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Old-age mortality deceleration and the modal age at death: insights from dynamic laws of adult mortality

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Abstract We estimated overall period and cohort age-mortality patterns following a gamma-Gompertz-Makeham (ΓGM) model, expressed in terms of the old-age modal age at death (M) and taking advantage of the Life Table Aging Rate (LAR) parametric representation.
For different countries from the Human Mortality Database, we first take advantage of Horiuchi and Coale's LAR to seek for more precision in parameter estimation and define the best age to start fitting the model across different periods. Secondly, we test Vaupel's hypothesis by period a cohort by fitting a ΓGM model, seeking evidence to confirm or refute the existence of a constant rate of individual aging over time, and if, the obtained estimates accordingly each subpopulation, i.e., country, present essentially the same rate of individual aging. Thirdly, we elaborate on the relationship between the estimated LARs and 1) the rate of life expectancy increases in the chosen countries; 2) the age patterns of mortality deceleration in the overall population; 3) the relationship between M and the age of mortality deceleration ($X^\star$); and 4) the impact of specific causes-of-death on M. At the same time, we also test the goodness of fit of the LAR formula by Vaupel and Zhang. Fourthly, we verify the heterogeneity hypothesis that a) deceleration is less pronounced with lower death rates; and b) mortality deceleration should occur at later ages due to selection effects.

Keywords: Mortality, Longevity, Rate of Aging, Laws of Mortality.

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