

Recent Trends and Future Uncertainties in Longevity

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Beyond a mortality plateau: a fresh inquiry into the adult longevity and the force of old-age mortality

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A scientific and media controversy relating to a fixed limit to human lifespan and extreme age mortality plateaus continues to ferment. Instead of investigating the occurrence of a mortality plateau to uncover whether a limit to human life span exists or not, the study of old-age mortality compression with the adult modal length of life (M) (M-approach) is relevant to unfold this riddle. Raw data on the number of deaths and exposure at risk by age, sex and single year were obtained from the Human Mortality Database (HMD) for 19 European countries, as well as from Australia, Canada, Japan and the United States of America (U.S.A.) and pooled together for six different groups. A total of 1,760 period life tables by sex are constructed and the distributions of deaths are fitted by P-Spline method to estimate M and its derivatives. Our analysis shows that the force of mortality at M ($\mu(M)$) for the 23 low-mortality countries started to increase earlier for females since the 1950s, ranging 0.09 to 0.13. For males, the increase in $\mu(M)$ is 20 years lagging behind. We contend that the effect of $\mu(M)$ rise on the mean length of life after M ($e(M)$) and the effect of compression of mortality above M on $e(M)$ are distinguishable. Using Kitagawa's decomposition method, our results show that the fall in $e(M)$ is two-thirds due to the effect of change in $\mu(M)$. Since an increase in $\mu(M)$ is far from negligible at any rate to cause a decrease in $e(M)$, it is imperative to examine the steepening of the slope of mortality curve between $\mu(M)$ and the highest attained age the mortality function about 0.5 ($\mu(\omega)$). Our findings

reveal that the occurrence of the mortality compression above M concurrently with a $\mu(M)$ rise suggests that there is “a seemingly unstoppable limit” for extending human life, but there is good reason to believe that the limit is still far off.

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