Cost-equality analysis of health care programmes – a methodological case study of the UK Bowel Cancer Screening Programme

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- Outline
- Clarifications
- Discussion points

Outline: Background

- Equality matters
  - Health inequality
  - Fairness
- Bowel Cancer Screening
  - Effective intervention
  - Inequality in uptake
    - Sex(F ↑), age(↑), ethnic diversity (↓), deprivation(↓)

Outline: Cost-effectiveness analysis

- Model-based approach
  - Pre-existing model
- 3 strategies:
  - Standard screening
  - Screening + targeted reminder
    - Most deprived 40%
    - Highest proportion of Indian subcontinent
  - Screening + universal reminder

Outline: Cost-effectiveness analysis

- Table 1 (edited)

| Results based on a lifetime model for a cohort comprising of one million 30 year olds [a]	Incremental Bowel Cancer Related Cost (£) compared to no screening [b] *population* **per person**	Incremental QALYs compared to no screening *population* **per person**	Cost per QALY gained (£/QALY) compared to no screening	Incremental NHB @£20k per QALY (QALYs) compared to no screening *population* **per person**
1. Standard screening	*44,013,836* **44**	*50,324* **0.0503**	*875*	*48,123* **0.0481**
2. Screening + targeted reminder	*75,604,844* **76**	*54,566* **0.0546**	*1,386*	*50,785* **0.0508**
3. Screening + universal reminder	*75,886,777* **76**	*54,919* **0.0549**	*1,382*	*51,124* **0.0511**

Outline: Cost-equality analysis

- Firstly assumes all variation in health unfair
- Estimate distribution of health in population
- Estimate distribution of uptake for each intervention
- Estimate effect of interventions on distribution of health
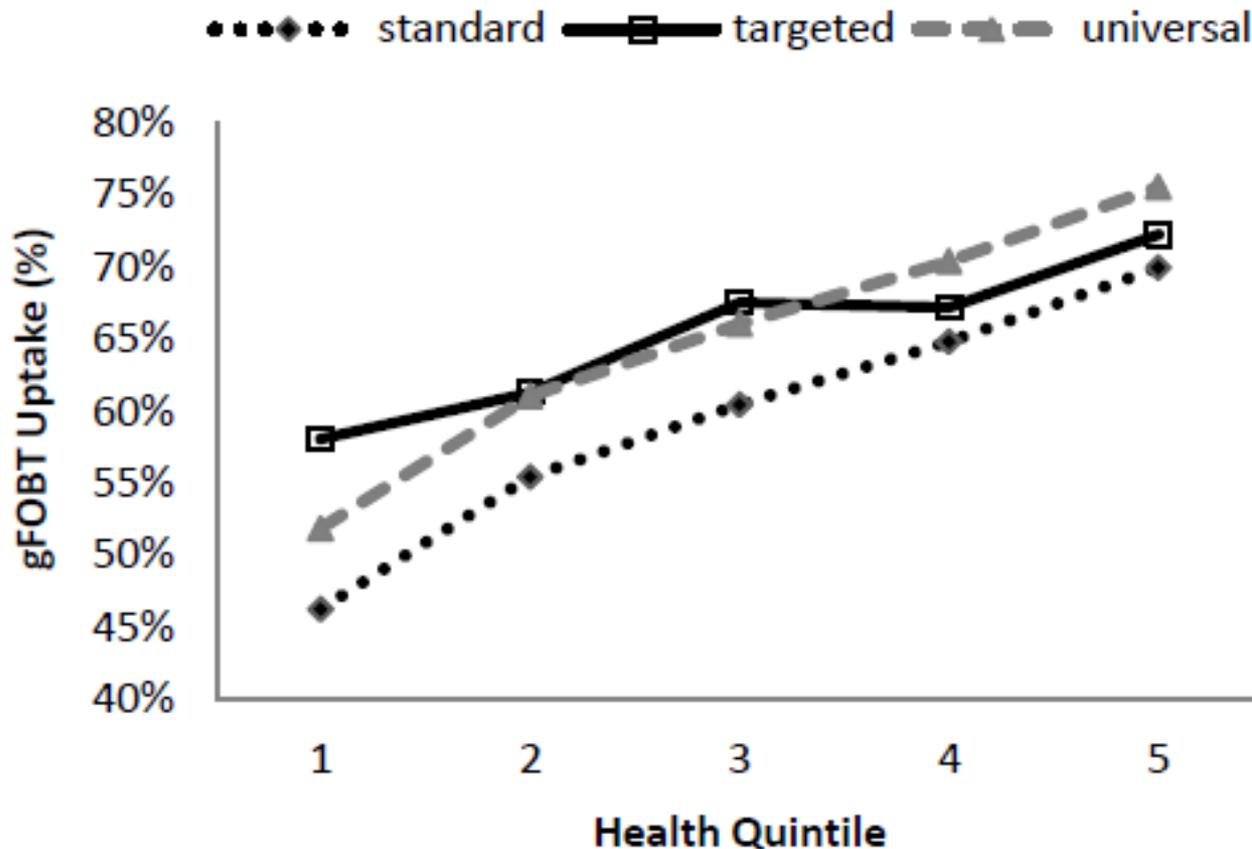
Outline: Cost-equality analysis

Figure 1: Baseline health distribution
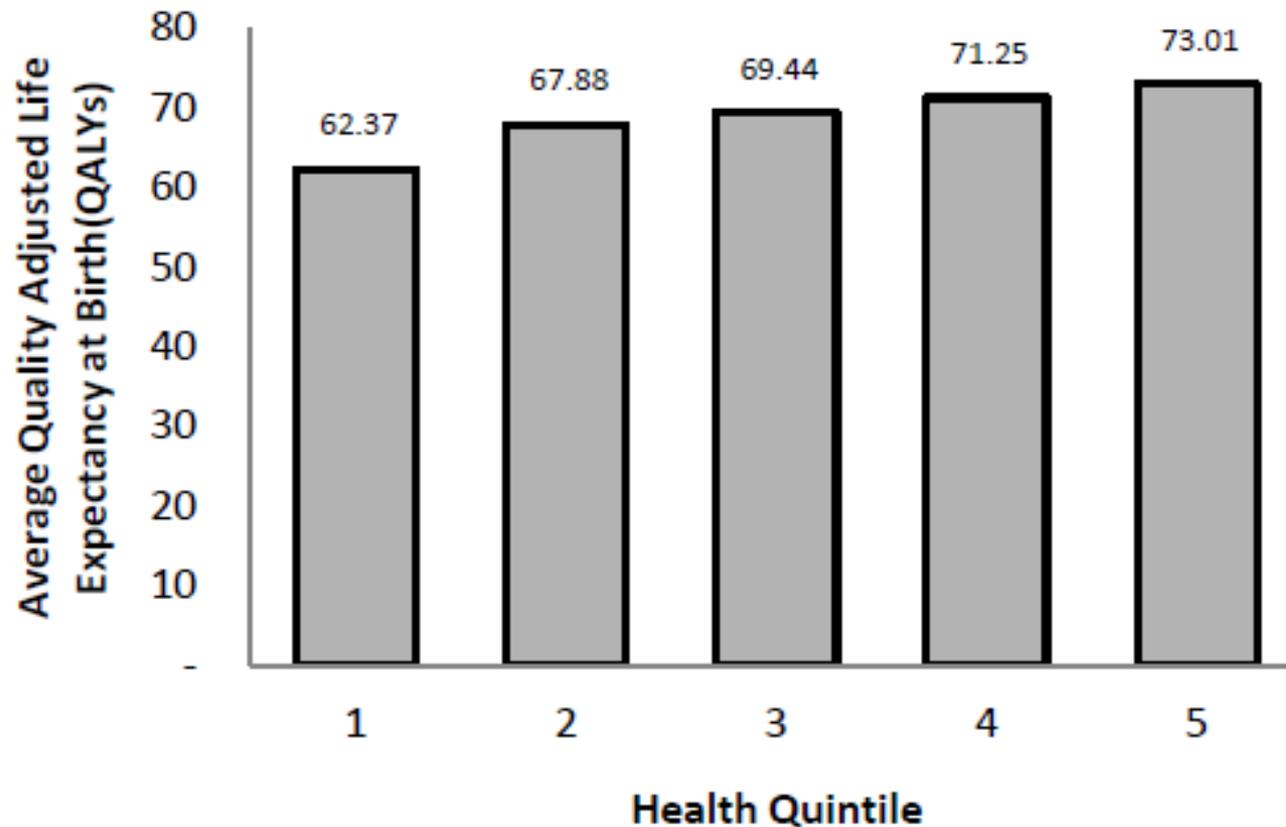
Outline: Cost-equality analysis

Figure 2: gFOBT uptake distribution

Outline: Cost-equality analysis

Figure 3: Health compared to no screening
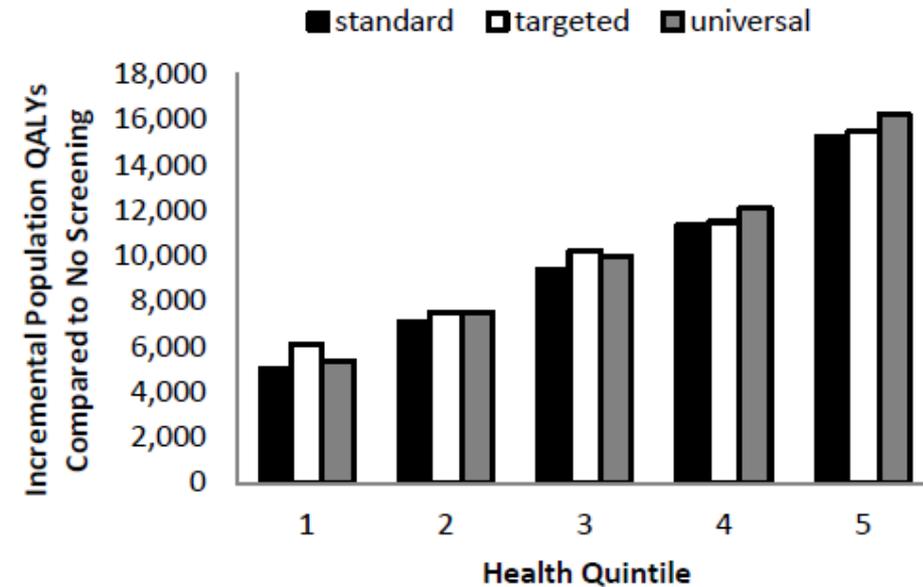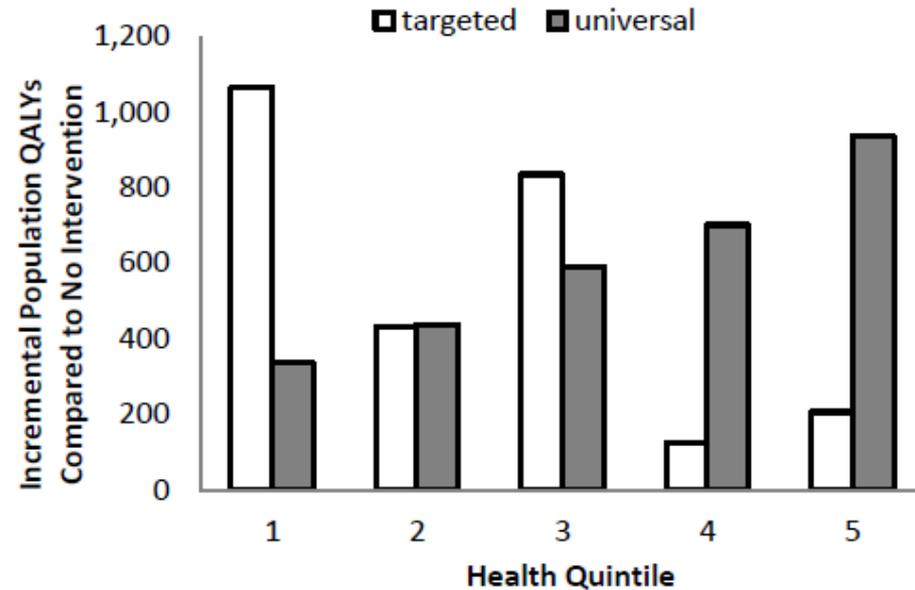(per million of population invited for screened)

Figure 4: Health compared to standard screening
(per million of population invited for screening)

Outline: Cost-equality analysis

- Inequality indices used to highlight preferred options in terms of equality
  - Screening + targeted reminder is the preferred option
  - Screening + universal reminder is least preferred option

Outline: Cost-equality analysis

- Also uses social welfare indices
  - Maximum health and inequality aversion
    - Measured by level of equal health necessary for indifference with inequality
  - Screening alone always least preferred

Social Welfare Indices	standard gFOBT	gFOBT + targeted	gFOBT + universal
Mean Health	68.83853	68.84119	68.84153
Atkinson EDE ($\varepsilon = 1$)	68.72511	68.72787	68.72806
Atkinson EDE ($\varepsilon = 5$)	68.22774	68.23091	68.23047
Kolm EDE ($\alpha = 0.025$)	68.64509	68.6479	68.64799
Kolm EDE ($\alpha = 0.125$)	67.76671	67.77018	67.76918

Outline: Cost-equality analysis

- Secondly, allows for some variation in health to be deemed fair
  - In terms of IMD, ethnic diversity, sex

IMD	Ethnic Diversity	Sex	Atkinson EDE ($\varepsilon = 1$)	Atkinson EDE ($\varepsilon = 5$)	Kolm EDE ($\alpha = 0.025$)	Kolm EDE ($\alpha = 0.125$)
Fair	Fair	Fair	U	U	U	U
Fair	Unfair	Fair	U	U	U	U
Fair	Fair	Unfair	U	U	U	U
Fair	Unfair	Unfair	U	U	U	U
Unfair	Fair	Fair	U	T	U	T
Unfair	Unfair	Fair	U	T	U	T
Unfair	Fair	Unfair	U	T	T	T
Unfair	Unfair	Unfair	U	T	U	T

Outline: Discussion

- Screening increases inequality
- Results suggest BCSP should be augmented with reminder
  - Targeted if inequality aversion high
  - Universal if inequality aversion low
- Limitations
  - Assuming CRC incidence constant across groups

Clarifications

- What are 'population health interventions'?

- Could not find source of 12% increase in uptake for targeted group

- Why one million 30 year olds?

- Data to derive distribution of health appear to be from general population
  - Those eligible for BCSP are not general population

Clarifications

- Figures (3,4,7,8) show incremental QALYs (compared with no screening).
  - Does not seem to take into account cost of intervention
  - Incremental net health benefit?
  - Negative incremental QALYs (fig 8) doesn't seem to make sense

Discussion points

- Framework lacks clarity
  - Not clear how social welfare indices are estimated
  - Better explanation needed
    - Formulas if necessary
- How does this framework account for uncertainty?
  - Especially important for this analysis where health benefits are tiny

Discussion points

- Incremental cost/benefit
  - Paper inconsistent, sometimes comparing with no screening, sometimes with standard screening.
  - Actually compares 4 interventions, not 3

Discussion points

- 'Cost-equality analysis' misleading
  - Implies trade-off between expenditure and equality, not efficiency and equality
- Equality or Equity?
  - Accounting for 'fairness' suggests cost-equity analysis

Discussion points

- Combination of character-specific and population data
  - Would unbiased results require separate cost and effectiveness information for subgroups
    - Sex/age/IMD/etc

Discussion points

- Different uptake rates may be a good thing
  - Characteristics of treatment may vary by age/sex/IMD
    - Effectiveness of treatment
    - Capacity to benefit
    - Disutility of screening
      - Model does not seem to account for this
- Can't assume marginal benefit of additional attendees is constant
  - There's a reason they don't attend!

Discussion points

- Must this methodology be limited to 'population health interventions'
  - If we know the characteristics of the treatment group, can apply to any intervention?