Quantifying Health Equity Impacts in Effectiveness and Cost-Effectiveness Studies

Workshop convenors:

Richard Cookson, Centre for Health Economics, University of York

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Download Excel workshop exercise:

https://www.york.ac.uk/che/research/equity/economic_evaluation/publicviews/

Scroll down and click on Interactive Spreadsheet Questionnaire ("slider")

Workshop Aims

- To communicate the basic principles of health equity impact evaluation to health services and public health researchers who do not specialise in health equity

- To explain why health equity impact evaluation matters and how it can add value to standard effectiveness and cost-effectiveness studies that focus on average health impacts

- To raise awareness of the range of practical methods that now exist for quantifying health equity impacts in effectiveness and cost-effectiveness studies

- To provide practical examples and further readings that will help researchers conduct their own health equity impact evaluation studies

Workshop Schedule

- Introduction (20 mins)
  - Effectiveness (Tim)
  - Cost-effectiveness (Richard)

- Equity trade-off exercise (20 mins) (Shehzad)
(small groups of 4-6 people with one laptop each)

- Cost-effectiveness analysis examples (20 mins)
  - Bowel cancer screening in England (Miqdad)
  - Rotavirus vaccination in Ethiopia (Andrew)

- Applying this to your own research (20 mins)
(small groups of 4-6 people to discuss one or two applications each)

- Summing up (10 mins)

Key Readings

Cookson, R, Mirelman, A, Asaria, M, Dawkins, B, Griffin, S. (2016). Fairer Decisions, Better Health for All: Health Equity and Cost-Effectiveness Analysis. CHE Research Paper. *(contains 18 further readings)*
https://www.york.ac.uk/che/research/equity/economic_evaluation/

Asaria, M, Griffin, S and Cookson, R. (2016). "Distributional Cost-Effectiveness Analysis: A Tutorial." Medical Decision Making 36(1): 8-19.
http://mdm.sagepub.com/content/36/1/8.abstract

Verguet, S., J. J. Kim and D. T. Jamison (2016). "Extended cost-effectiveness analysis for health policy assessment: a tutorial." PharmacoEconomics 34(9): 913-923. http://link.springer.com/article/10.1007/s40273-016-0414-z

Victora C, Vaughan J, Barros F, Silva A, Tomasi E. Explaining trends in inequities: evidence from Brazilian child health studies. Lancet 2000;356:1093-98.

Rheingans, R., Atherly, D., Anderson, J. Distributional impact of rotavirus vaccination in 25 GAVI countries: Estimating disparities in benefits and cost-effectiveness. Vaccine 2012; 30S:A15-A23.

QUANTIFYING HEALTH EQUITY IMPACTS IN EFFECTIVENESS STUDIES

Tim Doran

**Department of Health Sciences, University of York**

INVERSE EQUITY HYPOTHESIS

○ New public-health interventions and programmes disproportionately benefit those of higher socioeconomic status.

○ Interventions only later affect the poor.

○ There are early increases in inequity ratios for coverage, morbidity, and mortality indicators.

○ Inequities only improve later when the rich have achieved new minimum achievable levels for morbidity and mortality and the poor gain greater access to the interventions.
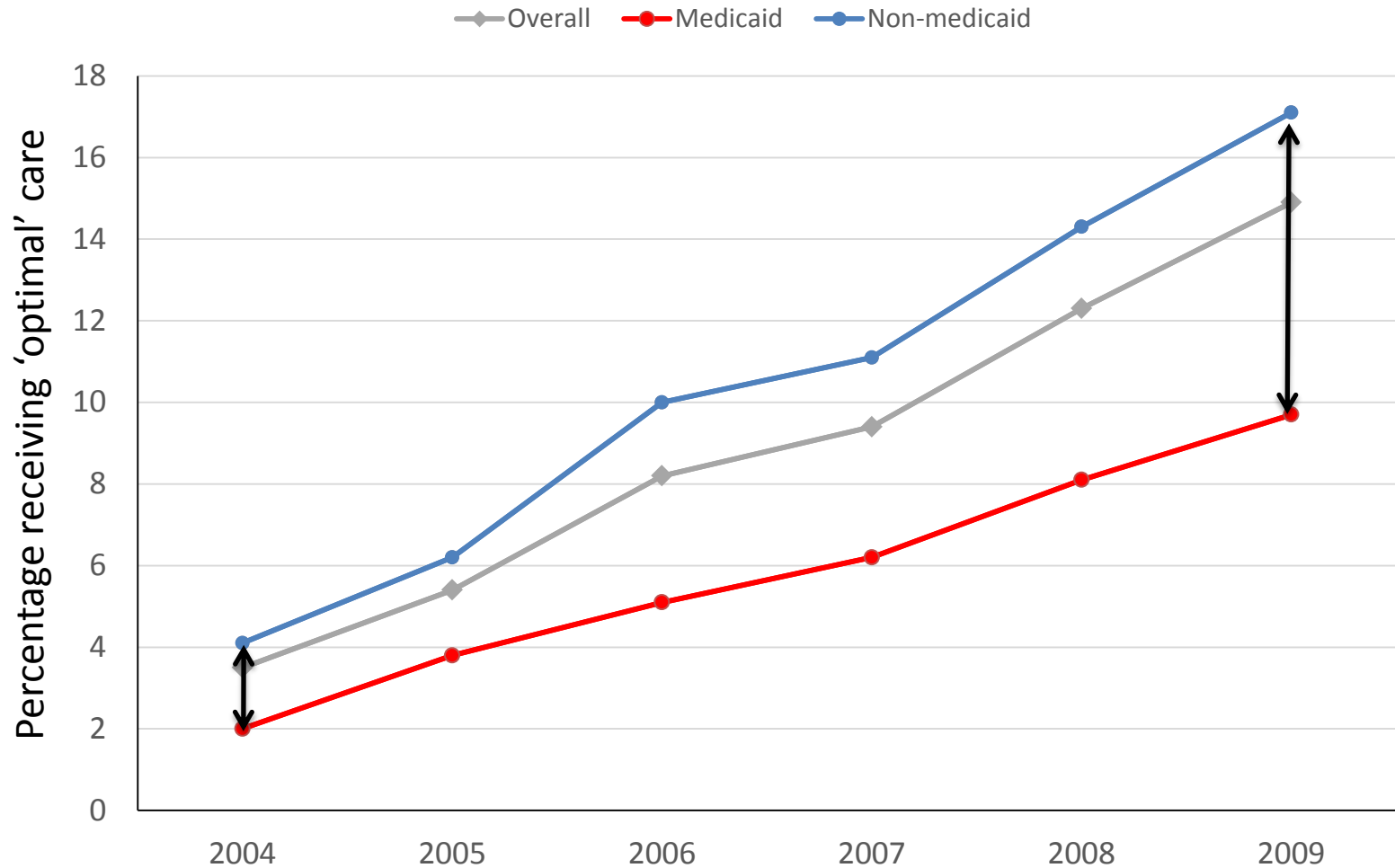
PFP IN MINNESOTA

○ 'Optimal' diabetes care

- Daily aspirin use (age 41-75)

- Low density lipoprotein < 100 mg/dl

- Blood pressure < 130/80 mmHg

- HbA1c < 7%

- Tobacco free

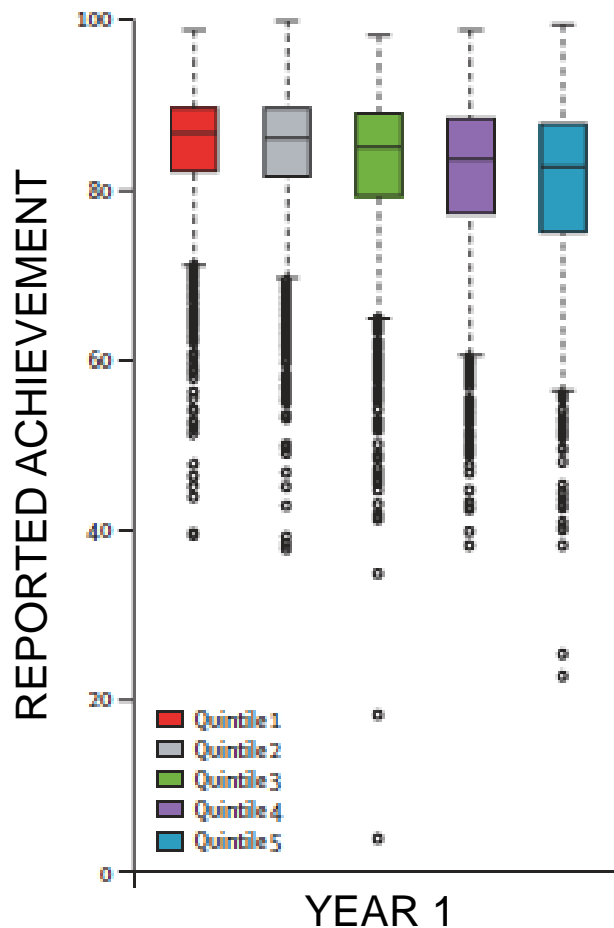○ $100 per patient for achieving threshold

- 10% in 2005

- 20% from 2006

INEQUALTIES IN DIABETIC CARE
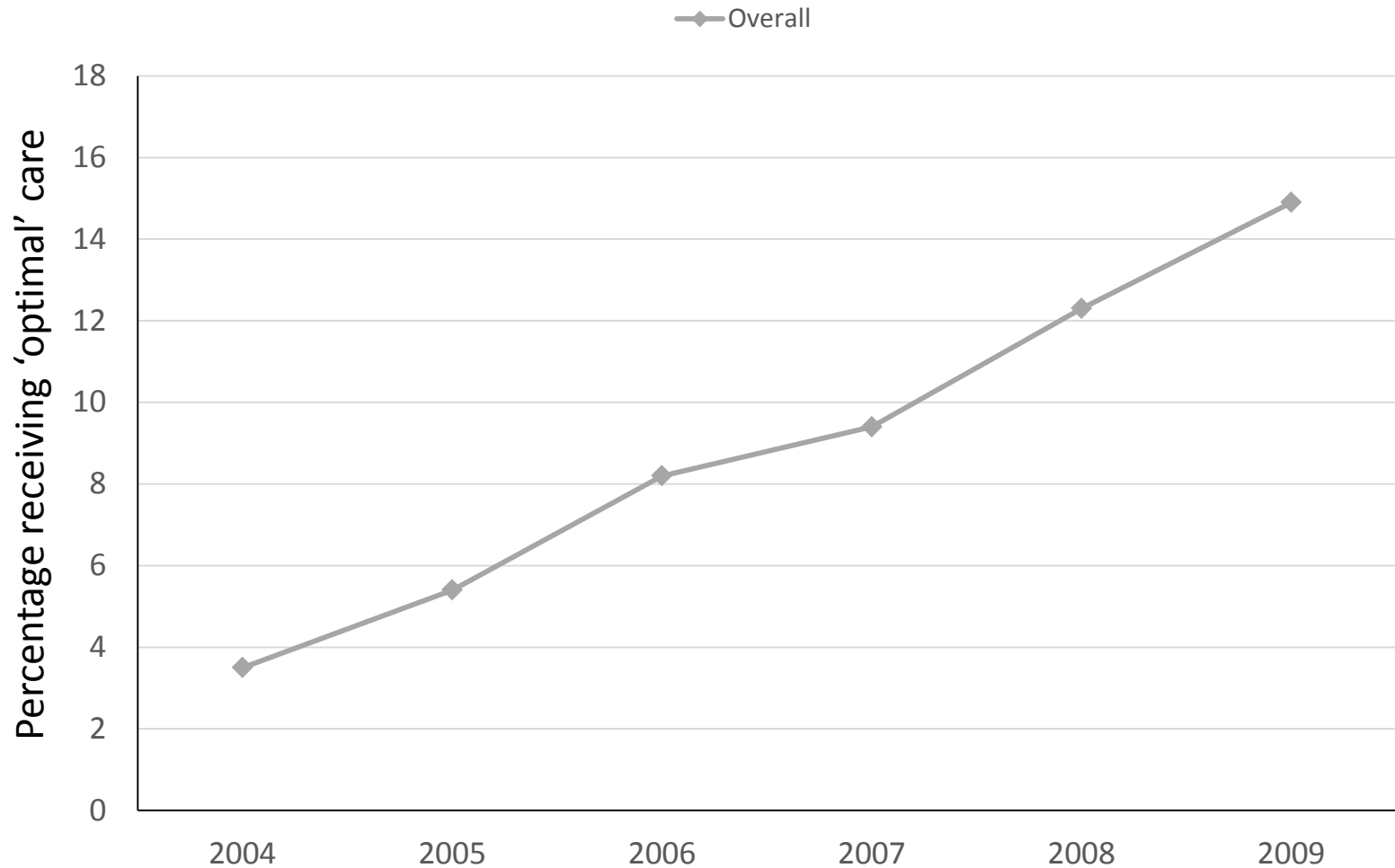
# INEQUALTIES IN DIABETIC CARE

PFP IN THE UK

PFP IN MASSACHUSETTS

○ Clinical performance measures

- surgical infection (e.g. prophylactic antibiotic)
- pneumonia (e.g. culture prior to antibiotic)
- pediatric asthma (e.g. home management plan)
- maternity & newborn (e.g. peri-operative antibiotics for C-section)

○ Minimizing racial disparities in processes of care for pregnant women and children

- Up to $180,000 per hospital
- Absolute Risk Difference: $n_1/d_1 - n_2/d_2$

RACIAL DISPARITIES
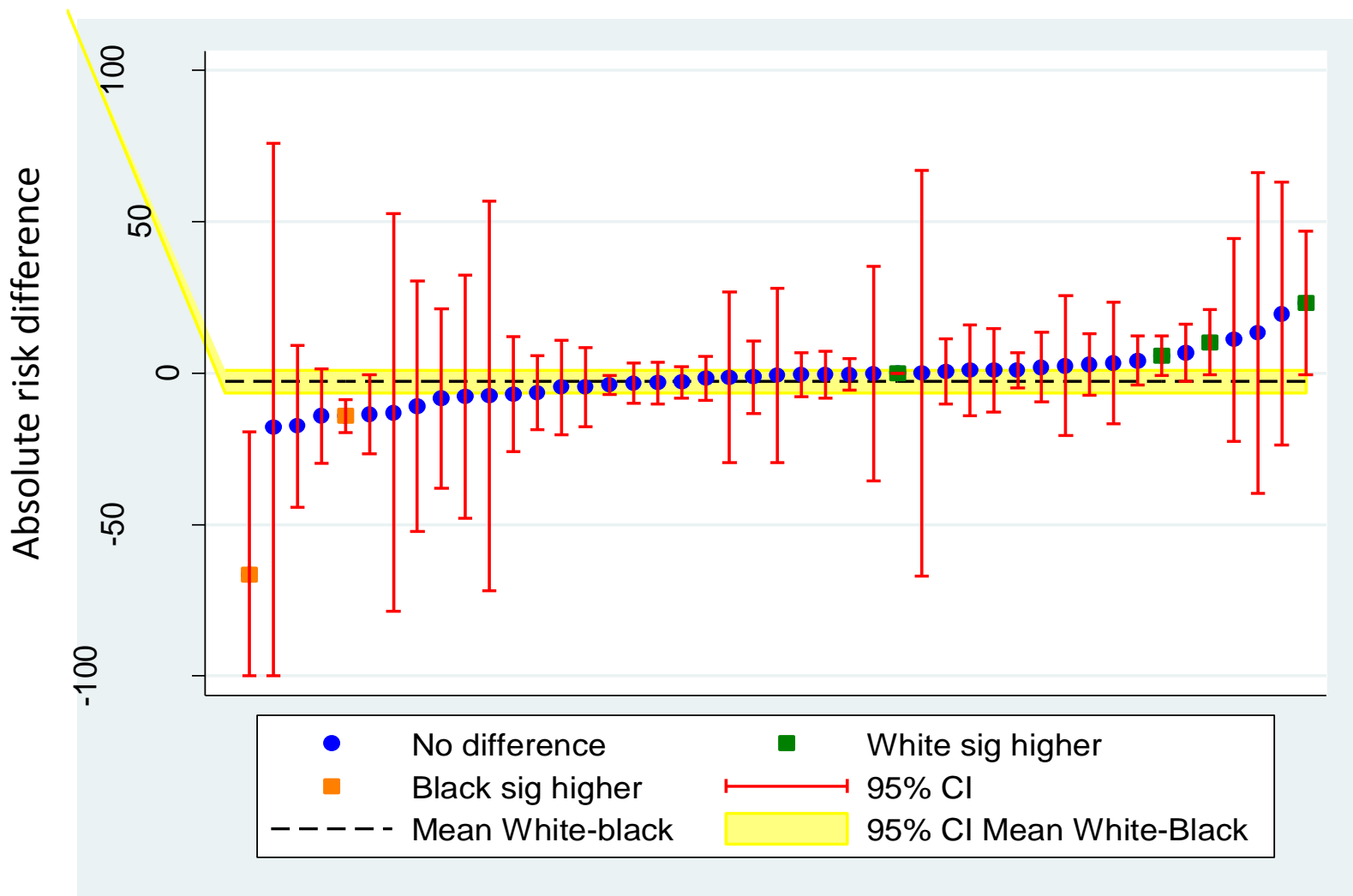
Cost-Effectiveness

- An ethical principle
- Population level duty of beneficence
  - Policy makers should do as much good as possible with scarce public resources
  - "doing good" => "increasing total health"
- But not the ONLY ethical principle
- Decision makers may also be concerned about reducing unfair differences in health ("health inequities")

Who gains and who loses from health policy decisions?

- Decision makers may want to know the distribution of costs and benefits by equity-relevant variables such as socioeconomic status, ethnicity, location, gender, age, severity of illness

    - e.g. Sheffield alcohol model: Secretary of State wanted breakdowns by social class

- May depend on social variation in…health risks, access to care, adherence to care, capacity to benefit, and opportunity costs.

Embodying value judgements vs. informing decision makers about health equity impacts

- Embodying

  - e.g. a QALY to group 1 is worth 2.5 times more than a QALY to group 2

- Informing

  - e.g. this option reduces differences in health between group 1 and group 2

  - e.g. this option is not worthwhile unless QALY gains to group 1 are worth at least 10 times more than QALY gains to group 2

Types of equity-informative cost-effectiveness analysis

1. Equity Impact Analysis

   – How much do different groups gain and lose?

2. Equity Constraint Analysis

   – How much benefit is foregone if a more cost-effective option is ruled out on equity grounds?

3. Equity Weighting Analysis

   – How much concern for equity is required to choose a fairer but less cost-effective option?

Applicable to many different types of health policy decision

- Purchasing health care technologies – e.g. whether to fund imatinib for stomach cancer, at what price, and for which patients?

- Designing health care benefit packages – e.g. whether to cover diabetes and if so which treatments to include?

- Investing in health care infrastructure and incentives – e.g. whether to invest in primary care strengthening, and if so how to design workforce payment structures and prioritise investments in different geographical areas?

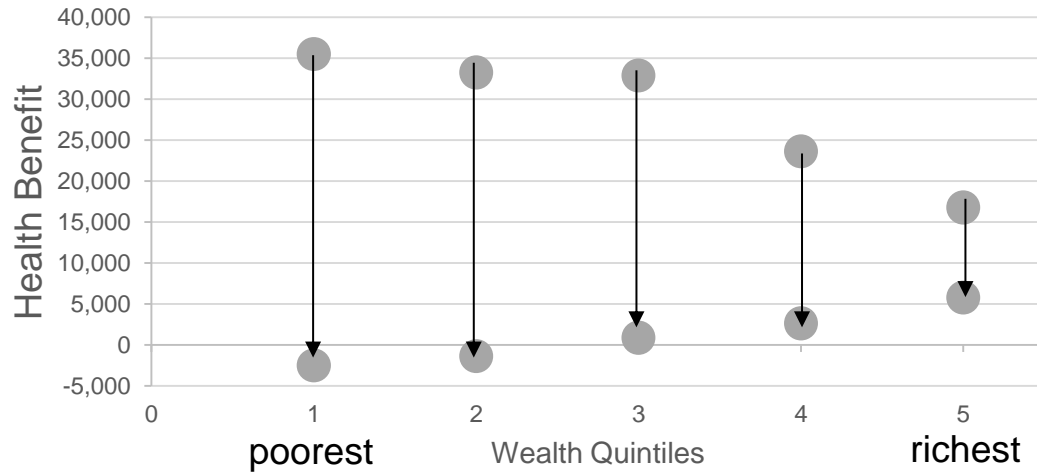- Public health – e.g. whether to introduce a sugar tax, and if so at what level?

Equal Opportunity Costs
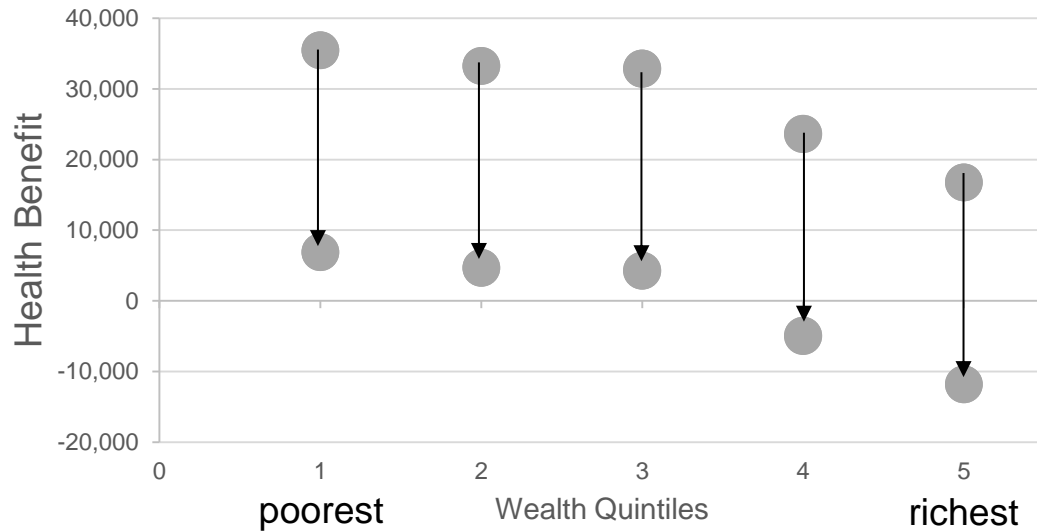
Gross Health Benefit

Net Health Benefit

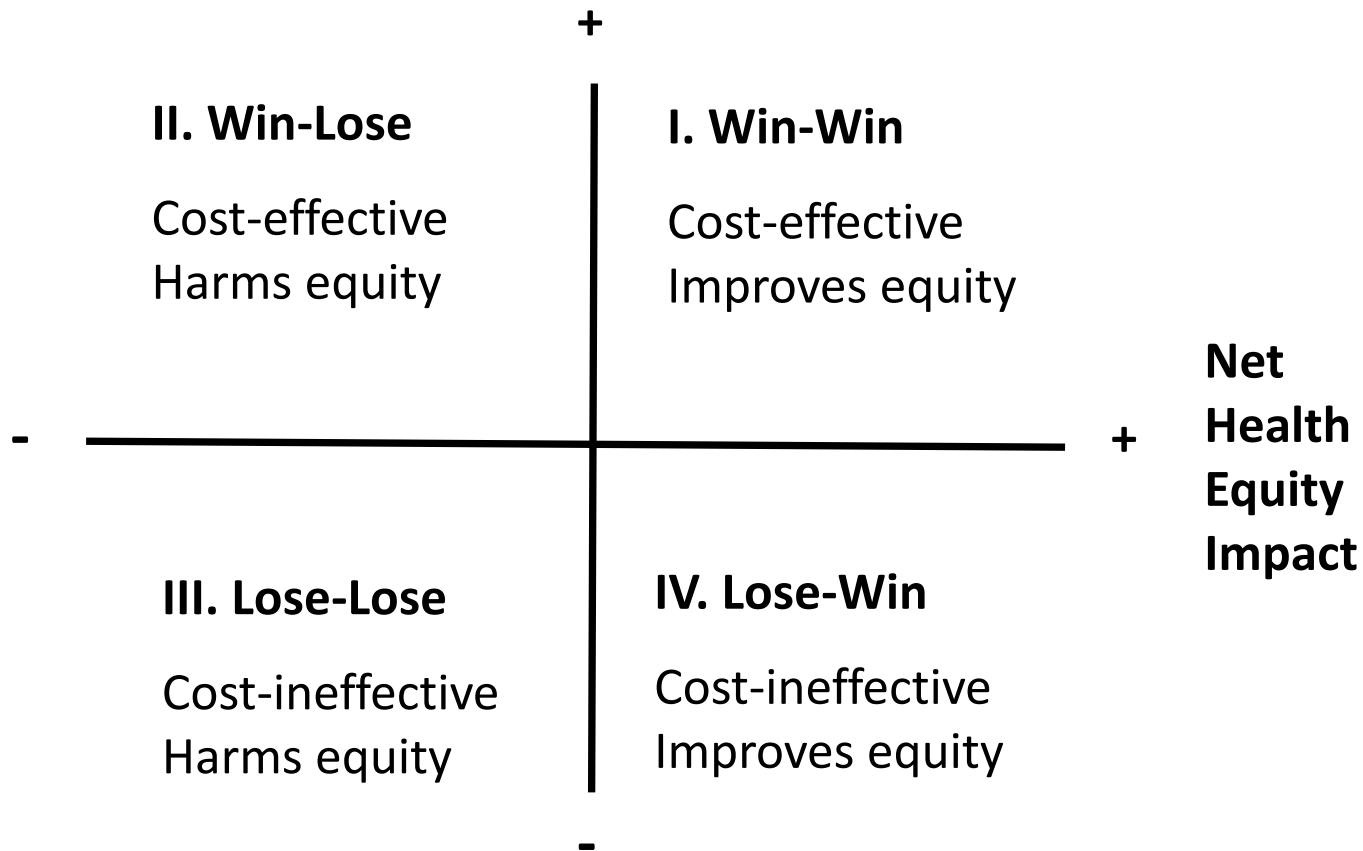**Unequal Opportunity Costs (Larger for the Poor)**

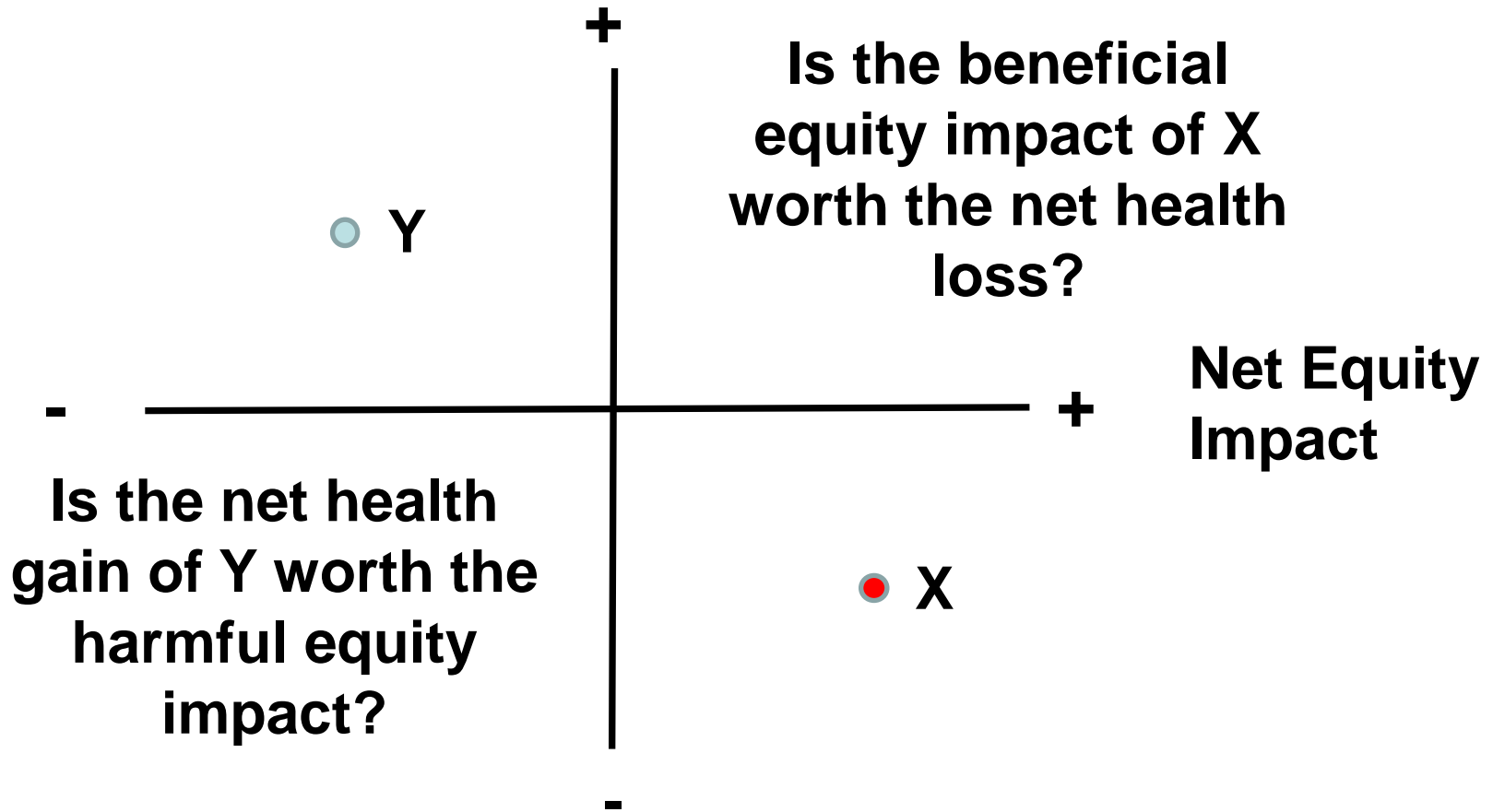Gross Health Benefit

Net Health Benefit

Health Equity Impact Plane
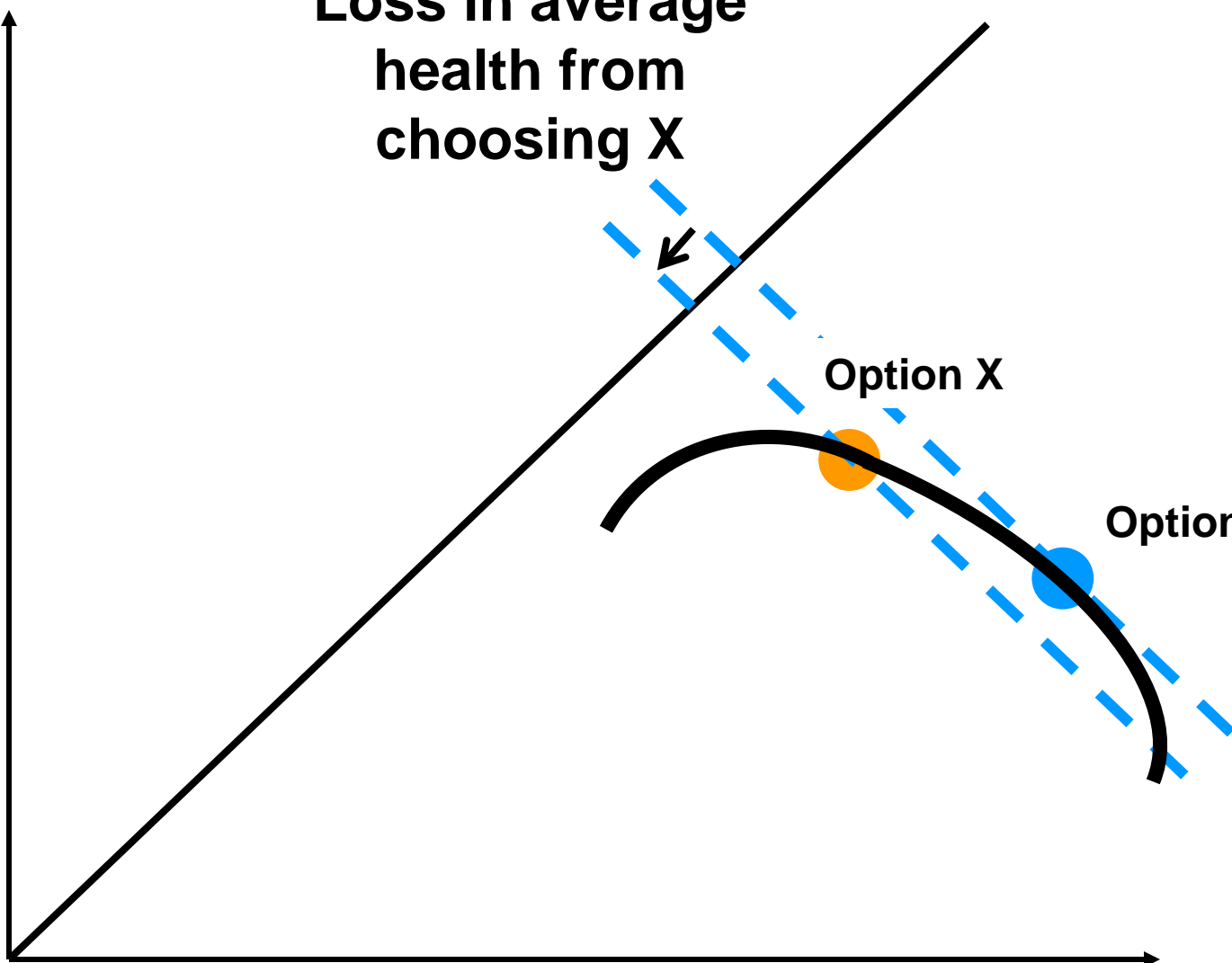
**Cost-Effectiveness
(Net Total Health Impact)**

+

II. Win-Lose

Cost-effective
Harms equity

I. Win-Win

Cost-effective
Improves equity

-         +   **Net Health Equity Impact**

III. Lose-Lose

Cost-ineffective
Harms equity

IV. Lose-Win

Cost-ineffective
Improves equity

-

Equity Trade-Offs

Net Health Impact

+

Is the beneficial equity impact of X worth the net health loss?

Net Equity Impact

- ———————————— **+**

Is the net health gain of Y worth the harmful equity impact?

Y

X

-

Maximising versus equalising health

Two specific methods

- Distributional Cost-Effectiveness Analysis (DCEA)
  - Breakdowns of health effects and health opportunity costs
  - Summary measures of equity impact
  - Equity weighting analysis
- Extended Cost-Effectiveness Analysis (ECEA)
  - Breakdowns of health effects and financial effects (e.g. impoverishment due to catastrophic health care expenditure)
  - No summary measures of equity impact or equity weighting analysis

Checklist of questions for equity-informative CEA

1. What key equity-relevant variables are of most concern to policy makers in the context of this decision? (e.g. socioeconomic status, ethnicity, location, gender, severity of illness, other)

2. What key drivers of health outcomes might lead to differences in health benefits by these key equity-relevant variables? (e.g. social variations in health risks, access to care, adherence to care, lifetime capacity to benefit)

3. Where do the opportunity costs fall and how might they differ by the equity-relevant variables? (e.g. health expenditure, general public expenditure, private consumption)

4. Are non-health benefits or opportunity costs very important in the context of this decision? (e.g. risk of catastrophic health care expenditure, effects on household income, effects on education, employment, crime or other non-health outcomes, costs falling on non-health public expenditure) If so, ECEA may be preferable.

5. Might this be a "win-lose" or "lose-win" case involving trade-offs between improving total health and reducing unfair health inequality? If so, DCEA may be preferable.

Further Information

http://www.york.ac.uk/che/research/equity/economic_evaluation/

Cookson, R, Mirelman, A, Asaria, M, Dawkins, B, Griffin, S. (2016). Fairer Decisions, Better Health for All: Health Equity and Cost-Effectiveness Analysis. CHE Research Paper. *(contains 18 further readings)*

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Verguet, S., J. J. Kim and D. T. Jamison (2016). "Extended cost-effectiveness analysis for health policy assessment: a tutorial." PharmacoEconomics 34(9): 913-923. http://link.springer.com/article/10.1007/s40273-016-0414-z

Equity Trade Off Exercise

Shehzad Ali
Department of Health Sciences
University of York

https://www.york.ac.uk/che/research/equity/economic_evaluation/publicviews/

Interactive Spreadsheet Questionnaire ("slider")

Introduction

- This hypothetical exercise aims to find out how much you care about reducing health inequality compared with improving total health

- Economists call this "health inequality aversion"

- We tried this on a nationally representative sample of the English public, and the findings are here:

- Matthew Robson, Miqdad Asaria, Aki Tsuchiya, Shehzad Ali and Richard Cookson (2016). Eliciting the level of health inequality aversion in England CHE Research Paper 125 https://www.york.ac.uk/media/che/documents/papers/researchpapers/CHERP125_eliciting_inequality_preferences_.pdf

Background

- The richest fifth of households are people like doctors, lawyers and accountants and their families.

- The poorest fifth are people like cleaners, shop assistants, the unemployed and their families.

  These two groups are equal in size.

Current distribution:
Years of life in full health

Gap = 12 years

74

62

Richest Fifth   Poorest Fifth
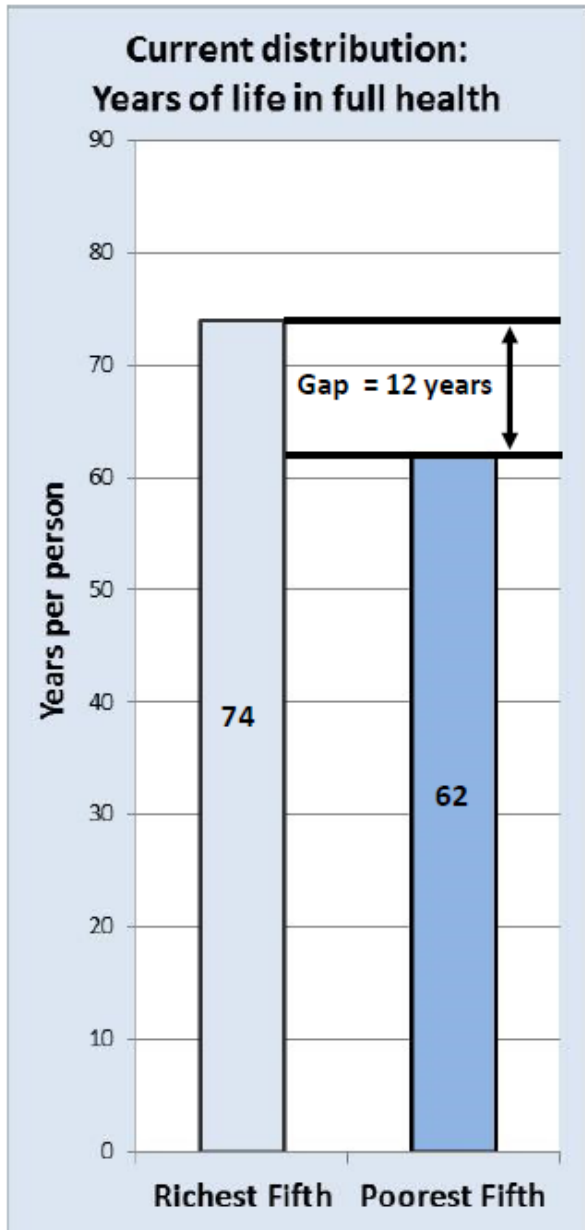
On average, people in the richest fifth experience 74 years of life in full health.

On average, people in the poorest fifth experience 62 years of life in full health.

This means there is a gap of 12 years between the richest and poorest fifths.

Someone who has 74 years in full health might for example live to 80, but in less than full health towards the end of their life.

Imagine that you are asked to choose between **two large government programmes** which will improve population health. <u>Both programmes cost exactly the same.</u>

Who Benefits?

Programme	Population Group	Before	Change	After
Programme A	Richest Fifth	74	+7	81
	Poorest Fifth	62	+3	65
Programme B	Richest Fifth	74	+3	77
	Poorest Fifth	62	+8	70

These are gains in years of life in full health over the average person's lifetime.

When making a decision, it is important to remember the following:

- We cannot pay for both programmes - a choice must be made
- "Equally good" means you don't mind which one is chosen
- Both programmes cost exactly the same
- The only difference between the programmes is the gain to the poorest and richest fifth
- The middle three fifths of the population are not affected
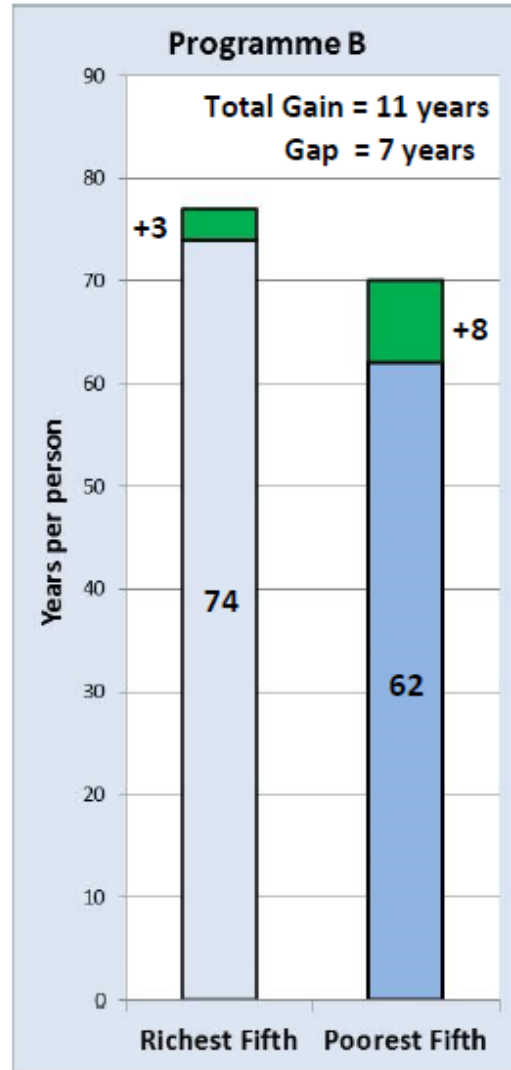
Which programme should the government choose?

1.

Programme A

Total Gain = 10 years
Gap = 16 years

+7

74

62

+3

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Total Gain = 11 years
Gap = 7 years

+3

74

62

+8
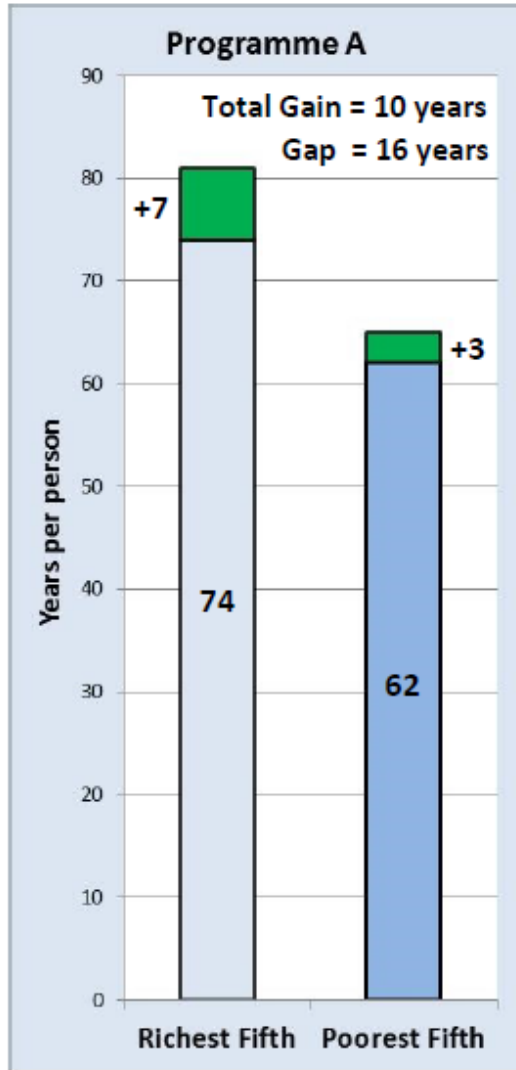
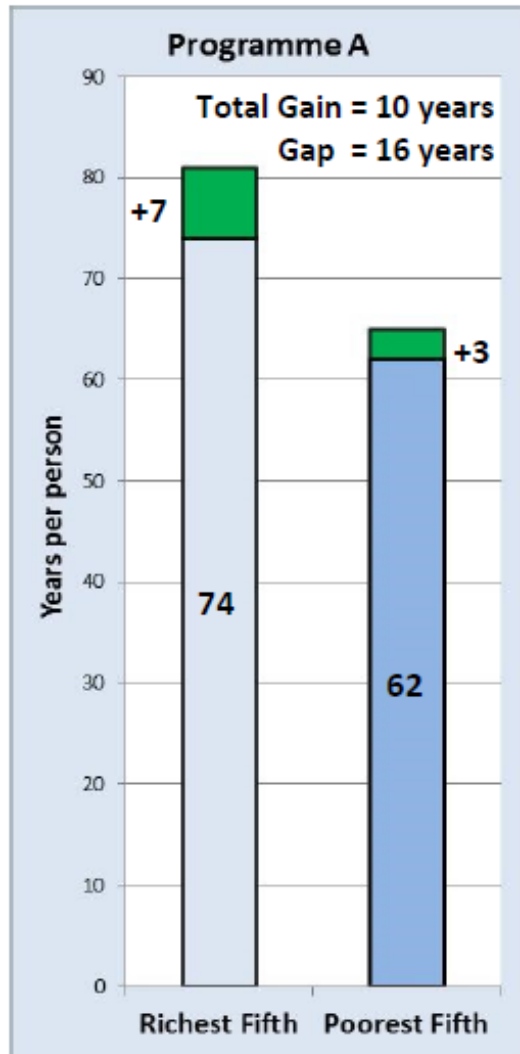Richest Fifth   Poorest Fifth

After: 77 years   70 years

Programme A ☐

Programme A and B are equally good ☐

Programme B ☐

**Now imagine it is more difficult than we thought to benefit the poorest fifth.
For each of the following comparisons please tick ONE box per comparison.**

2.
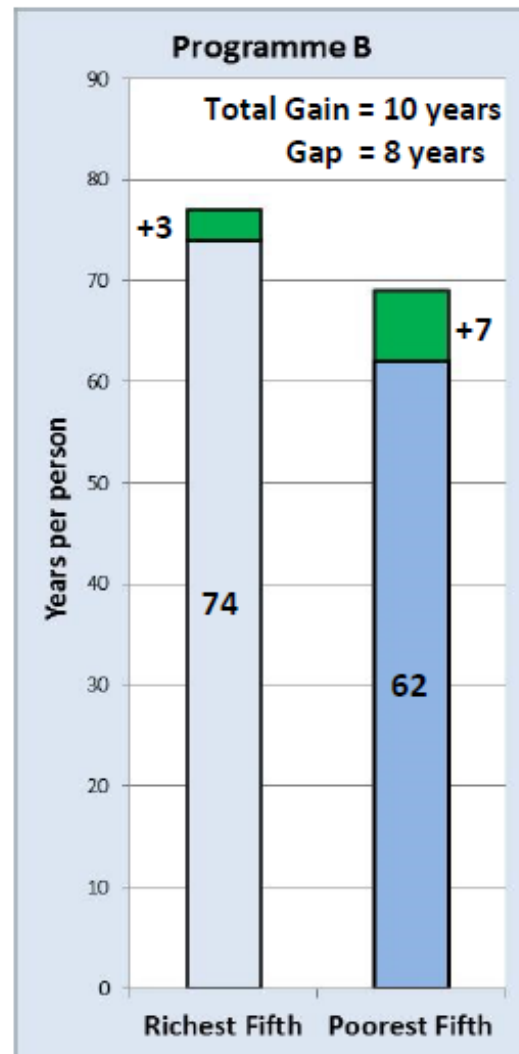
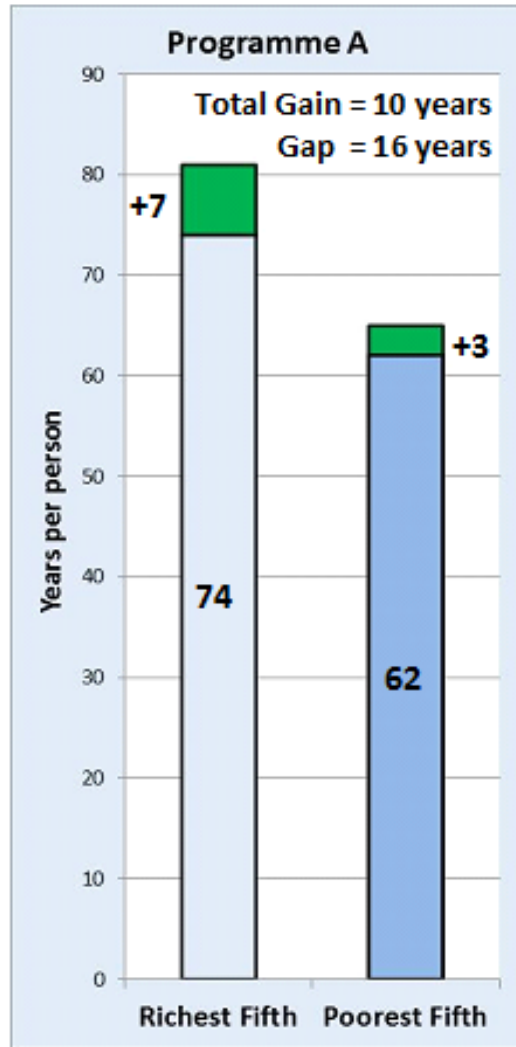Programme A

Total Gain = 10 years
Gap = 16 years

+7

74

62

+3

Years per person

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Total Gain = 10 years
Gap = 8 years

+3

74

62

+7

Years per person

Richest Fifth   Poorest Fifth

After: 77 years   69 years

Programme A ☐

*Programme A and B
are equally good* ☐

Programme B ☐

3.

Programme A

Years per person

Total Gain = 10 years
Gap = 16 years

+7
74

+3
62

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Years per person

Total Gain = 9 years
Gap = 9 years

+3
74

+6
62

Richest Fifth   Poorest Fifth
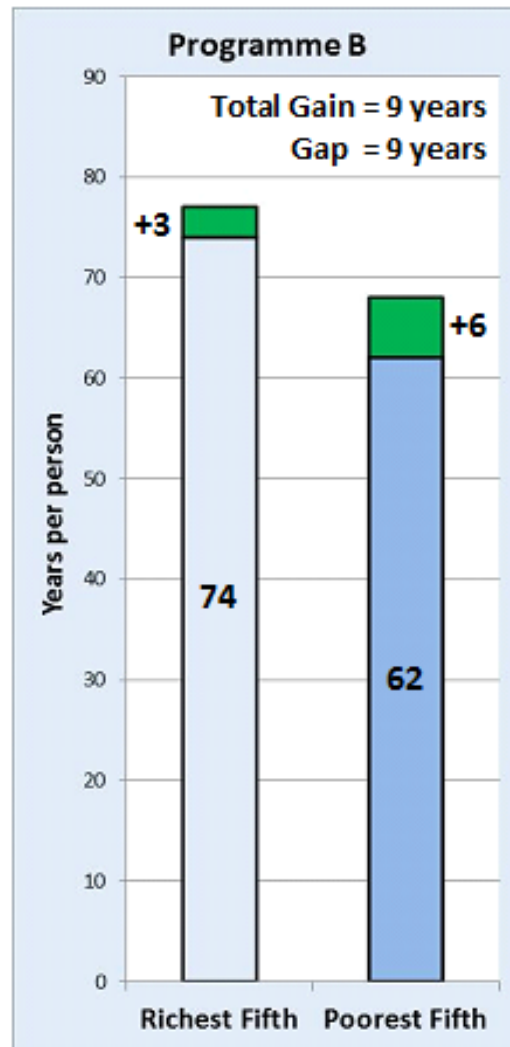
After: 77 years   68 years

Programme A ☐

*Programme A and B
are equally good* ☐

Programme B ☐

4.

Programme A

Total Gain = 10 years
Gap = 16 years

Years per person

+7

74

+3

62

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Total Gain = 8 years
Gap = 10 years

Years per person

+3

74

+5

62

Richest Fifth   Poorest Fifth
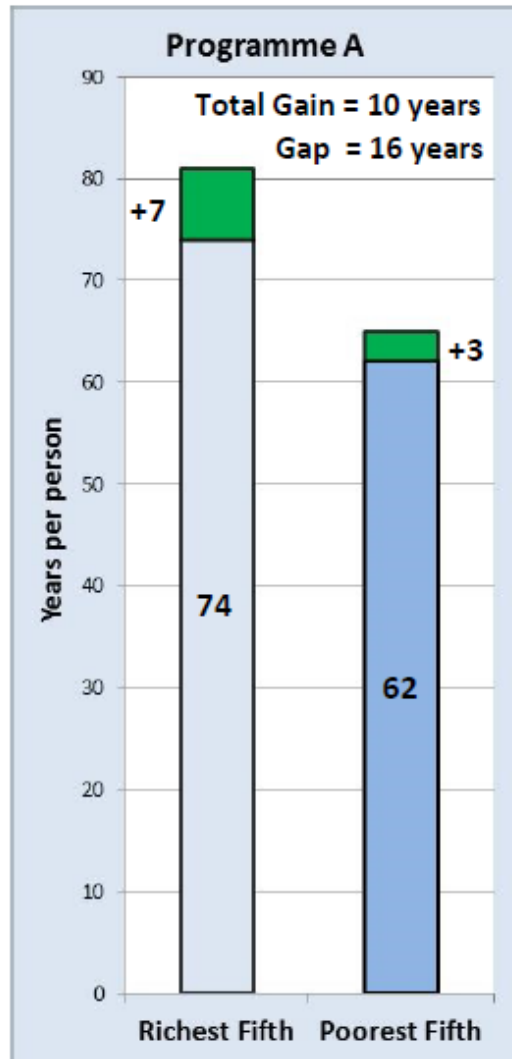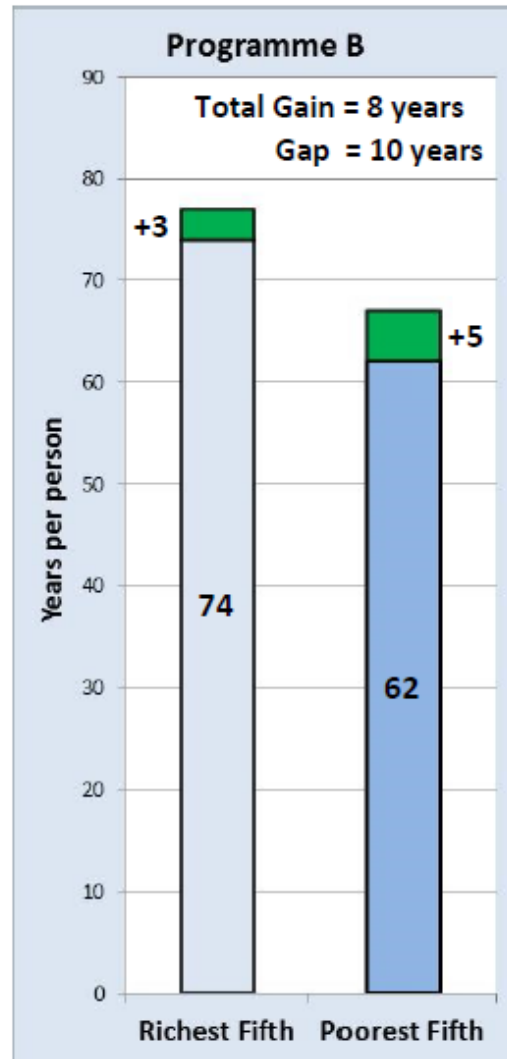
After: 77 years   67 years

Programme A   ☐

Programme A and B
are equally good   ☐

Programme B   ☐

5.

Programme A

Total Gain = 10 years
Gap = 16 years

Years per person

+7

74

62

+3

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Total Gain = 7 years
Gap = 11 years

Years per person

+3

74

62

+4

Richest Fifth   Poorest Fifth
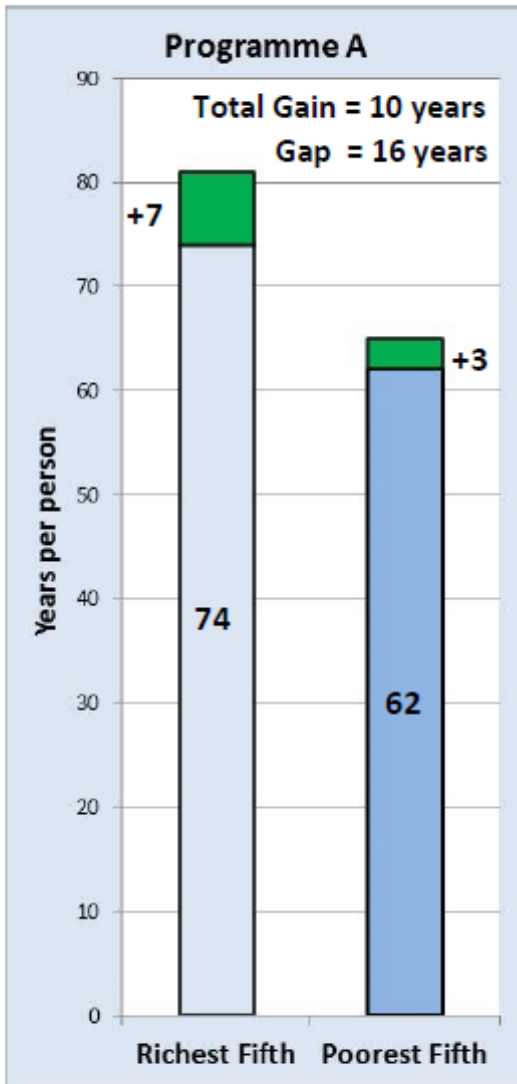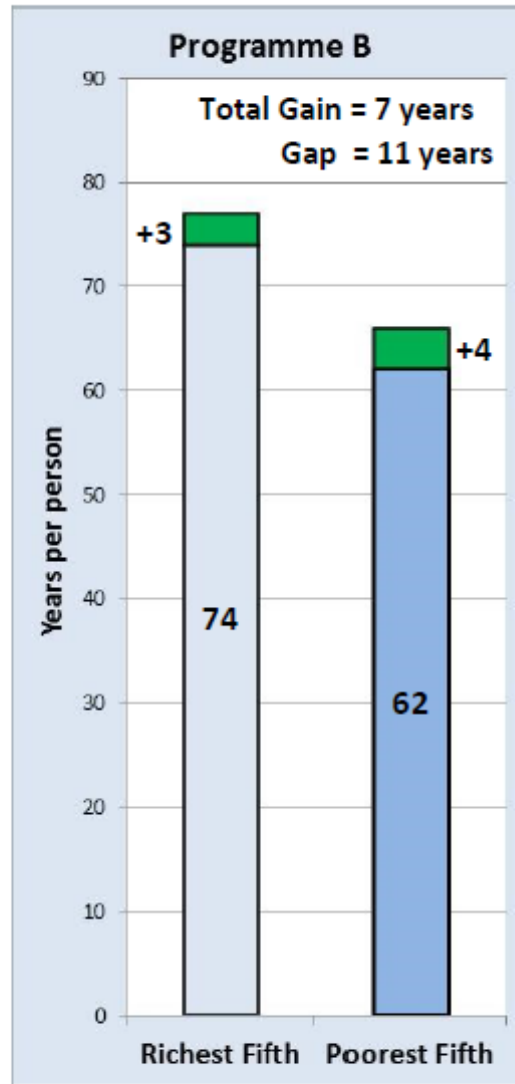
After: 77 years   66 years

Programme A ☐

Programme A and B are equally good ☐

Programme B ☐

6.

Programme A

Total Gain = 10 years
Gap = 16 years

+7

74

+3

62

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Total Gain = 6 years
Gap = 12 years

+3

74

+3

62

Richest Fifth   Poorest Fifth
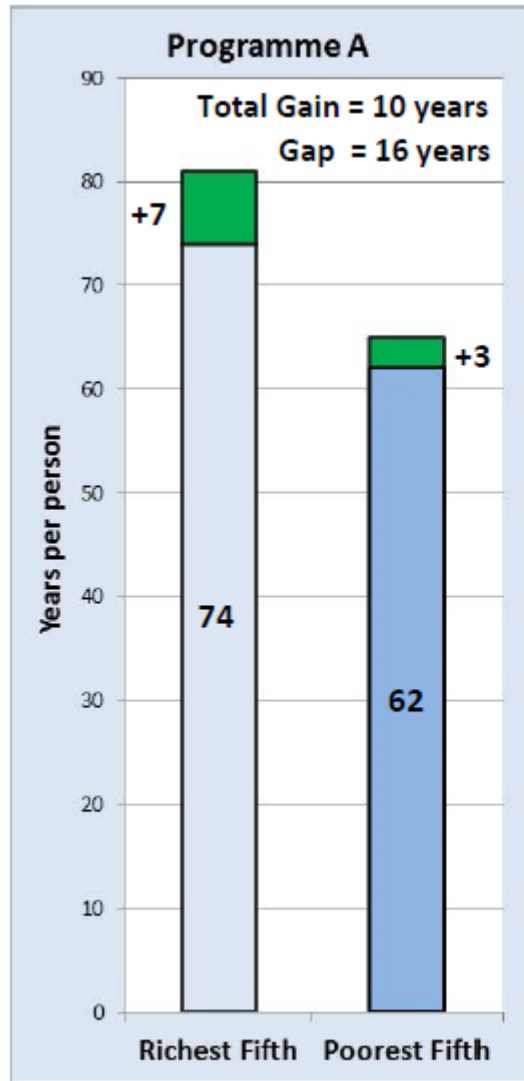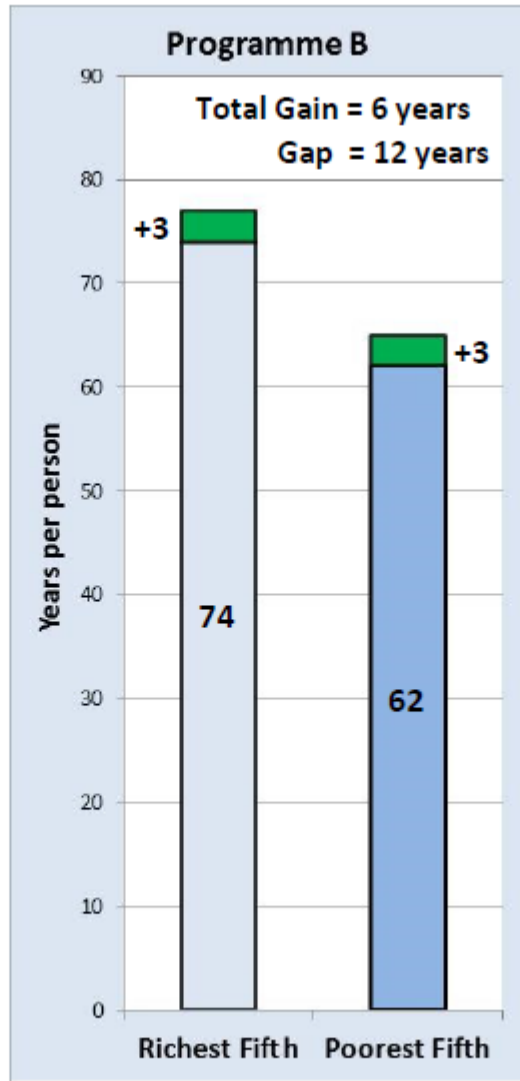
After: 77 years   65 years

Programme A ☐

*Programme A and B
are equally good* ☐

Programme B ☐

7.

Programme A

Total Gain = 10 years
Gap = 16 years

Years per person

+7

74

+3

62

Richest Fifth   Poorest Fifth

After: 81 years   65 years

Programme B

Total Gain = 5 years
Gap = 13 years

Years per person

+3

74

+2

62

Richest Fifth   Poorest Fifth
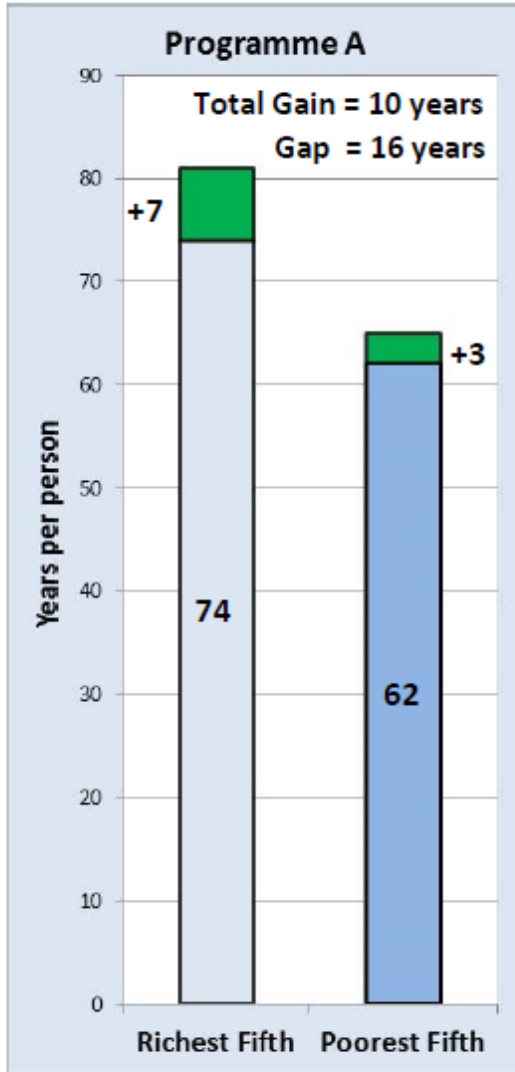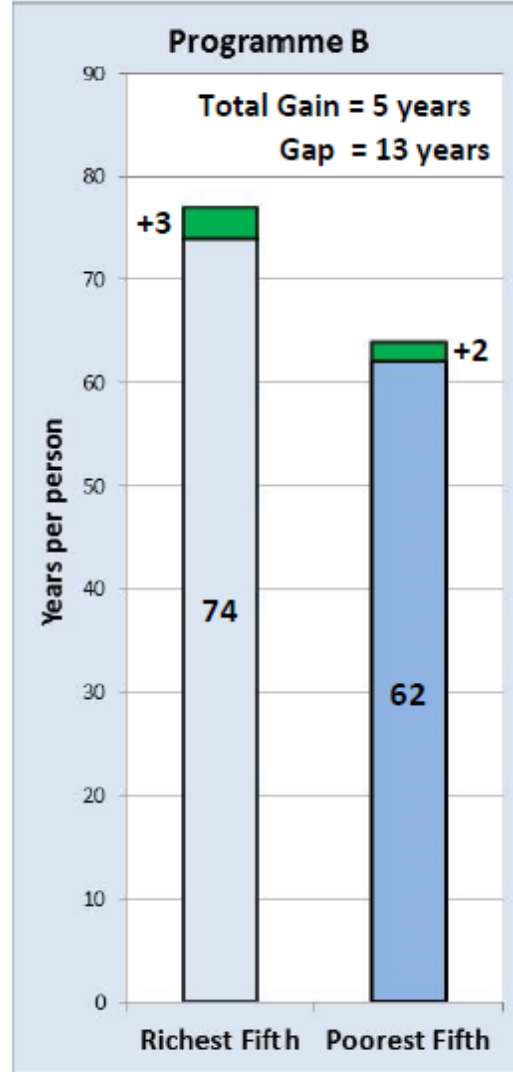
After: 77 years   64 years

Programme A

Programme A and B
are equally good

Programme B

DISTRIBUTIONAL COST-EFFECTIVENESS ANALYSIS:
EXAMPLE 1 - NHS BOWEL CANCER SCREENING PROGRAMME

Miqdad Asaria – University of York

SSM Workshop York

September 2016

UNIVERSITY *of* York

CHE
Centre For Health Economics

NHS Bowel Cancer Screening Programme

- Bowel cancer is the second most common cause of cancer death in the UK – more than 16,000 in 2010
- Free national screening programme rolled out in 2006 to all 60-74 year olds in England
- Those who attend screening have a 25% reduction in their risk of dying from bowel cancer
- Less than 60% of those eligible for screening participate

Inequality in Health & Screening Uptake
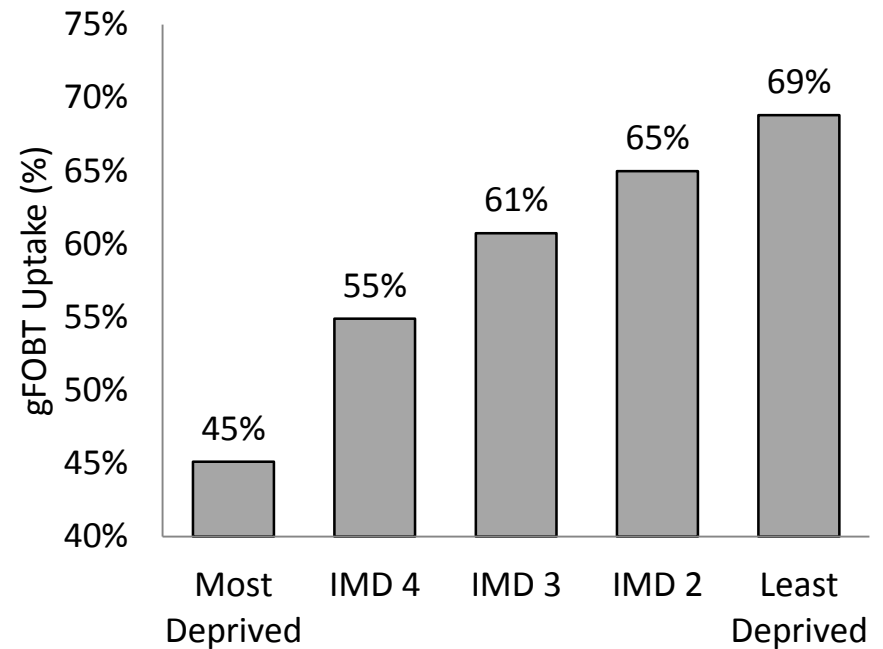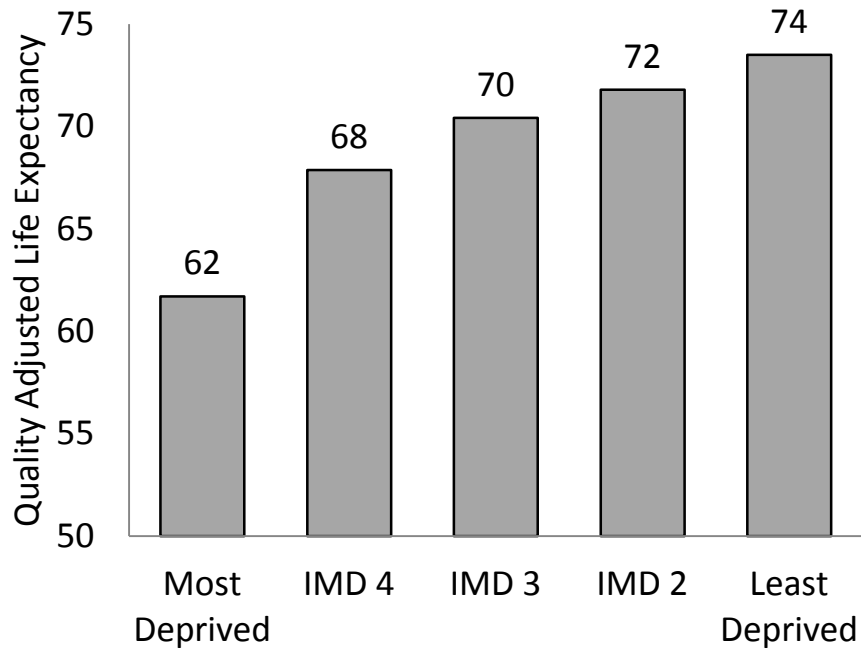
Redesign Options

- Two redesign options considered both having same total cost

- Option A: additional reminder sent by doctor targeted at the most deprived areas–increase in uptake 12%

- Option B: a standard reminder sent to everybody –increase in uptake 6%

Impact of Redesign on Health
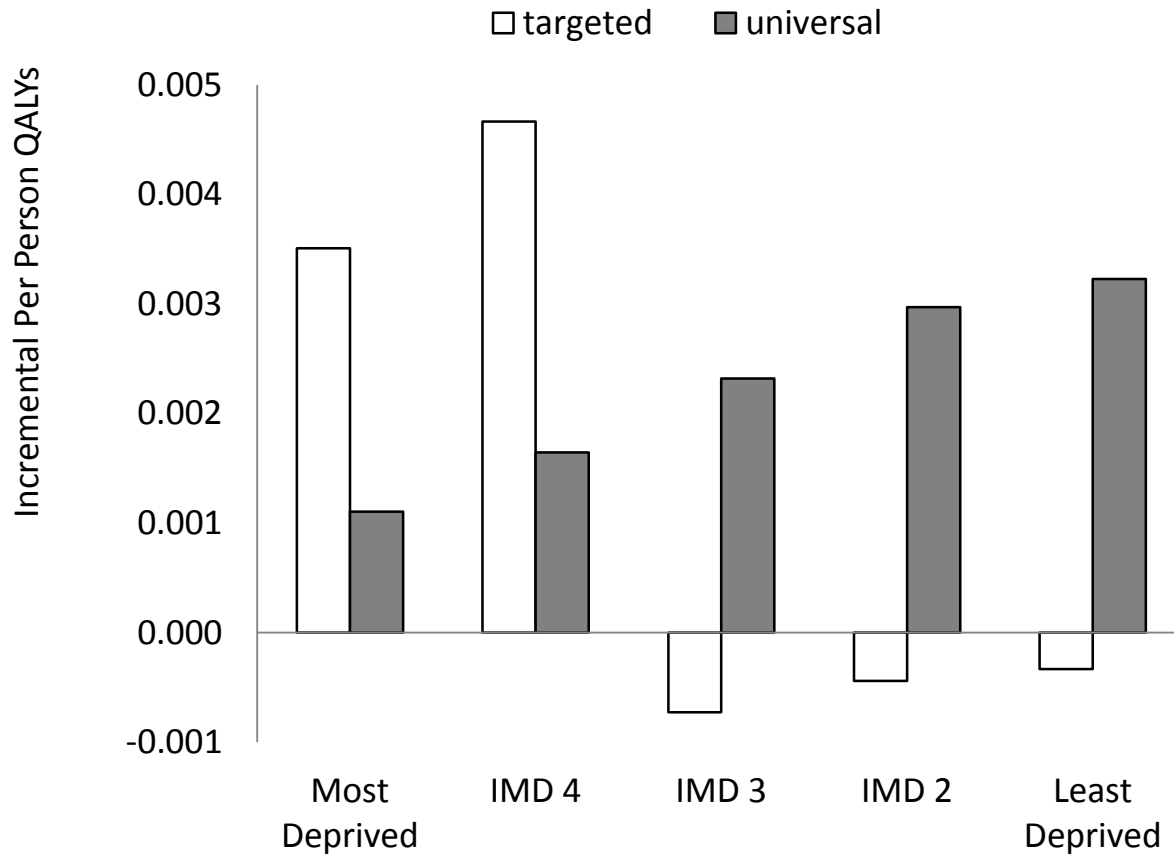
Results

Targeted reminder more equal on all measures

	Population NHB	Relative Inequality	Absolute Inequality
targeted reminder	*Worst*	*Best*	*Best*
universal reminder	*Best*	*Worst*	*Worst*

Standard CEA would choose universal reminder as greater total net health benefit

Which is the better option

- To decide this we need to make a number of value judgements …
  - Equity relevant characteristics: rich vs poor, rural vs urban, male vs female, ethnicity etc.
  - Relative versus absolute measures: difference between 50 and 60 years equivalent to 100 and 120 years or 100 and 110 years
  - Level of inequality aversion

DCEA Results
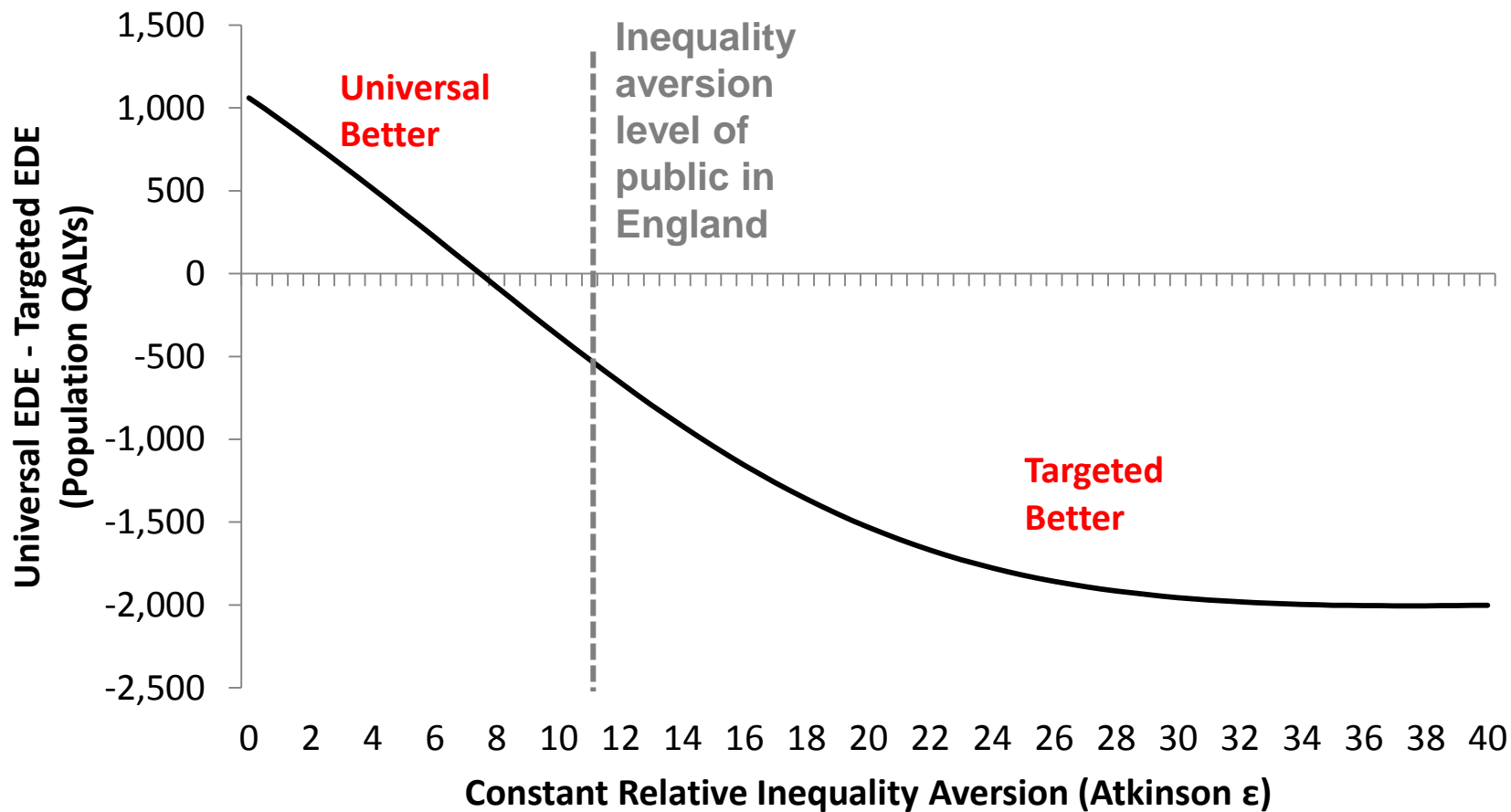
MIQDAD ASARIA

Centre for Health Economics
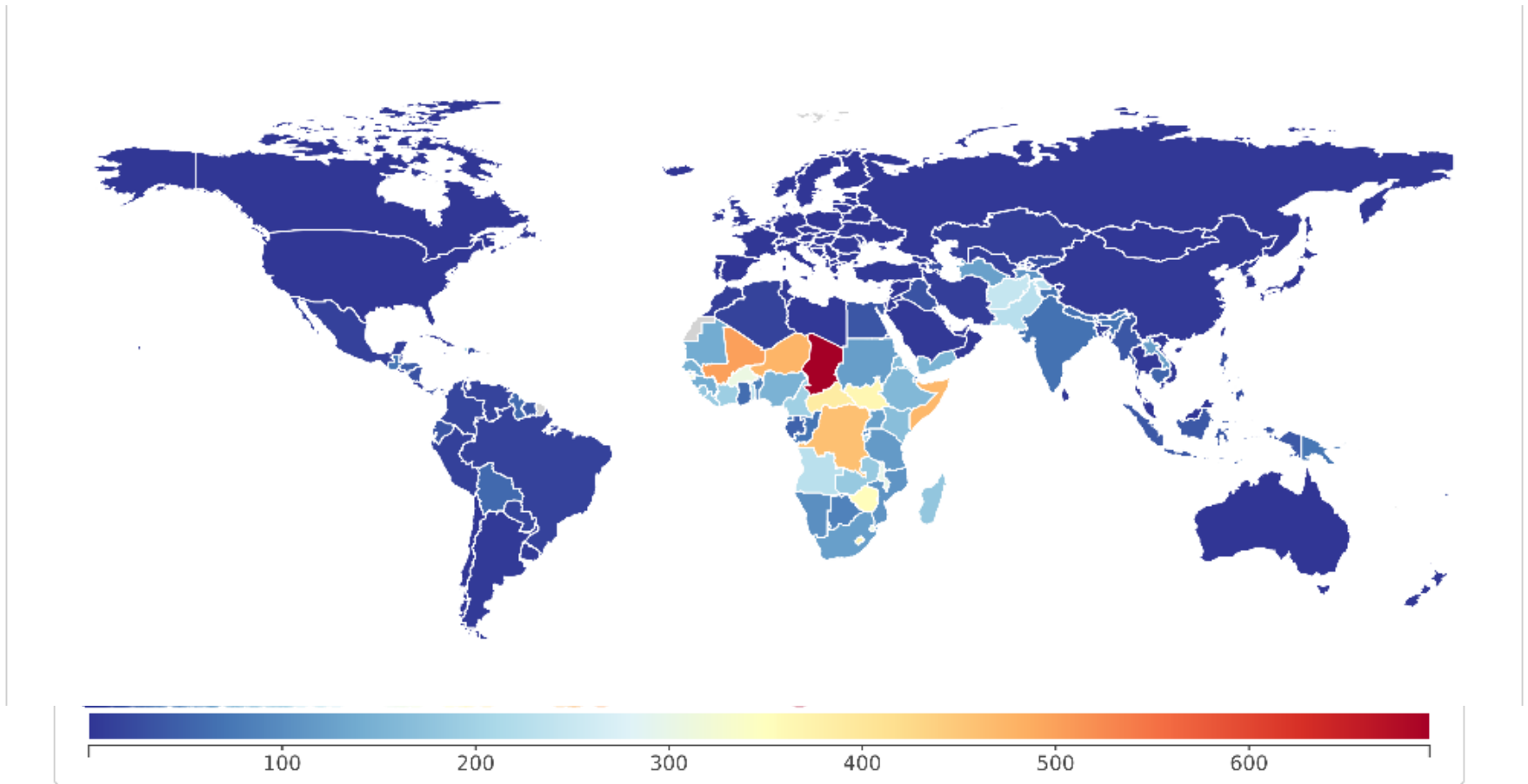
University of York

miqdad.asaria@york.ac.uk

DISTRIBUTIONAL COST-EFFECTIVENESS ANALYSIS:
EXAMPLE 2 – ROTAVIRUS VACCINATION IN ETHIOPIA

Andrew Mirelman – University of York

SSM Workshop York

September 2016

UNIVERSITY *of York*

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Centre For Health Economics

Diarrheal diseases
Both sexes, Under 5 years, 2013, Deaths per 100,000

Source: IVAC VIEW-Hub, http://www.jhsph.edu/research/centers-and-institutes/ivac/view-hub/
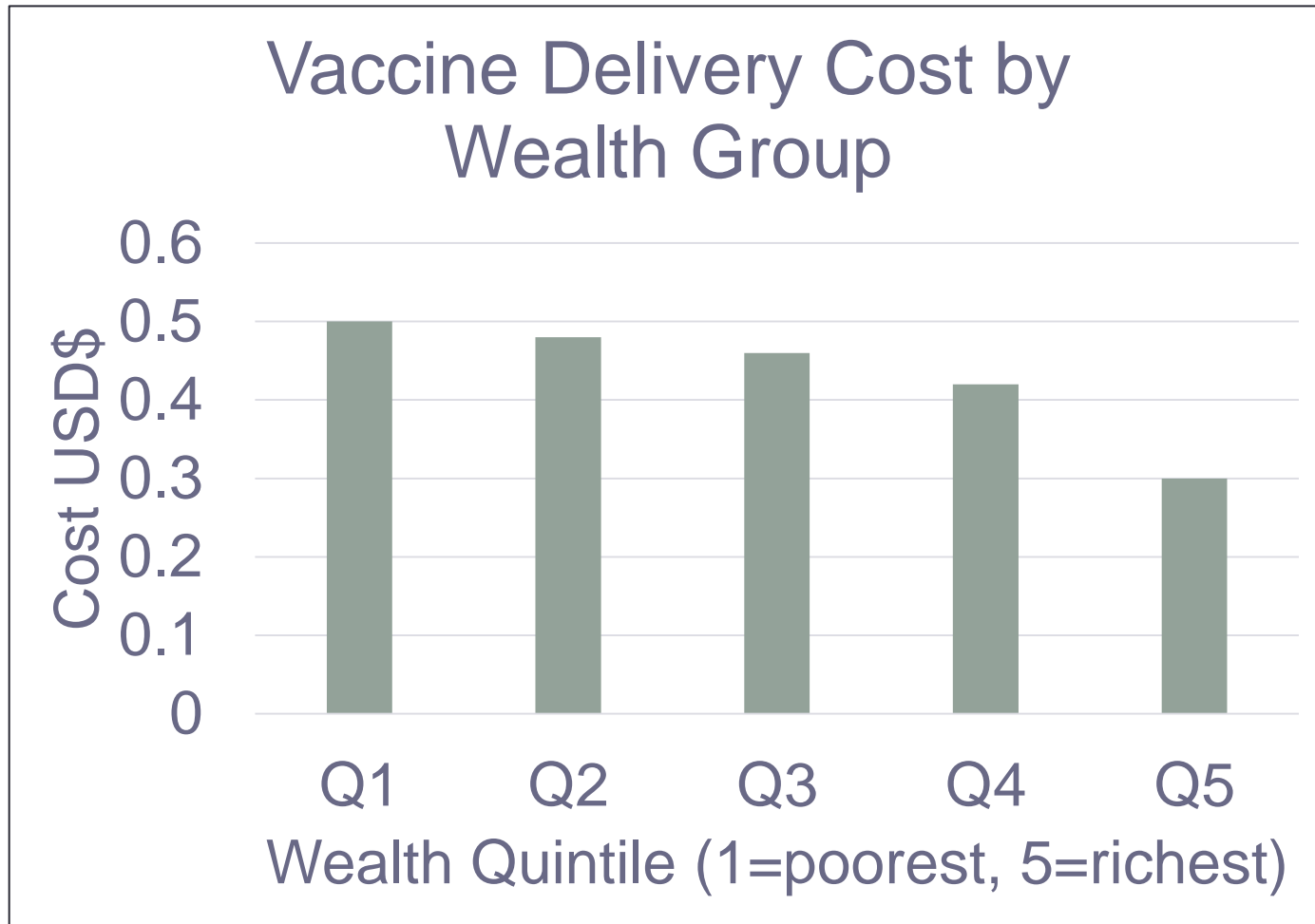
Incorporating "DCEA Thinking" into a Rotavirus example

- Vaccines for illnesses such as Rotavirus and Pneumococcal Pneumonia are relatively cheap and effective against large disease burdens

- They may all seem to be "win-win's"

- But also consider
  - There may be **higher delivery costs** in lower SES groups
  - There may be **lower coverage** in lower SES groups
  - There may be **higher opportunity costs** in lower SES groups
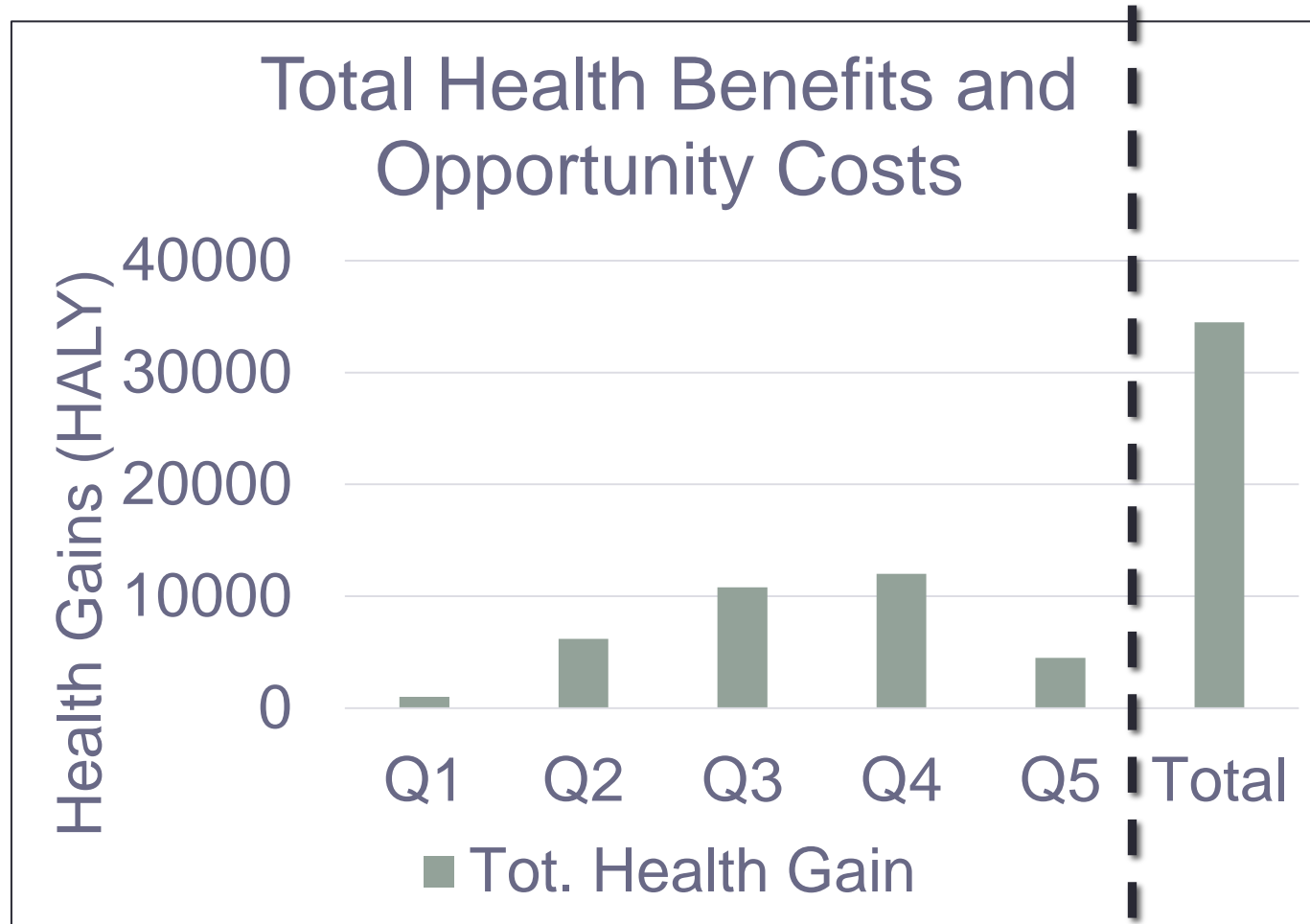 - So not all vaccine delivery programmes are "win-win's"

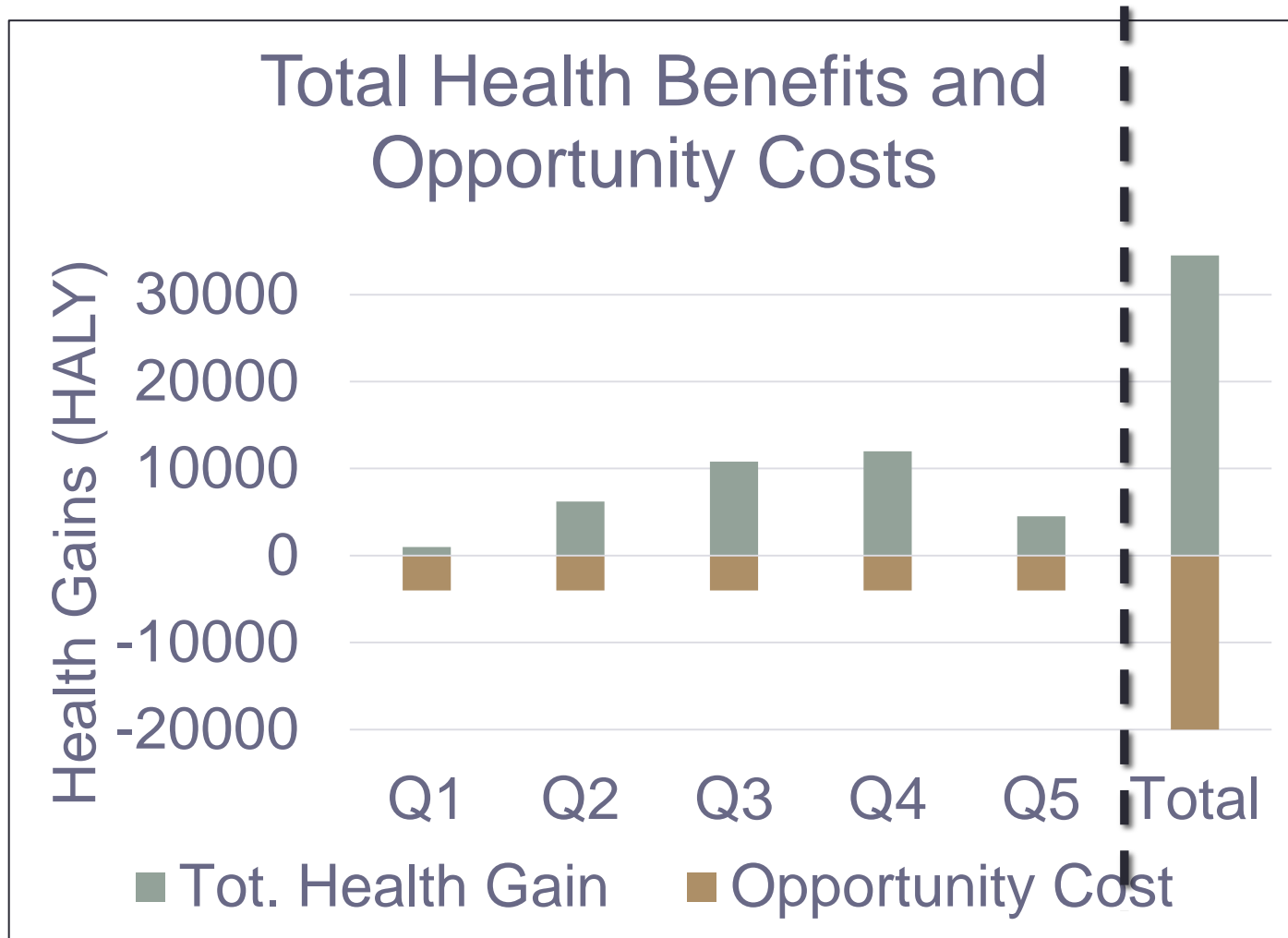# Model Inputs – Effective Coverage

Rotavirus Vaccine Use by Wealth Group
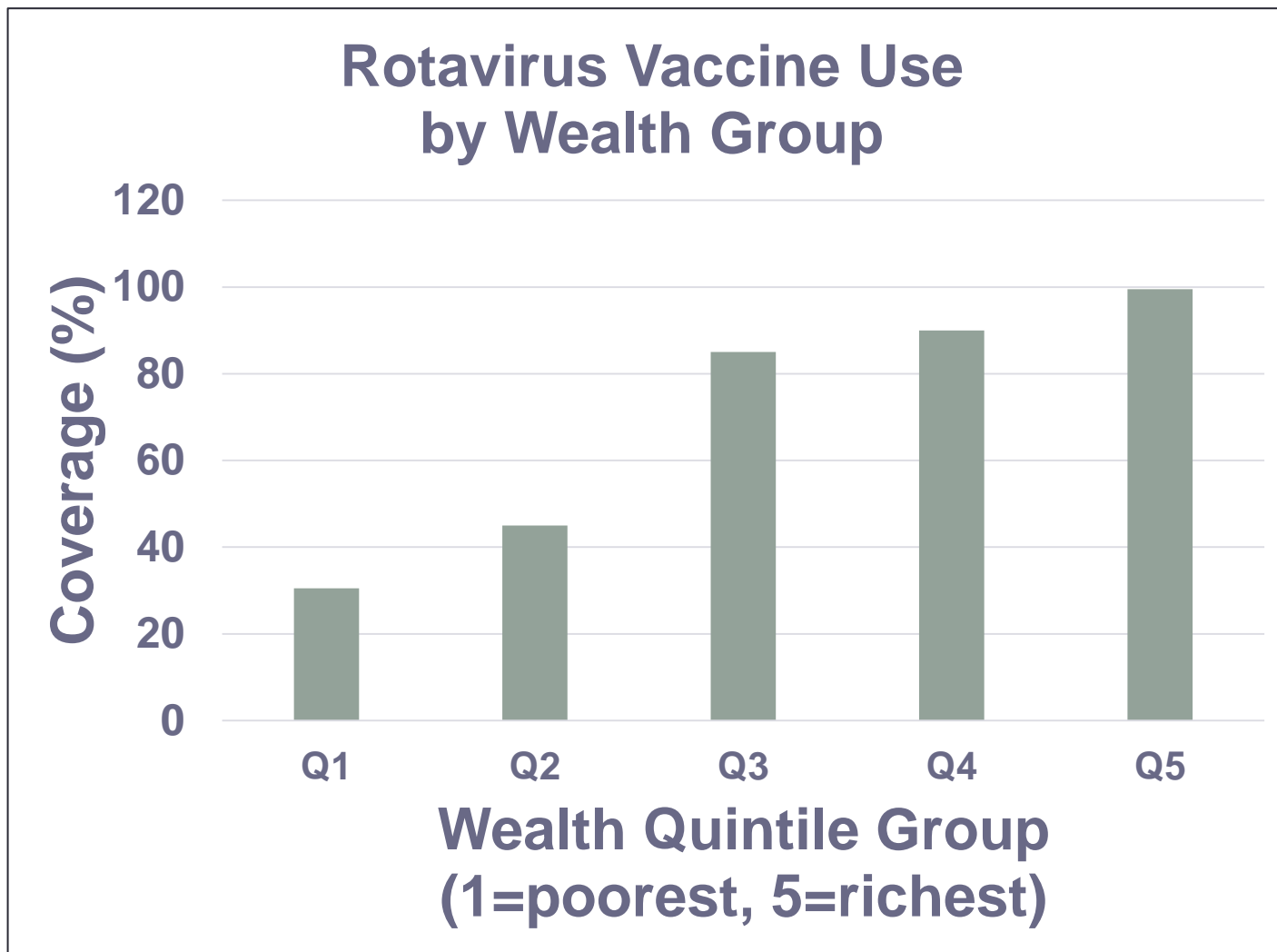
Model Inputs – Delivery Cost

Vaccine Delivery Cost by Wealth Group

Distribution of Health Gains

Health Opportunity Costs

Total Health Benefits and Opportunity Costs

Health Gains (HALY)

30000
20000
10000
0
-10000
-20000

Q1 Q2 Q3 Q4 Q5 Total

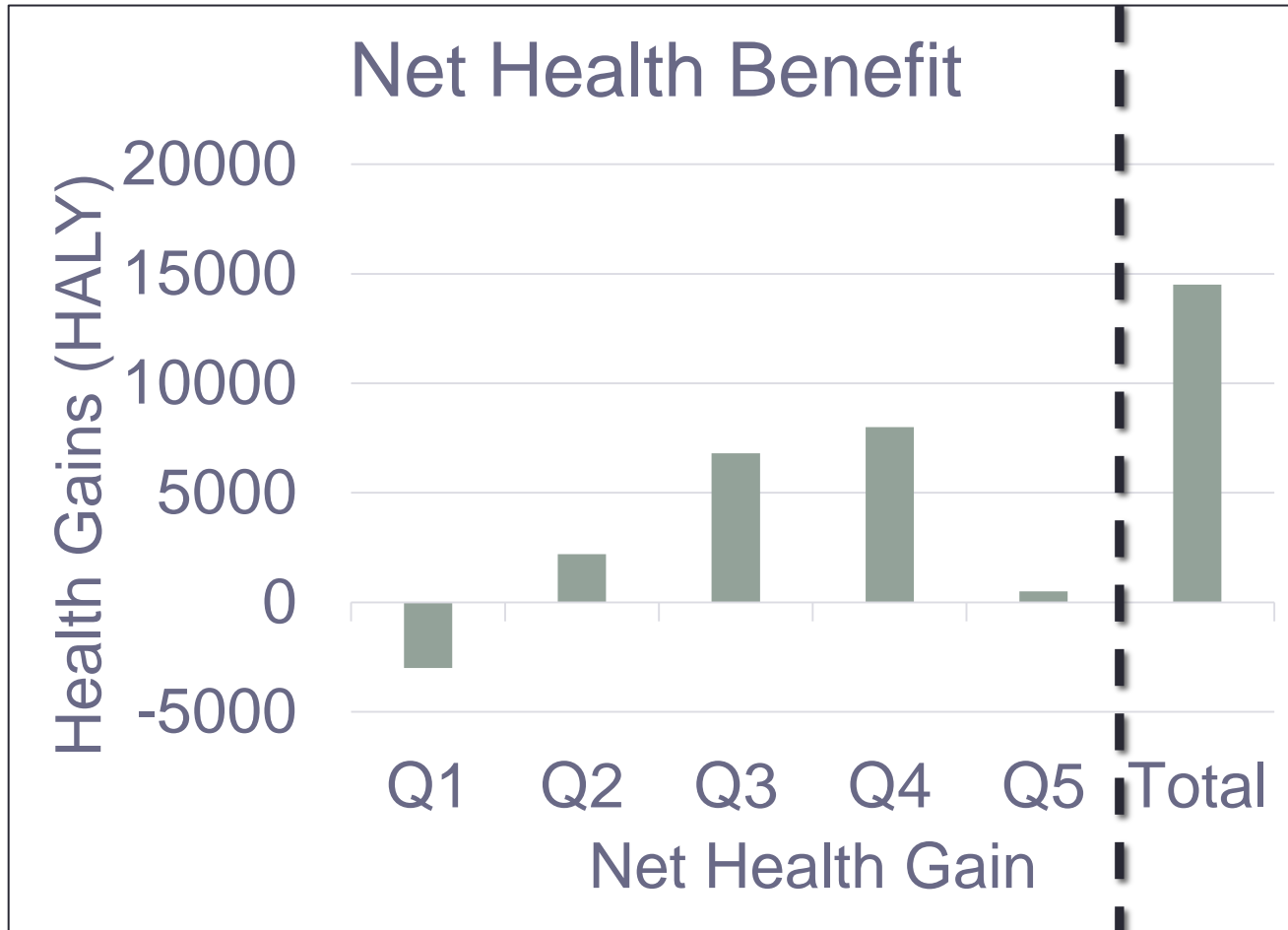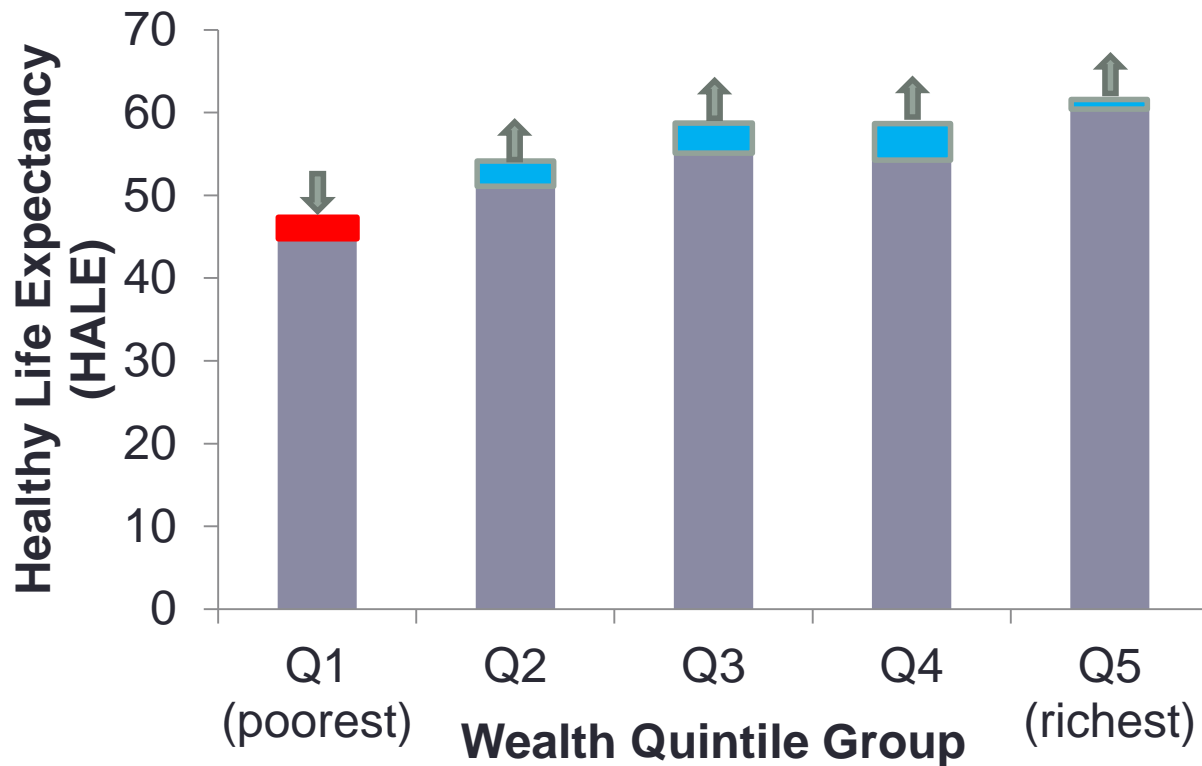■ Tot. Health Gain   ■ Opportunity Cost
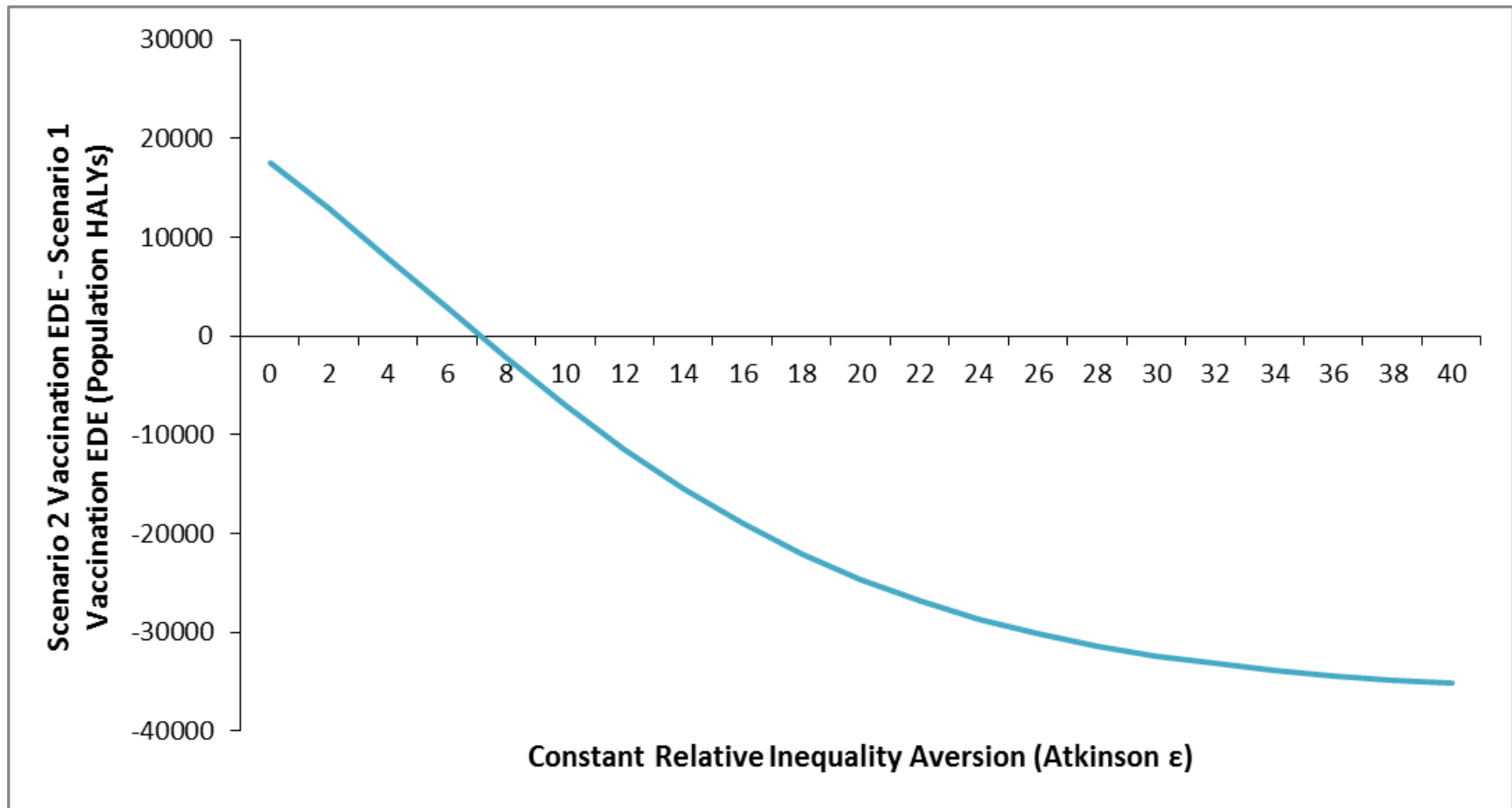
Distribution of NET Health Gains

Adding the Net Health Gains to the Baseline Health Distribution

Source: Dawkins et al. Forthcoming

Equity Trade-off Analysis

Applying this to your own research

Further resources at:
https://www.york.ac.uk/che/research/equity/economic_evaluation/

List of possible topics

- Salt reduction targets
- Alcohol minimum pricing
- Pre-school education
- New drugs for hepatitis C
- New drugs for skin cancer

Checklist of questions for equity-informative CEA

1. What key equity-relevant variables are of most concern to policy makers in the context of this decision? (e.g. socioeconomic status, ethnicity, location, gender, severity of illness, other)

2. What key drivers of health outcomes might lead to differences in health benefits by these key equity-relevant variables? (e.g. social variations in health risks, access to care, adherence to care, lifetime capacity to benefit)

3. Where do the opportunity costs fall and how might they differ by the equity-relevant variables? (e.g. health expenditure, general public expenditure, private consumption)

4. Are non-health benefits or opportunity costs very important in the context of this decision? (e.g. risk of catastrophic health care expenditure, effects on household income, effects on education, employment, crime or other non-health outcomes, costs falling on non-health public expenditure) If so, ECEA may be preferable.

5. Might this be a "win-lose" or "lose-win" case involving trade-offs between improving total health and reducing unfair health inequality? If so, DCEA may be preferable.