Revisiting life tables construction: how different laws can influence mortality forecasts

(Abstract)

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Demographic paradigms are changing with time. Some resulted in an extraordinary life expectancy increase and nowadays past high rates of mortality are experienced later in life. As consequence, developed societies are facing a fast aging process. It is impossible, at the moment, to predict how long will we live, but it has been demonstrated that life expectancy is breaking old theorized limits (Oeppen & Vaupel, 2002) and with time every human can achieve later ages with improved health (Vaupel, 2010). These changes have profound implications, not only for individuals and family relations/dynamics, but also for society and the economy.

Life table mortality measures are used not only to evaluate a population mortality but also to provide a strong basis for population projections/forecasts. Between the 10-year hiatus of population census estimates are needed and if those estimates are erroneous, most government resolutions to deal with aging population structures will be inefficient. Especially if, trying to mitigate the aging impact, the elderly number is constantly over/under-estimated.

Life table data are (usually) right-censored and some proposals are made to deal with this issue, e.g., the Human Mortality Database (2017) employs the Kannisto law of mortality to smooth old-age mortality, Missov *et. al.* (2016) proposes a gamma-Gompertz-Makeham law and Statistics Portugal employs the Denuit and Goderniaux (2005) method. Those three different approaches might produce very similar outputs, but huge differences when used for mortality and population projections/forecasts. Thus, it is our goal not only to re-calculate life table mortality measures based on distinctive laws of mortality, but mainly to evaluate its impact on demographic projections and understand if this late life smoothing is really needed. To achieve our goal, we (1) fit different chosen laws of mortality; (2) find the best starting age of fitting; (3) recur to the Life-Table Aging Rate (Horiuchi and Coale, 1990) to evaluate and compare the validity of chosen models; (4) employ Oeppen's (2008) and Bergeron-Boucher *et al.* (2017) Compositional-Data-Analysis proposals to forecast life expectancy at different ages; and (5) compare obtained results and its possible impact on population projections/forecasts at older ages. (6) Obtained results will also allow to examine the changing meaning of ageing from different points of view and why an increasing lifespan may or may not be a synonymous of late life autonomy or frailty. Data for this study will be taken from Human Mortality Database, especially concerning raw mortality data, and obtained results will be compared with the official statistics available at the Human Life Table Database and Human Mortality Database. Additional information can also be taken from used countries national statistical offices.

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