**Instructions for equity trade-off practical**

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**Link to access spreadsheets:** [**https://www.york.ac.uk/che/research/equity/economic\_evaluation/**](https://www.york.ac.uk/che/research/equity/economic_evaluation/)

**Notes**

1. There are two spreadsheets: “Equity practical – student file” and “Equity practical – solution file”. Please open the “student file” to start with, and go through the worksheets filling in the relevant cells yourself. You can look at the solution file if you get stuck.
2. These step-by-step instructions are reproduced on the main worksheets of the spreadsheet. There are also four additional worksheets with optional extra material requiring a more advanced understanding of Excel functions and mathematics, for which step-by-step instructions are not provided.
3. When the spreadsheet is first opened a ‘Security Warning’ may be displayed below the menu bar.  Select ‘Enable this content’.

**Sheet 1. Title-Intro**

The objective of this practical is to analyse an equity trade-off between improving total health and reducing health inequality. In the exercise, you will analyse the health and equity impacts.

You are confronted with a hypothetical, equity-focused policy, "Programme B". There is an assumption that funding is obtained from a fixed, fully allocated budget for health. The current situation is described by "Programme A". Funding "Programme B" requires disinvestment from "Programme A". "Programme B" reduces social inequality in health, but is not cost-effective. Its health benefits do not outweigh its costs so it reduces total health.

In the next sheets, we will show you what an equity trade-off looks like using this simplified hypothetical example. Several of the following sheets will have you fill in cells yourself to calculate the equity trade-off.

*Now turn to Sheet 2 to calculate the total health impact.*

**Sheet 2. Health impact**

The table below describes Programmes A and B using three input variables, by wealth quintile group:

* Input 1. Quality adjusted life expectancy (QALE) at birth of the average individual under Programme A (column B)
* Input 2. The incremental QALYs for the average individual under equity-focused Programme B (column C)
* Input 3. Population size of each wealth quintile group (column E)

**TASK 1**. To calculate the total heath impact of Programme B, fill in the green highlighted cells.

* First add columns B and C to get the resulting individual health when Programme B is introduced (column D).
* Multiply column C by population to get the population impact for each quintile group (column F).
* Finally, calculate the relevant totals and averages.

After completing TASK 1.

The sign of the average individual impact (C17) should be negative, since Programme B is not cost-effective.

The population health impact is the average individual impact multiplied by the population size, in this case 50 million.

Figures: How does the equity-focused B distribution of lifetime health (in red) differ from the comparator A distribution (in blue). How does this relate to the net population health impact? Is total health bigger or smaller in Programme B? Is the distribution more or less equal? Would you choose A or B?

*Now that you have worked out the total health impact, let's quantify the equity impact. We will use the Atkinson inequality index as our equity metric. Sheet 3 will show you how to calculate this index.*

**Sheet 3. Equity impact**

The Atkinson welfare and inequality indices are seen in equations (1) and (2) below. The estimated size of the equity impact depends on the chosen inequality aversion parameter ε. We have entered an initial benchmark value of 11 for ε, and have used the Excel "named range" feature to name this value "atkinson\_e" so that we can change it later on. You can use this feature in formulae simply by writing atkinson\_e instead of 11. Later on you can change this parameter to see what happens.

**TASK 2**. To calculate the equity impact, fill in the green highlighted cells:

Calculate the Equally Distributed Equivalent (EDE) welfare index in cells F9:F13 using the formula in orange (hint, look at column D).

Next, sum across all quintile groups in F14. Then divide by the population to compute the population average in F15.

Then compute the EDE by taking the average in cell F15 to the power 1(1-ε) as per equation (1), and put this in cell F16.

Now calculate the Atkinson inequality index A(ε) for Programme B using equation (2) in cell F17.

Finally, calculate the difference between B and A for the two indices in cells G16 and G17.

Take the reverse sign of the A(ε) difference in cell I17 for plotting purposes: a positive impact represents an improvement.

Key Atkinson formulae:

Welfare index

(1) $EDE=\left(\frac{1}{N}\sum\_{}^{}h\_{i}^{1-ε}\right)^{\frac{1}{1-ε}}$

Inequality index

(2) $A\left(ε\right)=1-\frac{EDE}{\overbar{h}}$

where

hi = individual health in quality adjusted life expectancy (QALE)

N = total population size

ε = Atkinson inequality aversion parameter

EDE = "Equally Distributed Equivalent" health (the Atkinson index of social welfare on the same scale as individual health)

A(ε) = Atkinson index of inequality (scaled from 0 to 1, where 0 represents no inequality and 1 represents full inequality)

 = mean health in the general population

$$\overbar{h}$$

The Atkinson index of inequality measures the fraction of population health you would sacrifice to achieve full equality in health, given the current health distribution and your degree of inequality aversion.

*Now look at the next sheet to see these results plotted on the equity impact plane. Once you have interpreted the equity impact plane, turn to sheet 4 to analyse the equity trade-off.*

**Sheet 4. Equity trade off**

To illustrate the equity trade-off we can use the equally distributed equivalent health (EDE) Atkinson welfare index, which combines total health and health inequality into a single overall measure of health achievement.

**TASK 3**. Using a *data table* (below highlighted in green) calculate the EDE under each Programme for a range of inequality aversion parameters.

Hint: Fill in the first row and then highlight the whole table and go into Data, What if Analysis, Data Table, and enter B4 as Column Input.

For this "what if" analysis to work, the starting inequality aversion value in cell B4 needs to stay set to 0. If you cannot see the 'What-If Analysis' option on the Data tab, install the Analysis Toolpak by going to 'File', select 'Options' then 'Add-Ins' and use the 'Manage: Excel Add-ins' option.

The point at which EDE impact becomes positive is the point at which Programme B becomes worthwhile. The larger your degree of inequality aversion, the more worthwhile you will consider Programme B to be.

*Now turn to sheet 5 to see how it all fits together*

**Sheet 5. Final**

Equity Trade-Off Dashboard.

Try entering a different choice of inequality aversion parameter in the green box. Then click the grey button to update the equity weight.

Then try altering the input values in blue and see what happens to the results and the graphs.