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
- $X_1, \ldots, X_n$: independent and identically distributed copies of $X$
- $x_1, \ldots, x_n$: realization of the random variables $X_1, \ldots, X_n$
- $Y$: 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 $EEP(95)$