

Appendix:**Appendix 1: Formulas Used in the Modeling**

a) Death probability according to age calculated from pyramids of age (with $X = \text{age} / 100$)

b) Developed Context: French-INSEE pyramid of age for 1989

i. For Males:

$$\text{death probability} = \text{Exp} \left(\frac{-3019.183 * X^7 + 11222.290 * X^6 - 16759.380 * X^5 + 12811.500 * X^4 - 5272.053 * X^3 + 1118.751 * X^2 - 97.754 * X + 5.8}{100\,000} \right)$$

ii. For Females:

$$\text{death probability} = \text{Exp} \left(\frac{-2007.620 * X^7 + 7403.493 * X^6 - 11039.040 * X^5 + 8508.472 * X^4 - 3584.127 * X^3 + 801.506 * X^2 - 78.000 * X + 5.31}{100\,000} \right)$$

c) Under-Developed Context: GLOBOCAN pyramid for North-Africa (2000)

i. For Males:

$$\text{death probability} = 7.3231 * X^6 - 20.278 * X^5 + 23.087 * X^4 - 12.738 * X^3 + 3.451 * X^2 - 0.3955 * X + 0.0325$$

ii. For Females:

$$\text{death probability} = \frac{(160.413 * X^7 - 391.218 * X^6 + 343.061 * X^5 - 112.346 * X^4 - 4.142 * X^3 + 9.218 * X^2 - 1.007 * X + 0.0556)}{5}$$

d) Primitive Context (England – 1851)

i. For Males:

$$\text{death probability} = 16.41 * X^6 - 47.621 * X^5 + 54.247 * X^4 - 29.299 * X^3 + 7.495 * X^2 - 0.7728 * X + 0.0411$$

ii. For Females:

$$\text{death probability} = 10.689 * X^6 - 29.735 * X^5 + 33.972 * X^4 - 19.213 * X^3 + 5.412 * X^2 - 0.6453 * X + 0.0397$$

e) Female fecundity according to age = probability to get pregnant per year:

$$Y = 1.17 - 26.267 * X + 201.637 * X^2 - 655.324 * X^3 + 961.593 * X^4 - 528.292 * X^5$$

where X is the age divided by 100.