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Objectives

To use a stochastic all-cause, cause of death mortality model to determine the risk of cardiovascular (CVD) mortality in smokers compared with non-smokers in the UK, allowing for competing causes of death.

Methods

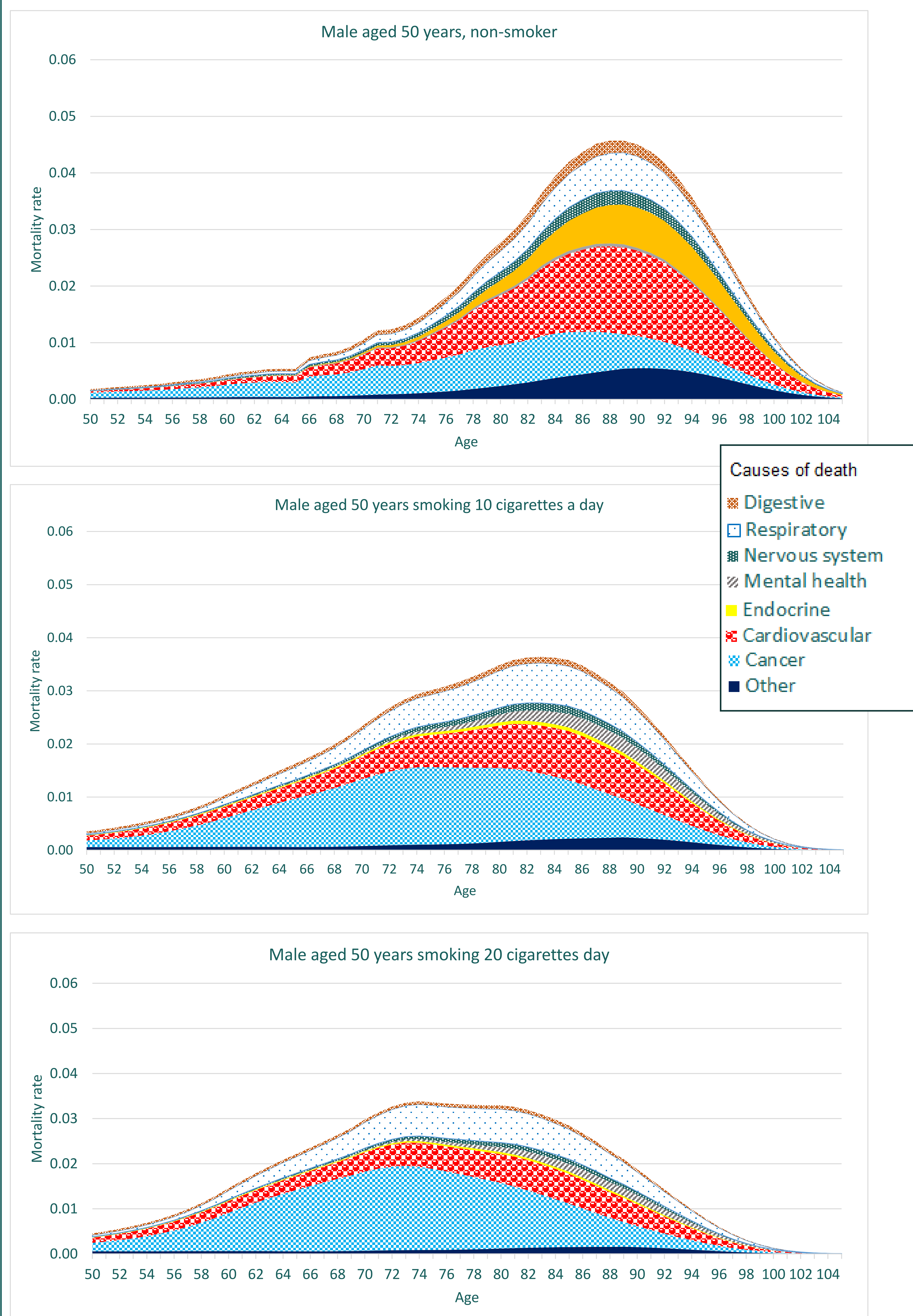
The *Sonata Vivo* model adjusts population baseline mortality for known risk factors to calculate the mean age of death and most likely causes of death for an individual, and has been validated against long-term cohorts in the UK (Whickham and British Regional Heart Studies) and USA (NHANES).¹

We used the model to calculate the likely outcomes for a 50 year-old male who smokes no, 10 or 20 cigarettes a day, with population average values for blood pressure (130/85 mmHg), body-mass index (25 kg/m²), cholesterol (total cholesterol 5.6 mmol/L, HDH-cholesterol 1.5 mmol/L, TC:HDL ratio 3.73) and alcohol consumption (10 units per week). Base mortality data were taken from the Office for National Statistics mortality DR2 series tables for England and Wales in 2012.

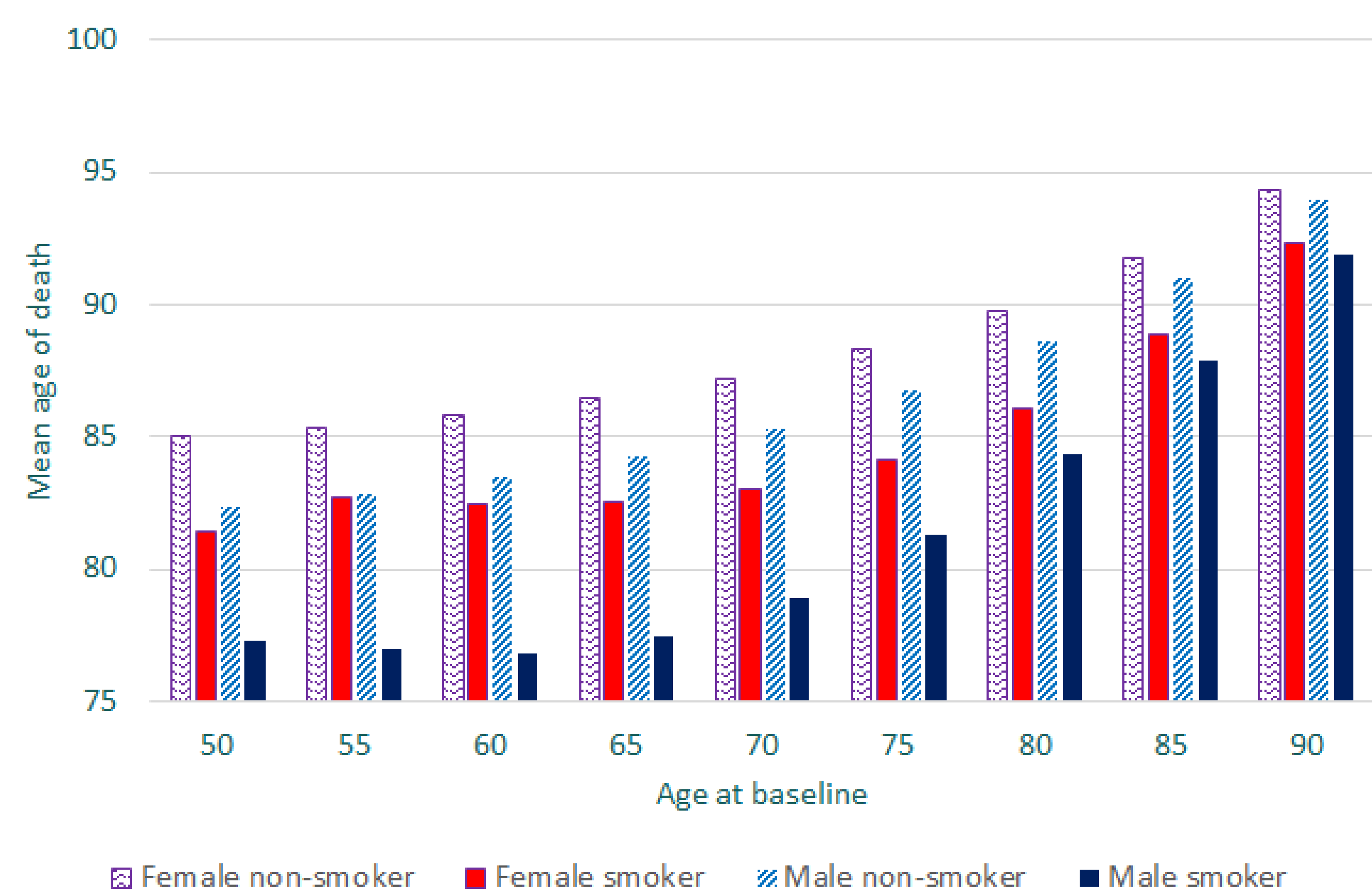
Results

The mean ages of death were 82.7 years for the non-smoker, 78.7 years for a 10/day and 76.1 years for a 20/day smoker. At each year of life, smokers had a higher mortality from CVD than non-smokers. However, overall, there were fewer CVD deaths in smokers than non-smokers. This is an example of Simpson's paradox, where an association between factors at a population level may be the opposite for each subgroup in the population. Smokers have increased mortality from cancer and respiratory disease, and on average die of these at a younger age than those who eventually die of CVD. Smokers also have fewer years of life than non-smokers in which CVD deaths can occur.

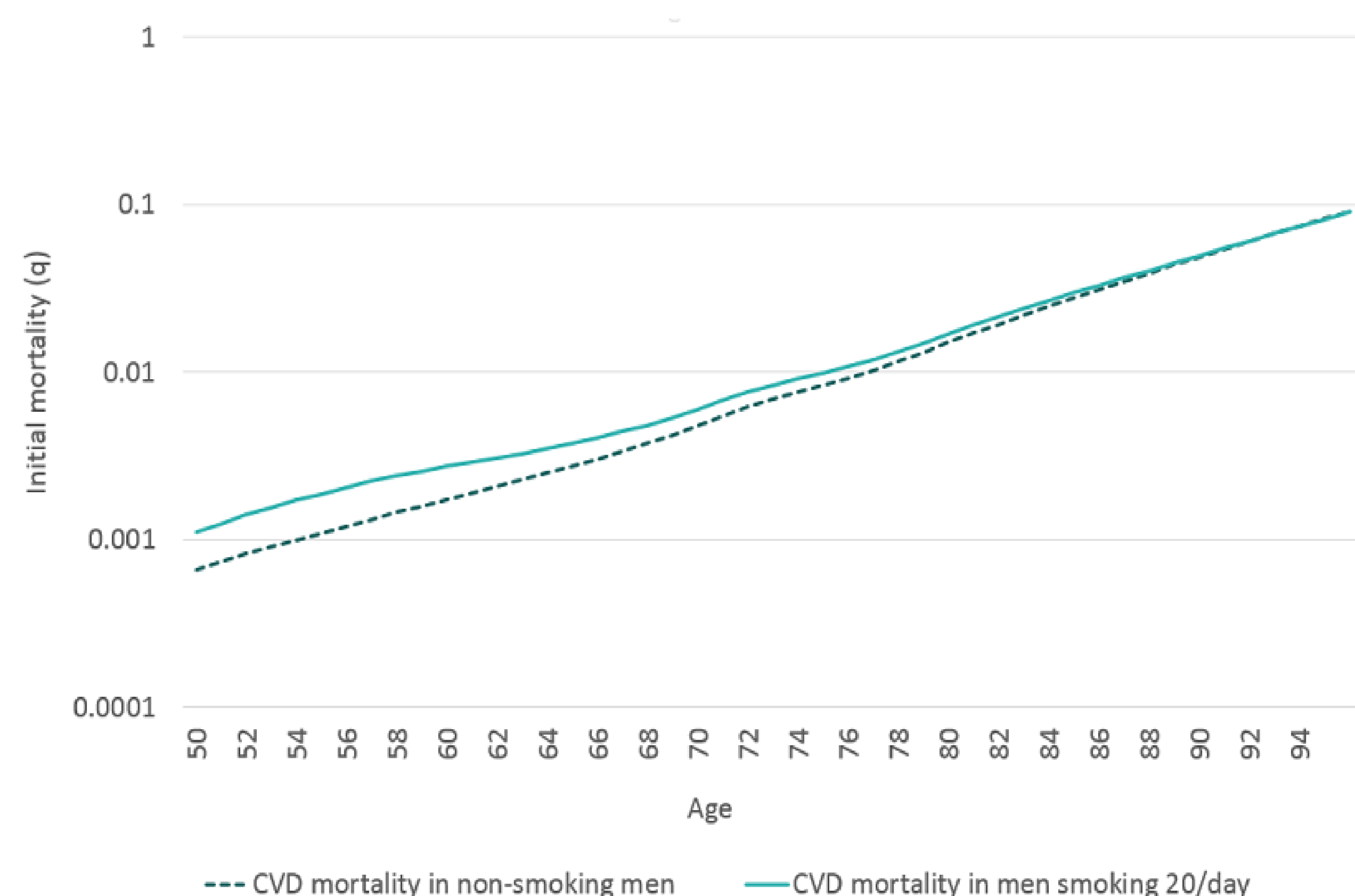
Curve of deaths for males aged 50: non-smoker versus smoker of 10 and 20 cigarettes a day



Predicted mean ages of death for female and male smokers and non-smokers aged 50 to 90 at baseline



Initial mortality from cardiovascular disease for a non-smoking male aged 50 versus a 20-a-day smoker



Initial mortality is the probability on 1st January of dying in the following year, shown on a log scale

References

1. Martin CJ (2013). *Individualized modelling of mortality by cause based upon risk factors*. PhD thesis, University College, London. Available from <http://discovery.ucl.ac.uk/1395578/>

Conclusions

Smoking increases the risk of many diseases, which have their greatest impact at different ages. Smokers have lower overall risks of CVD death as they are more likely than non-smokers to have died of cancer before the peak age for CVD deaths. The real-world effect of interventions for smoking-related diseases will be influenced by this impact of competing causes of death.