Appendix B7. Differences between microsimulation and tool

There are three main methodological differences between the microsimulation and the deterministic tool.

Difference 1: Disease class

The key method of the disease class is to calculate an individual's risk (transition probability) of getting a disease based on their age, sex, current disease state, medical history and risk factor level. For stochastic transitions (microsimulation) this probability is compared to an application-generated random number to determine if the transition takes place. In the deterministic tool this probability is included in the relevant life-disease table that both computes and lists the probabilities of being alive with no disease, within possible exclusive disease states and dead.

Difference 2: Risk factor trajectories

The microsimulation uses a representative distribution of BMI and smoking trajectories over the whole population. In the case of BMI a value will be sampled from this distribution and allocated to an individual in the simulation. Whereas, the tool uses only a small set of risk factor trajectories:

- For BMI, 3 trajectories are represented: normal weight, overweight and obese. The BMI values of each trajectory are taken as the midpoint within each BMI group. The following BMI values are used for each group: 20 kg/m^2, 27.5 kg/m^2 and 32.5 kg/m^2.
- For tobacco, 3 trajectories are represented: never smoker, ex-smoker and smoker.

Difference 3: Population class

The microsimulation can process any specified population or cohort; the deterministic tool processes only cohorts. A *population* is a specified number of males and females whose age distributions and risk factor distributions are input as appropriate tab delimited text files; for the tool, a *cohort* made up of weighted individuals is used where the weight is calculated as shown in equation (0.1).

$$\begin{aligned}&\text{cohort member weight}[i,j,k,l] = p_{sex}(i) \times p_{age}(j \mid i) \times p_{rf}(k \mid i,j) \\ &\text{where } i \in [0,1],\ j \in [0,n], k \in [0,2]\end{aligned} \qquad (0.1)$$

Where,

$p_{sex}(i)$ is the probability of being male or female

$p_{age}(j|i)$ is the probability of having a certain age given sex

$p_{rf}(k|i,j)$ is the probability of being in a certain category (i.e. Smoker, obese, etc…) given sex and age.