APPENDIX B

Informing decisions on investment to reduce health inequalities (III) in Scotland: explaining the delayed mortality effect

December 2014
Comparison group

**Year 0**
- 100 individuals

**Year 10**
- 80 individuals
  - 20 people die 
    \((20/100) \times 100\)

**Year 20**
- 64 individuals
  - 16 people die 
    \((20/100) \times 80\)

Mortality rate is 20/100 per 10 years in the unaffected (comparison) group, and this is unchanged over the 20-year period.

The years of life lost (YLL) at 10 years is therefore 500 \((0.5 \times \text{average 50 years life lost for each person} \times 20 \text{ people})\) and at 20 years is 900 \((500 \text{ (from the first 10 years)} + 400 \text{ (16 people} \times 0.5 \text{ (because average of 8 people over the time) \times 50 years of life lost for each person)}\).

Intervention group

**Year 0**
- 100 individuals

**Year 10**
- 90 individuals
  - 10 people die 
    \((10/100) \times 100\)

**Year 20**
- 72 individuals
  - 18 people die 
    \((20/100) \times 90\)

Here we assume that the intervention reduces the mortality rate in the first 10 years to 10/100 per 10 years, but the effect of the intervention stops at 10 years and the mortality rate returns to the baseline rate of 20/100 per 10 years. The YLL are 250 \((10 \text{ people} \times 0.5 \times 50 \text{ years})\) in the first 10 years and 450 in the second 10 years \((18 \text{ people} \times 0.5 \times 50 \text{ years})\), a total of 700. Over the 20 years this is less YLL \((700 \text{ v 900})\), but in the first 10 years the difference is much less \((250 \text{ v 500})\) and the second 10 years is slightly more \((450 \text{ v 400})\).

As can be seen, the number of people dying in the second 10-year period in the intervention group is greater than in the comparison group. This is simply because of
the greater population at risk of death (i.e. the denominator is greater). The YLL lost per year (in crude terms) can therefore increase in the intervention group, and be higher than in the comparison group.

Importantly, this increase in YLL can be seen even where the overall survival remains higher in the intervention group (e.g. 72 survivors at 20 years in the intervention group and 64 survivors at 20 years in the comparison group).