The adequacy of aging techniques in vertebrates for rapid estimation of population mortality rates from age distributions

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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 $T$
$\tau$: the maximum possible age an individual from the population can attain

Linear regression related notation

$X$: age proxy
$X_1, ..., X_n$: independent and identically distributed copies of $X$
$x_1, ..., x_n$: realization of the random variables $X_1, ..., X_n$
$Y$: age
$f_Y(y)$: density function of the age of an individual at time 0
$g(y)$: regression function relating age proxy to age
$\alpha$: intercept for linear regression of age proxy against age
$\beta$: slope for linear regression of age proxy against age
$\sigma$: standard deviation of the error in the regression model
$\varepsilon$: standardized error in the regression model
$f_\varepsilon(z)$: density function for $\varepsilon$
$F_\varepsilon(z)$: distribution function for $\varepsilon$
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

\( \beta / \sigma \): the crucial indicator for the variation in estimated mortality rate

\( \mu = \sigma \lambda / |\beta| \): proxy coefficient

\( \hat{\mu}_n \): asymptotically efficient estimator of \( \mu \)

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

\( J(\mu) \): Fisher information for \( \mu \)

\( CR(95) \): 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 \( EEP(95) \)