

The Demographic Transformation of America

S. Jay Olshansky

Abstract: The face of aging in America is about to change. Within the next thirty years, the U.S. population will experience a permanent change in its age structure, and there is reason to believe that cohorts reaching older ages in the future will be far different from those reaching older ages today. In this essay, I explain why life expectancy in the United States is likely to diverge from that experienced by the rest of the developed world; describe recent trends in healthy life expectancy; and examine how the age structure of the United States will by mid-century be different from that found today.

S. JAY OLSHANSKY is Professor of Epidemiology at the School of Public Health, Division of Epidemiology and Biostatistics at the University of Illinois at Chicago. He has published articles in such journals as *The New England Journal of Medicine*, *JAMA: The Journal of the American Medical Association*, *Science*, *The Scientist*, *Scientific American*, and *Health Affairs*.

The face of aging in America is undergoing a profound transformation. Within the next thirty years, the U.S. population will accompany the rest of the developed world in experiencing a permanent change in its age structure. The United States will not only be much older in the coming decades, confronting a suite of resulting challenges and opportunities, but cohorts that reach older ages in the future are likely to be far different from those reaching older ages today. The reason? Older cohorts in the future will have been born into and lived through an entirely different set of environmental and medical/health conditions relative to their counterparts born in the early twentieth century. In this essay, I begin by explaining why life expectancy in the United States is likely to diverge from that experienced by the rest of the developed world (a phenomenon that has already begun); describe recent trends in healthy life expectancy; and examine how the age structure of the United States by mid-century will be different from that found today. Weaved into the discussion of each topic is the issue of how disparities are likely to influence trends in longevity and health.

© 2015 by the American Academy of Arts & Sciences
doi:10.1162/DAED_a_00326

The question of how high life expectancy in the United States can rise has been the subject of intense debate for decades. Because forecasts of longevity influence efforts to ensure the financial integrity of age entitlement programs such as Social Security and Medicare, the answer to this question has important public policy implications. In order to understand what the future might bring, we must first place our current longevity within historical context.

The modern rise in life expectancy is one of humanity's crowning achievements. Historical trends suggest that after more than two hundred thousand years of slow but steady increases, a new chapter in the book of human longevity began in the middle of the nineteenth century with a quantum leap in average duration of life. As modern populations learned how to insulate themselves from the hazards of the outside world, the external forces of mortality (infectious diseases, predation, and accidents) that precluded survival beyond the first few years of life were for most people largely relaxed.¹ The rapid increase in life expectancy was initially due to advances in public health (such as refrigeration, sewage disposal, clean water, and indoor living and working environments) that saved the lives of the young. When the lives of young people are extended, life expectancy rises rapidly since a large number of person-years-of-life are added to the total population (a phenomenon that can only occur once). Once reductions in early-age mortality are achieved, future gains in life expectancy must then be a product of reductions in death rates in other (middle and older) regions of the lifespan.

The latter part of the twentieth century followed this model exactly: death rates at middle ages began to decline as some behavioral risk factors for the U.S. population improved (such as reductions in smoking prevalence) and as advances in

medical technology yielded reductions in case fatality rates for people with cardiovascular diseases, cancer, and diabetes. However, the resulting gain in life expectancy at birth as a product of declining middle-age mortality was much smaller than that observed in the early twentieth century because of entropy in the life table: declining death rates at middle ages and above yielded progressively smaller gains in life expectancy since the total person-years-of-life added to the life table is much smaller than what occurs when saving the young.²

Long-lived populations such as the United States' are now in a position where the only way to significantly increase life expectancy in the future is to generate dramatic reductions in death rates at the oldest ages *and* simultaneously push the envelope of survival into the outer regions of the lifespan (ages above one hundred twenty), where only a handful of people have ever lived. That is, large increases in life expectancy at birth in the future require not only large declines in death rates for older people on par with what was observed in the past for young and middle-aged populations; it also requires that most people either routinely live past the age of one hundred ten, or that a significant segment of the population begin surviving well past the age of one hundred thirty. Is this likely to happen? Unfortunately, the answer is no, and there are three reasons why.

First, it is now acknowledged that the biological processes of aging represent the most important risk factor for fatal diseases expressed at older ages.³ Since it is not currently possible to significantly alter the processes of aging, there is no reason to suspect that dramatic declines in death rates among the extreme elderly are plausible. To the contrary, entropy in the life table is likely to continue to erode gains in life expectancy in the future. This does not mean declines in death rates at older

ages cannot be achieved – they can – rather, it just means that the resulting gains in life expectancy will be small.

Second, the age distribution of death in long-lived populations like that of the United States has indeed shifted to later ages, but this shift has been characterized by a compression of death into a fairly narrow region between the ages of sixty-five and ninety. There is no evidence that the prospects for surviving past the age of one hundred ten are improving; there is no reason to expect people will routinely live beyond the age of one hundred thirty, an age to which no human in history has been documented to live; nor is there reason to believe that in a genetically heterogeneous population, everyone has the potential to live as long as the longest-lived member of the population. The implications of these observations are straightforward: mortality compression is the most likely scenario going forward, and this, in turn, must be accompanied by a decelerating increase in life expectancy.

Finally, there are vast differences in longevity prospects among existing birth cohorts in the United States – a phenomenon well documented in the scientific literature.⁴ As detailed in the sections that follow, some subgroups of the U.S. population today are facing rather bleak health and longevity prospects for the future. If these health and longevity trends play out as suspected, some people will live longer and healthier lives relative to populations alive today, but others may very well experience a decline in life expectancy on par with observed reductions in life expectancy among the least educated white men and women in the United States.⁵ The Hispanic paradox, discussed by Robert Hummer and Mark Hayward in their contribution to this volume, suggests that this growing segment of the U.S. population could place an additional dampening effect on the historic rise in life expectancy.⁶

The bottom line regarding the future of longevity in the United States is that there is no reason to expect that survival can be routinely pushed beyond the age of one hundred thirty; there are no medical breakthroughs on the horizon that offer the prospect of radical life extension; and there is compelling evidence to suggest that population subgroups within the United States are simultaneously moving in opposite directions with regard to future longevity. Overall, there is reason to expect that life expectancy in the United States may rise marginally in the coming decades, and that what is far more important from a public health perspective is how healthy the population will be in the future.

Life expectancy at birth and at older ages has been rising in the United States at a fairly steady pace for most of the last century; but of equal interest to researchers are the trends in how healthy U.S. populations are along the way. The measure of life expectancy is often taken as a barometer of a population's health, yet, in fact, it is more appropriately defined as little more than a measure of death. Life expectancy tells us nothing at all about how healthy people are when alive. The proportion of total life expectancy lived in a state of good health free from frailty and disability is known as healthspan and is measured by a metric referred to as healthy life expectancy (HLE). Because the unique data required to calculate it has only recently become available, measures of HLE have only been calculated for developed nations since the early 1970s.

Trends in HLE for the United States indicate that a complex pattern has emerged consistent with the complexity of how life expectancy has changed in recent decades. In 1970, HLE at birth in the United States was 67 for men and 74.6 for women, rising to 71.8 and 78.8 for men and women, respectively, by 1990.⁷ The rate of improve-

S. Jay
Olshansky

ment in HLE accelerated during this time frame, and the same trend toward increases in HLE and accelerated improvements also occurred among the population aged sixty-five and above. However, when HLE is considered within the frame of reference of secular trends in total life expectancy, the 1970s were characterized by a slight expansion of morbidity (when the rise in life expectancy outpaces the rise in HLE), while the 1980s were characterized by a slight compression of morbidity (when the rise in HLE occurs faster than the rise in life expectancy).⁸

Given a history of known disparities in the life expectancies of American subgroups,⁹ it should be no surprise that HLE is also inequitably distributed. Based on trends in HLE at age thirty by race, sex, and level of completed education from 1970 to 1990, the gap in HLE between population subgroups is large. For example, in 1970 the HLE at age thirty for black men with less than a high school degree was 23.6 years, while the HLE at age thirty for white women with more than sixteen years of education was 40.1 years.¹⁰ Interestingly, the gap in HLE between these two population subgroups declined from 1970 to 1990; that is, HLE increased by 0.2 years for the most educated white women while the least educated black men experienced an increase in HLE of 4.8 years. Nevertheless, differences in total life expectancy and HLE remain extremely large among population subgroups demarcated by level of completed education, essentially placing today's disadvantaged populations in the middle part of the twentieth century in terms of their health and longevity prospects.

The good news is that overall, the health status of older Americans has improved during the last half century.¹¹ The age-specific incidence of functional impairments defined by activities of daily living (ADLs) improved from 1980 to 2000, leading to notable increases in the prevalence

of functionally independent older cohorts. In fact, there is evidence to indicate that a surprisingly large percentage of the population aged sixty-five and above in the United States today is physically and mentally operating at a level of efficiency that is not far different from people who are decades younger.¹²

The challenging news is that disability rates have leveled off among people reaching older ages during the last decade,¹³ and recently published cohort studies suggest that younger cohorts moving through the age structure are less healthy than their recent predecessors.¹⁴ Particularly notable is the rise in pathology among children who are both obese and who have diabetes – a disturbing trend that does not bode well for this generation. It implies that as contemporary younger and middle-aged generations move into older regions of the lifespan in the coming decades, unless these public health issues are ameliorated, we may witness declines in both HLE and possibly even life expectancy for the entire U.S. population.¹⁵ Changing demographic conditions – discussed below – will influence these trends.

The U.S. population has undergone a dramatic demographic shift since the beginning of the twentieth century, when our age structure was in the shape of a pyramid: few people reached older ages, contrasted by a comparatively large number of young people. By way of illustration, in 1900 the proportion of the total U.S. population aged sixty-five and above was 4.1 percent; but this has risen to 14 percent today, and will rise to over 20 percent by mid-century.¹⁶ When rapid increases in longevity combined with declining fertility in the latter part of the twentieth century, the U.S. age structure began shifting to a more rectilinear form. By 2050, the age structure of the United States and all other developed nations will be in the shape of

a square, with at least as many people alive at older ages as there are at younger ages. This new shape to the U.S. age structure is likely to be a permanent feature of our population for the foreseeable future.

However, beneath the surface of a visibly shifting age structure are forthcoming changes to our demographics that will alter the course of U.S. health and longevity by the mid-twenty-first century. Three major events are now unfolding: First, there is evidence to suggest that subgroups of the U.S. population are experiencing significantly different longevity and health trajectories.¹⁷ While the least educated among us compose a slowly shrinking segment of the population, being less educated today is far more lethal now than it was just two decades ago. This trend *will not* have a profound influence on national vital statistics because the proportion of the total population that falls into this category is relatively small; but it will be a health challenge nonetheless.

A second factor that will influence U.S. age structure in the twenty-first century is the advances in public health and the biomedical sciences that are likely to yield improvements in health and longevity. Included among them are continued efforts to reduce smoking prevalence; greater success in the treatment of complications associated with obesity; traction beginning in the battle against the rise of childhood obesity; and anticipated advances in aging science that could yield a notable extension of healthy life by mid-century.

Finally, one of the more interesting developments in shifting U.S. demographics is the anticipated dramatic increase in the Hispanic population and the unique impact it will have on national health and longevity over the next few decades. This development is discussed in detail in Hummer and Hayward's essay in this volume, but for now it is important to recognize that the proportion of the total U.S.

population that is Hispanic will rise from 16 percent today to 28 percent by 2050. More important, Hispanics now represent only 7 percent of the population aged sixty-five and above, but this will rise to 18 percent by 2050. Neither of these projections would ordinarily be all that notable, except for the fact that Hispanics represent perhaps one of the more interesting anomalies in U.S. demographics.

Hispanics currently have the highest life expectancy among the main population subgroups in the United States today. Hummer and Hayward demonstrate that this is due to the fact that the Hispanic population in the United States is currently dominated by first-generation immigrants known to possess healthier lifestyles than either the citizens of their country of origin or the general U.S. population. This has led to what is commonly known as the Hispanic paradox: the unexpected observation that Hispanic immigrants currently live longer than the total resident population.¹⁸

What makes the Hispanic impact on U.S. demographics even more interesting is the likelihood that the health and longevity of this subgroup is expected to worsen in the coming decades. Recent evidence indicates that second- and third-generation Hispanics are experiencing notable declines in health due to the acquisition of increasingly harmful behavioral risk factors such as smoking and obesity.¹⁹ Thus, if Hispanics are about to dramatically increase their proportion of U.S. demographics, and their future health and longevity trajectory is spiraling downward, then there is reason to believe that this will have a notable negative impact on national vital statistics such as life and health expectancy. Such future trends would be invisible to currently popular forecasting models that rely exclusively on historical trends.

The United States – along with the rest of the world – is headed down an inevi-

table one-way path toward population aging. However, there are elements to the U.S. demographic transformation to an aged society that set us apart from other developed nations. Unlike France and Japan, where life expectancy at older ages has risen rapidly in recent decades, the United States has been characterized by stagnating or slowly rising life expectancy at birth and older ages. The United States is a far more heterogeneous population relative to most other nations, and the differences among us have been accentuated over time by often radically different living conditions for subgroups of the population.

The overall trend toward population aging in the United States will take on unique characteristics relative to the rest of the developed world. Although life expectancy at birth and at older ages is expected to rise in this century, there will be competing events that will influence the future course of both longevity and health. Some will live longer and healthier lives than anticipated by most forecasting mod-

els in use today, while others may experience significant challenges. It is distinctly possible that two Americas will emerge: one characterized by privilege as defined by higher levels of education, income, and every other benefit packaged with higher socioeconomic status; and another characterized by lack of education, low income, poverty, and the lifelong challenges imposed by a lifetime of lower socioeconomic status. Our shifting demographics will have a powerful influence on these trends, and chief among them will be the unique influence of a rising Hispanic population.

The prospects for an aging America are distinctive and challenging. Exactly how this phenomenon plays out in the coming decades is unclear since so many different factors can and will influence health and quality of life going forward. What is known with certainty is that the U.S. age structure will change dramatically in this century, and there is reason to believe that subgroups of the population will experience vastly different health and longevity prospects.

ENDNOTES

- ¹ S. Jay Olshansky, Bruce A. Carnes, and Christine K. Cassel, "The Aging of the Human Species," *Scientific American* 268 (4) (1993): 46–52.
- ² Nathan Keyfitz, *Applied Mathematical Demography*, 2nd ed. (New York: Springer, 1985).
- ³ Denham Harman, "The Aging Process: Major Risk Factor for Disease and Death," *Proceedings of the National Academy of Sciences* 88 (12) (1991): 5360–5363.
- ⁴ S. Jay Olshansky, Toni Antonucci, Lisa Berkman, Robert H. Binstock, Axel Boersch-Supan, John T. Cacioppo, Bruce A. Carnes, Laura L. Carstensen, Linda P. Fried, Dana P. Goldman, James Jackson, Martin Kohli, John Rother, Yuhui Zheng, and John Rowe, "Differences in Life Expectancy Due to Race and Educational Differences are Widening, and Many May Not Catch Up," *Health Affairs* 31 (8) (2012): 1803–1813.
- ⁵ *Ibid.*
- ⁶ See Robert A. Hummer and Mark D. Hayward's essay in this volume, "Hispanic Older Adult Health & Longevity in the United States: Current Patterns & Concerns for the Future."
- ⁷ Eileen M. Crimmins, Yasuhiko Saito, and Dominique Ingegneri, "Trends in Disability-Free Life Expectancy in the United States, 1970–1990," *Population and Development Review* 23 (3) (1997): 555–572.
- ⁸ *Ibid.*

- 9 Evelyn M. Kitagawa and Philip M. Hauser, *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology* (Cambridge, Mass.: Harvard University Press, 1973). S. Jay Olshansky
- 10 Eileen M. Crimmins and Yasuhiko Saito, "Trends in Healthy Life Expectancy in the United States, 1970–1990: Gender, Racial, and Educational Differences," *Social Science & Medicine* 52 (11) (2001): 1629–1641.
- 11 Vicki A. Freedman, Brenda C. Spillman, Patti M. Andreski, Jennifer C. Cornman, Eileen M. Crimmins, Ellen Kramarow, James Lubitz, Linda G. Martin, Sharon S. Merkin, Robert F. Schoeni, Teresa E. Seeman, and Timothy A. Waidmann, "Trends in Late-Life Activity Limitations in the United States: An Update from Five National Surveys," *Demography* 50 (2) (2013): 661–671.
- 12 David J. Lowsky, S. Jay Olshansky, Jay Bhattacharya, and Dana P. Goldman, "Heterogeneity in Healthy Aging," *The Journals of Gerontology: Biological Sciences & Medical Sciences* 69 (6) (2013): 640–649.
- 13 Freedman et al., "Trends in Late-Life Activity Limitations in the United States."
- 14 Eric N. Reither, S. Jay Olshansky, and Yang Yang, "New Forecasting Methodology Indicates More Disease and Earlier Mortality Ahead for Today's Younger Americans," *Health Affairs* 30 (8) (2011): 1562–1568; and Teresa E. Seeman, Sharon S. Merkin, Eileen M. Crimmins, and Arun S. Karlamangla, "Disability Trends Among Older Americans: National Health and Nutrition Examination Surveys, 1988–1994 and 1999–2004," *American Journal of Public Health* 100 (1) (2010): 100–107.
- 15 S. Jay Olshansky, Douglas J. Passaro, Ronald C. Hershow, Jennifer Layden, Bruce A. Carnes, Jacob Brody, Leonard Hayflick, Robert N. Butler, David B. Allison, and David S. Ludwig, "A Potential Decline in Life Expectancy in the United States in the 21st Century," *The New England Journal of Medicine* 352 (11) (2005): 1138–1145.
- 16 U.S. Department of Health and Human Services Administration for Community Living, "Administration on Aging," http://www.aoa.gov/Aging_Statistics/future_growth/future_growth.aspx (accessed September 20, 2014).
- 17 Olshansky et al., "Differences in Life Expectancy Due to Race and Educational Differences are Widening, and Many May Not Catch Up."
- 18 Kyriakos S. Markides, Raphael Samper-Ternent, and Soham Al Snih, "Aging and Health in Mexican Americans: Selected Findings from the Hispanic EPESE," in *Race and Social Problems*, ed. Ralph Bands and Larry E. Davis (New York: Springer, 2015), 171–186.
- 19 Mark D. Hayward, Robert A. Hummer, Chi-Tsun Chiu, César González-González, and Rebeca Wong, "Does the Hispanic Paradox in U.S. Adult Mortality Extend to Disability?" *Population Research and Policy Review* 33 (1) (2014): 81–96.