

Rectangularization of the Survival Curve and Longevity Extension in Taiwan

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Abstract

The overall mortality rate in Taiwan has experienced a lengthy and drastic decline since 1920. The decline was first triggered by a phenomenal decrease in the infant mortality rate and, when this rate began to rest at its current low level, the elderly mortality rate took its turn to fall. As a result of the sharp drop then leveling off in the youth sector and the mild decrease then plunge in the elderly sector, rectangularization of the survival curve ensued. Although rectangularization of the survival curve implies the concept of a longevity limit, the existence of such a limit is still under debate. To avoid controversy, some scholars turn to interpret the rectangularization from the angle of mortality compression at age of death and extend their discussion to the phenomenon of longevity extension.

This paper, based on the analysis of life table survivors (l_x) and life table deaths (d_x), discusses several phenomena that appeared in Taiwan between 1955 and 2005. These phenomena include mortality compression, the horizontalization and verticalization of the survival curve, and the implied longevity extension. We use indexes, such as SD(M+) (standard deviation of age at death above M), C_{50} (the shortest age interval concentrating 50 percent of the life duration), and the interquartile range (IQR) of age at death, to measure the degree of mortality compression, and to decompose the influence of changing mortality rate on mortality

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compression by age group. Next, we apply fixed rectangle, moving rectangle and other indexes recommended by Cheung et al. (2005), such as β , θ , θ^* and $M+4SD(M+)$, to measure the horizontalization of the survival curve, the verticalization of the survival curve and the degree of longevity extension. Our results show that (1) rectangularization of the survival curve (including both horizontalization and verticalization of the survival curve) steadily increased during 1955 to 2005; (2) the degree of mortality compression had lessened since 1970, and the underlying force behind the mortality compression had shifted from the decrease in the infant mortality rate to the decrease in the adult and elderly mortality rate; (3) the two indexes $M+4SD(M+)$ and $M+kSD(M+)$ indicate that the longevity limit for both genders is still expanding upward gradually.

Keywords: mortality, rectangularization of survival curve, mortality compression, longevity extension

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