Probs

V2 – 03/27/2023

~Modeling/Sim Functions/Probs2.R

1. **Input Parameters**: The function accepts the following input parameters:
   * **M\_it**: The health state occupied by the individual i at cycle t.
   * **risk\_modifiers**: A 3D object containing effect sizes for risk factors.
   * **v\_asthma\_state\_names**: A vector of asthma health state names.
   * **x\_i**: Individual characteristics of individual i (row i of m\_individual\_characteristics).
   * **fire\_it**: Fire experience of individual i at cycle t (binary).
   * **intervention\_coverage\_it**: Intervention receipt of individual i at cycle t (binary).
   * **death\_rate\_t**: Death rate adjuster at cycle t.
2. **Initial Setup**: The function first extracts the "from" health state and initializes a vector of transition probabilities, **v\_probs\_it**, based on the input **risk\_modifiers**.
3. **Create Risk Factors Matrix**: The function creates a matrix, **risk\_factors\_matrix**, where each row contains the individual's risk factors (age, sex, fire experience, and intervention coverage) for each health state.
4. **Extract Risk Ratios**: The function extracts the risk ratios for the appropriate transition probabilities from the input **risk\_modifiers** and stores them in the **risk\_ratios\_matrix**.
5. **Calculate Probability Adjustment Factors**: The function calculates a vector of probability adjustment factors, **v\_prob\_modifiers**, which encompass all risk factors. This is done by element-wise multiplication of the **risk\_factors\_matrix** and **risk\_ratios\_matrix**, followed by element-wise addition with the inverse of **risk\_factors\_matrix**. The product of each row in the resulting matrix is then calculated using **apply**.
6. **Calculate Adjusted Probabilities**: The function calculates the adjusted probabilities vector, **v\_probs\_it**, by element-wise multiplication of the original **v\_probs\_it** and **v\_prob\_modifiers**. It then replaces any values greater than 1 with 1 using the **pmin** function.
7. **Update All-Cause Mortality Probability**: The function updates the probability of all-cause mortality (health state "100") by multiplying it with the input **death\_rate\_t**.
8. **Calculate "Stay Put" Probability**: The function calculates the "stay put" probability (the probability of remaining in the current health state) as 1 minus the sum of all other probabilities.
9. **Error Checking**: The function checks for any errors in the calculated probabilities, such as:
   * If any elements in **v\_probs\_it** are **NA**, it stops execution with the message "NAs produced".
   * If any elements in **v\_probs\_it** are negative, it stops execution with the message "Negative probability calculated" and prints the problematic probabilities.
   * If the sum of the probabilities in **v\_probs\_it** is not equal to 1 (within a tolerance of 1e-9), it stops execution with the message "Probabilities do not sum to 1" and prints the sum and the probabilities.
10. **Return Adjusted Probabilities**: If no errors are found, the function returns the adjusted probabilities vector, **v\_probs\_it**.