Typology and Review of Measures of Human Aging, Longevity and Superlongevity, with Applications to U.S. Data and Some Implications for U.S. Public Programs

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Abstract

A multiway typology of measures of aging, longevity and superlongevity is presented, with measures classified as measures of aging and longevity, direct and indirect measures of aging and longevity, and measures based on population data, death statistics and life table functions. More specifically, the typology distinguishes measures of individual aging, population aging and biological aging; measures based on observed populations, observed deaths and life table functions; cohort and period measures; and measures based on time from birth and time to death. Measurement of time to death serves as a new way of looking at aging and longevity, and use of it could provide a degree of control over the fiscal consequences of increasing longevity on public programs. A simplified measure of the slope of the distribution of the population from age 22 to age 84 is tested as a measure of the aging of the population. The ratio of life expectancy at birth to complete life expectancy at age 100 provides a new measure of the compression of mortality and of the direction and extent of the rectangularization of the survival curve. The data suggest that a substantial increase in life expectation at the highest ages, e.g., age 100, not currently envisaged, will be required to achieve a turnaround in the increasing rectangularization of the survival curve. The trend of the longevity dividend (i.e., the combination of the difference between conventional life expectancy and complete life expectancy, and the difference between period and cohort life expectancy) by age is analyzed. It is found that the potential gains over life expectancy at birth recorded in each period life table, from survival to later ages and from the secular reductions in death rates, have been dramatic since 1900, but with the secular rise in life expectancy the potential gains have fallen off sharply.

The trends of the measures are compared using data for the United States from 1900 to 2050, and their implications for selected U.S. public programs are briefly discussed. The data are taken from NCHS, Census and SSA reports, principally census data, official population estimates, death registration statistics and official life tables.