained for (2015 US\$)

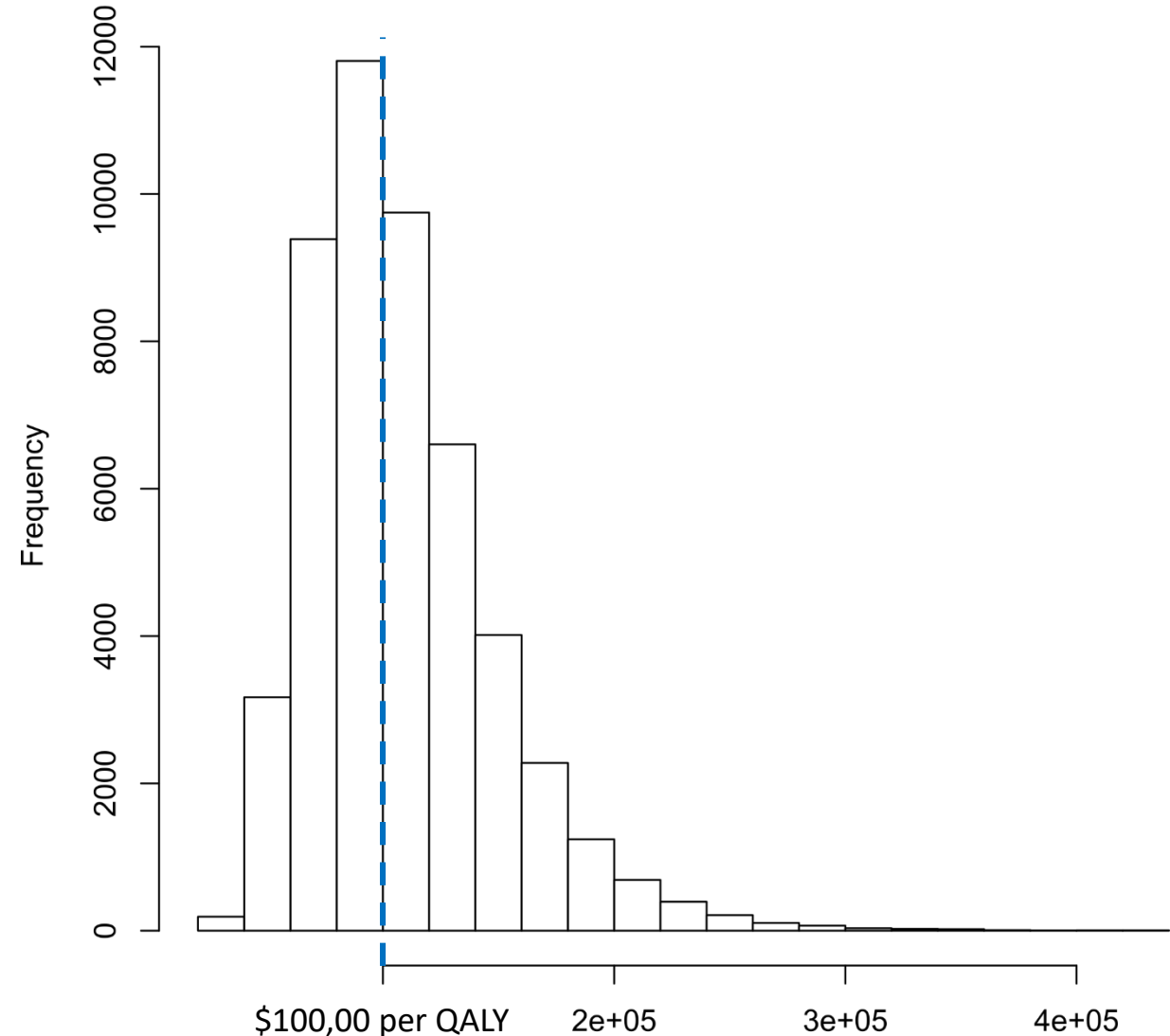
| | Claxton et al | Andrews et al | Bokhari et al |
|------------|-----------------|-----------------|------------------|
| | (-1.028) | (-0.705) | (-0.206.) |
| USA | \$16,048 | \$23,397 | \$80,234 |

What are the health effects of additional health care costs in the USA?

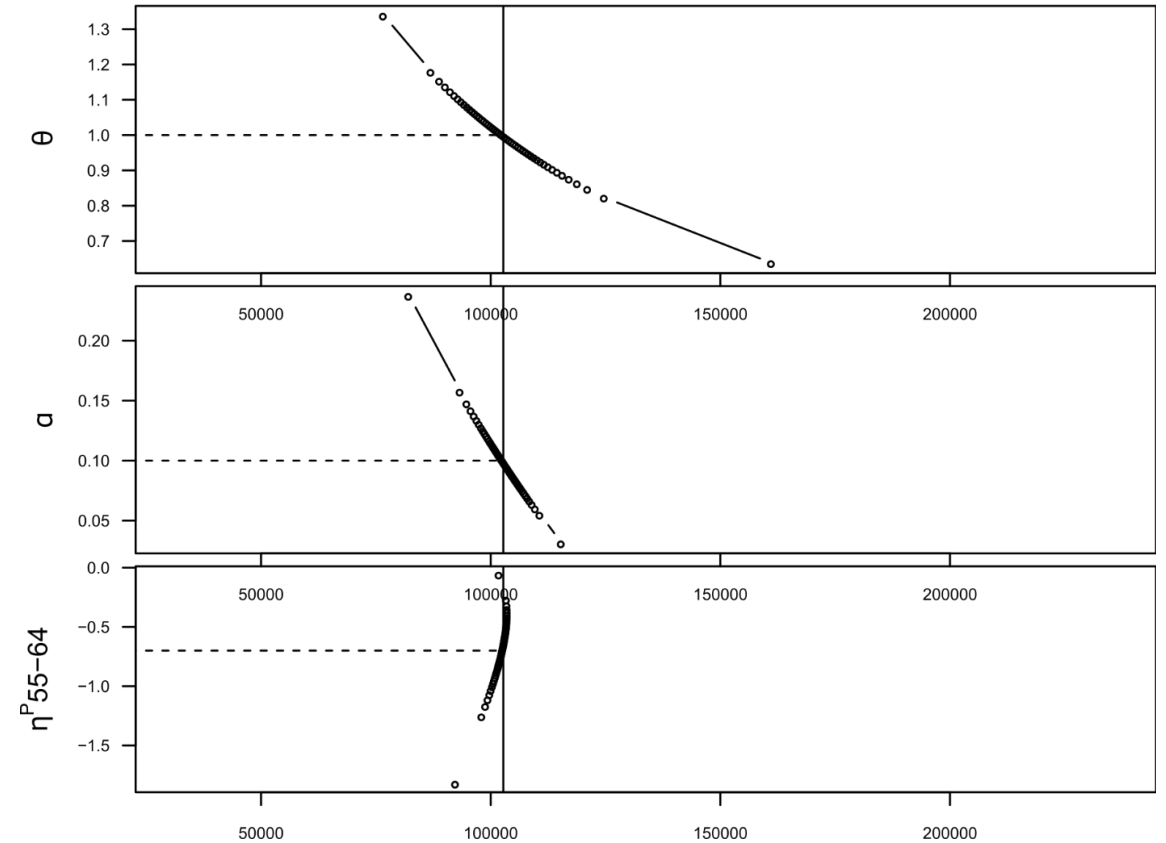
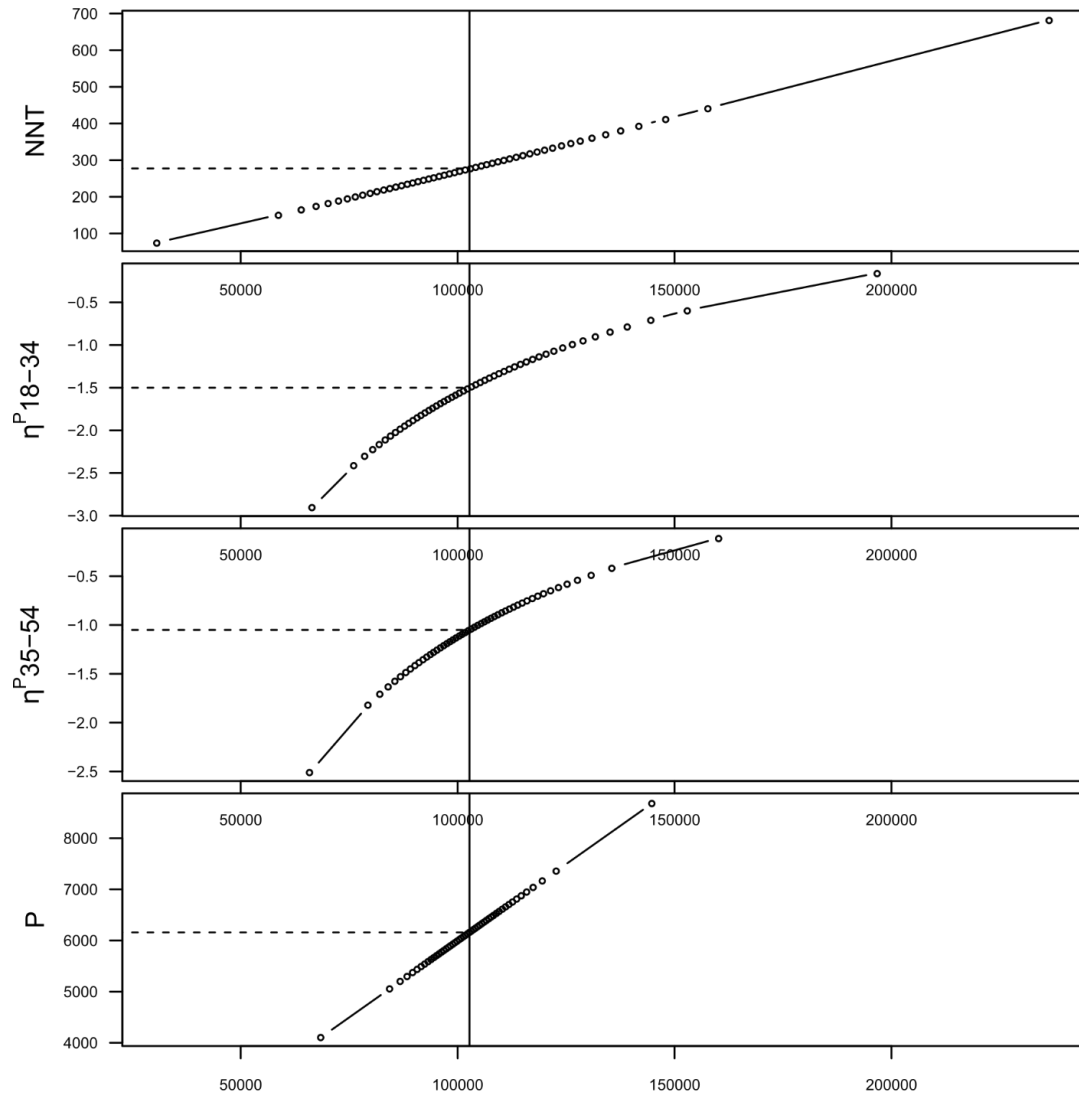
- Single payer health care systems (marginal productivity of expenditure)
 - Medicaid (50 systems), federal and state \$
 - Veterans Administration, federal \$
 - Medicare (not allowed make decisions, still good to know you what get for federal \$)
- Private health insurance plans
 - Health effect of being 'priced out' at plan choice or point of care
 - Costs net of the co-pay are passed on
 - Co-pay for the new drug has health (at point of care), consumption, and federal \$ (HAS) effects
 - Employers or employees may decide
 - Stop offering/buying coverage (has health and consumption effects)
 - Reduce the benefits offered to control costs (has health and consumption effects)
 - Increase in co-pays and deductibles (has health, consumption, and federal \$ effects)
 - Health and consumption effects likely greater for lower income and greater health need

Estimating health opportunity costs for private plans in the USA

- Dave Vanness iHEA 2017
 - Proportion insured by age
 - 100% pass through
 - Elasticity coverage wrt premium
 - Mortality effects of loss of coverage
 - Quality adjusted survival effects
 - Morbidity effects of loss coverage
 - Quality life effects of survivors
 - QALY effects of additional costs
 - = £100,000 per QALY



Estimating health opportunity costs for private plans in the USA



What are the effects of approving a new drug

- New drug 1 QALY gained ppt (100 patients)
- Costs additional \$200,000 ppt
- 20% co-pay
- 10% have HAS, will be topped up
- Marginal costs of public finance is 1.2 (\$1 federal = \$1.20 in your pocket)
- Marginal income tax 25%
- Health opportunity costs, kh = \$100,000 per QALY (Dave)
- Consumption value of health Vh = \$100,000 per QALY (Chuck)
- 10,000 initially in the plan
- Probability drop coverage 0.1

| | New drug | Opportunity costs | Net value |
|---|------------|-------------------|------------|
| Health effects | 1 | 1.6 | - \$60,000 |
| Consumption effects HSA | -\$3,000 | | -\$3,000 |
| Consumption effects | -\$36,000 | | -\$36,000 |
| Total consumption costs | -\$39,000 | \$2,222.22 | -\$41.222 |
| Consumption value of Federal \$ effects | -\$1,200 | | -\$1,200 |
| Total cost (plan + consumption) | -\$200,200 | | -\$202,422 |

What else do we need?

- Courage
 - We use estimates of health opportunity costs because you don't pay for your health care, other people do, sometimes with their lives and the lives and dignity of their loved ones
- Honesty (tell the truth)
 - K_h and V_h differ across your health care 'systems' and 'plans' or tell a story
 - Reduce health overall
 - Force those who can afford it least to pay too much for their health care
 - Impoverish those already struggling with non health care bills
 - Reveal the implications of current arrangements and add to the accountability of those responsible for them
- Humility
 - There is no such thing as a 'decision rule'
 - But there can be accountable decisions
 - Accountable to reason, evidence and reasonably held, but disputed social values