**TB or not TB**

Kun-Woo R. Kim

8/25/2023

Instruction: PDF with necessary text response and figures along with your code

1. Considering every 5 years from age 0 to age 50 (i.e., age 0, 5, 10, 15, 20, etc.), what is the age at which a one-time screen will maximize life expectancy, and what is the life expectancy gain compared to no program?

|  |  |
| --- | --- |
| **Strategy** | **Life Years** |
| **No screening** | 11.5265 |
| **screening at age 0** | 11.5265 |
| **screening at age 5** | 11.5268 |
| **screening at age 10** | 11.5266 |
| **screening at age 15** | 11.5265 |
| **screening at age 20** | 11.5265 |
| **screening at age 25** | 11.5265 |

Having a one-time screen at age 5 maximizes life expectancy. Compared to no program, it increases life years by 0.0003

1. Assuming testing costs of $10 and treatment costs of $200, report the incremental cost-effectiveness of non-dominated strategies (assume no discounting, and a lifetime analytic horizon). For a WTP of $1000 per life-year (LY) saved, what is the optimal strategy based on the information given? (Note, it is also an option to have no program).

|  |  |  |  |
| --- | --- | --- | --- |
| **Strategy** | **Life Years** | **Costs** | **ICER** |
| **screening at age 15** | 11.5265 | 0.20 | - |
| **screening at age 0** | 11.5265 | 20.20 | 24155503.85 |
| **screening at age 5** | 11.5268 | 33.12 | 48308.63 |

For a WTP of $1000/LY saved, having a one-time screening at age 15 is the most optimal strategy.

1. Revise your analysis to include uncertainty in the following variables (note that these priors have the same mean as the original point estimates). Based on these prior distributions, report a mean estimate and a 95% uncertainty interval for the life expectancy gain calculated in part (a). Does the mean equal the point estimate calculated in (a)? Why/why not?

|  |  |  |
| --- | --- | --- |
| **Strategy** | **Life Years** | **Cost** |
| **No screening** | 11.5265, 95% CI: (11.5265, 11.5265) | 0.1962, 95% CI: (0.1950, 0.1974) |
| **screening at age 0** | 11.5265 (11.5265, 11.5265) | 19.2363, 95% CI: (18.8003, 19.6723) |
| **screening at age 5** | 11.5268, 95% CI: (11.5268, 11.5267) | 32.8291, 95% CI: (32.4264, 33.2318) |
| **screening at age 10** | 11.52655, 95% CI: (11.5265, 11.5266) | 36.9828, 95% CI: (36.6335, 37.3321) |
| **screening at age 15** | 11.5265, 95% CI: (11.5265, 11.5266) | 0.1969, 95% CI: (0.1956, 0.1981) |
| **screening at age 20** | 11.5265, 95% CI: (11.5265, 11.5265) | 0.1962, 95% CI: (0.1949, 0.1974) |
| **screening at age 25** | 11.5265, 95% CI: (11.5265, 11.5265) | 0.1963, 95% CI: (0.1950, 0.1976) |

Mean value equals the point estimate calculated in a). Parameters used for prior distributions have the same mean as the original point estimates. With the Law of Large Numbers, increasing the number of simulations can bring the sample values closer to the population value.

1. Report the uncertainty in your cost-effectiveness results as a cost-effectiveness acceptability curve. At a WTP of $1000 per LY saved, what is the probability that the strategy identified in (b) is optimal?

A graph with blue lines

Description automatically generated

The strategy identified in (b) (having a one-time screening at age 15) has the probability of 99.7% of being cost effective at the WTP of $1000/LY with 1000 simulation runs.