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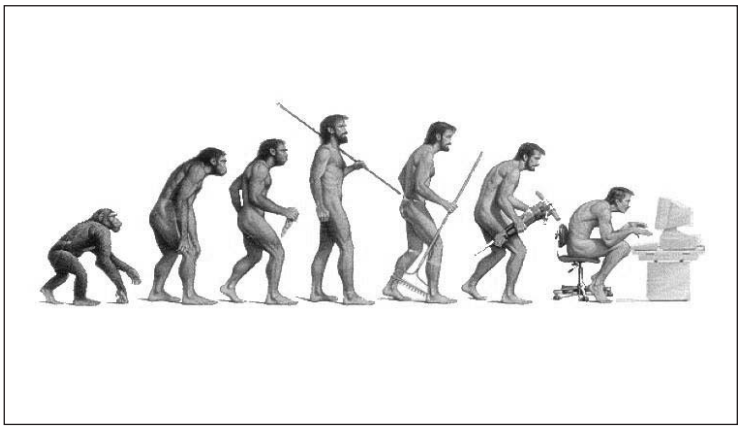
Will Human Life Expectancy Decline in the 21st Century?

by S. Jay Olshansky, Ph.D.

Editor's note: Dr Olshansky is the featured speaker for the Product Development Section's luncheon at the SOA spring meeting in San Antonio. This article is an abstract of a paper that he will discuss.

The life expectancy of humans rose at a slow pace from approximately 20 years in the time of the Roman Empire, to more than 40 years by the middle of the 19th century. Although the overall trend in life expectancy during this time was characterized by a steady but slow increase, the secular trends in death rates used in its calculation have been unstable—a volatility caused by the ever-present deadly force of locally concentrated epidemics of communicable diseases, but punctuated by the more recent episodic influence of pandemic plagues and infections in urbanized areas.



The modern rise in life expectancy was initially caused by rapid declines in death rates among infants and children, but recent gains have been fueled by reductions in mortality at middle and older ages. Even though the modern increase in life expectancy is known to be an anomaly, mathematical demographers have used extrapolation models to extend the observed rate of increase during the last 150 years through the remainder of the 21st century. This would eventually lead to a 100-year life expectancy in the United States and in other developed nations by or before the year 2060.

The public policy implications of such forecasts, if they were to occur, are profound. Forecasts of life expectancy have become critical elements in the development of public policy associated with the future solvency of age-entitlement programs. Actuaries at government agencies, which are responsible for making such forecasts, still rely on mathematical extrapolation. This method consistently led to underestimates of life expectancy from the inception of Social Security until 1980, and overestimates of projected levels of life expectancy since then.

In response to the uncertainty associated with their forecasts, the Social Security Administration (SSA) in the United States has sought the council of scientists who study both historical trends in mortality and the underlying biology that influence duration of life. In recent years, the SSA received conflicting advice from scientists representing these two schools of thought. The SSA has been advised by those using mathematical extrapolation models to raise their forecasts of life expectancy at birth for the population of the United States beyond the increases already anticipated between now and the latter part of the 21st century. The basis for this advice includes: 1) the observation that the extreme tail of the survival distribution has been documented to increase in Sweden since the middle of the 19th century; 2) record life

expectancy at birth in low mortality populations has been increasing by an average of 2.5 years per decade since 1850; 3) other demographic evidence suggesting large observed mortality declines in G7 nations during the latter half of the 20th century; and 4) the observation that some species appear to experience negligible senescence because they have constant age-specific mortality rates throughout the observed lifespan (as opposed to exponentially rising death rates following puberty among humans and most other forms of life). The implication of the last point is critical, because proponents of extrapolation models, who support the idea that another quantum leap in life expectancy is possible, use this as their only biological rationale. The hope that negligible senescence can be engineered for humans is thus not only held up as a viable goal for aging research, it is anticipated that such technologies will soon be developed and used to slow, stop or reverse aging in humans.

From a biodemographic perspective, it has been demonstrated that another quantum leap in human life expectancy is possible, but only if new biomedical technologies are developed that slow the rate of aging. Even then, they would have to be administered to, and be effective in, enough people to have a measurable impact on a population-based life table. However, such technologies do not currently exist.

Although there is reason to believe that it may become possible to slow the rate of aging in humans, and there is ample justification for pursuing such a goal, it is highly speculative to base national forecasts of the future solvency of an age-entitlement program on advances in technologies that do not currently exist. To the contrary, there are observable trends in the health attributes of many low mortality populations—including the United States—to suggest that life expectancy is not only unlikely to rise in the future as it has in the past, but there is reason to believe that life expectancy at birth could decline in this century. Recent trends in childhood and adult obesity in low mortality populations, and the global re-emergence of communicable diseases—if left unchallenged by significant changes in public health practices—threaten the health and longevity of present and future generations. In this paper, we present the empirical evidence demonstrating the existence of these portentous trends in obesity and communicable diseases, and discuss them in light of forecasts of human life expectancy and the public health measures required to address them.□

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