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Appendix S6: Key mathematical notation

General notation

F : distribution functions

f : (probability) density functions

$\Phi(z)$: standard normal distribution function

$\varphi(z)$: standard normal density function

Birth and survival related notation

S : survival time

$F_S(s)$: the distribution function of survival time S

$f_S(s)$: the density function of survival time S

T : time of birth of a random individual from the population

$f_T(t)$: the density function of time of birth T

τ : the maximum possible age an individual from the population can attain

Linear regression related notation

X : age proxy

X_1, \dots, X_n : independent and identically distributed copies of X

x_1, \dots, x_n : realization of the random variables X_1, \dots, X_n

Y : age

$f_Y(y)$: density function of the age of an individual at time 0

$g(y)$: regression function relating age proxy to age

α : intercept for linear regression of age proxy against age

β : slope for linear regression of age proxy against age

σ : standard deviation of the error in the regression model

ε : standardized error in the regression model

$f_\varepsilon(z)$: density function for ε

$F_\varepsilon(z)$: distribution function for ε

n : sample size, i.e., the number of sampled individuals of which the age proxy is measured

Mortality rate related notation

m : mortality rate

$\lambda = -\ln(1 - m)$: rate parameter of exponential distribution

β/σ : the crucial indicator for the variation in estimated mortality rate

$\mu = \sigma\lambda/|\beta|$: proxy coefficient

$\hat{\mu}_n$: asymptotically efficient estimator of μ

$I(m)$: Fisher information for mortality rate m

$J(\mu)$: Fisher information for μ

$CR(95)$: 95% confidence range

$EP(95)$: theoretical 95% error percentage for mortality rate m

$EEP(95)$: empirical 95% error percentage for mortality rate m

\hat{m}_n : efficient estimator for mortality rate m

$\frac{1}{m\sqrt{I(m)}}$: the basic factor used in the calculation of 95% error percentage $EEP(95)$