



Mortality and Longevity



Aging and Retirement

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Potential for Mortality Improvement From Cognitive and Psychological Factors

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Potential for Mortality Improvement From Cognitive and Psychological Factors

Gordon Woo

Progressive population mortality improvement is driven by healthier lifestyles of individuals, enhancements of the health care environment and the practical clinical benefits of medical science discovery. Yet monotonic population mortality improvement, with year-upon-year reductions in mortality rates, is far from guaranteed, as witnessed in recent years. Even with sustained global scientific research initiatives, breakthroughs in medical discovery still owe much to serendipity, advancement in the health care environment may stall in times of economic austerity, and population lifestyles may be lured toward excessive consumption at the expense of the benefit of long-term health.

This essay focuses on cognitive and psychological drivers of longevity. At the Society of Actuaries' Living to 100 Symposium in 2014, the author analyzed ways in which these brain factors significantly affect the healthy lifespan of the elderly (Woo and Bruce 2014). These are manifest in Blue Zone communities, celebrated for the number of men and women whose active lives extend into their 90s and beyond. In her book of interviews with lively nonagenarians in Cincinnati, Connie Springer (2010) was able to elicit the ways in which cognitive and psychological factors contributed to individual longevity. These were epitomized by the book cover lady, Florence Wesley, who lived to the age of 97, and whose hobbies included playing competitive Scrabble.

Inspired by neuroscience research into brain plasticity, brain fitness training to improve cognitive function has evolved from board games to increasing the reaction and play speed of veteran NFL quarterbacks like the Patriots' Tom Brady (Harris 2019). Beyond winning the Super Bowl, improved cognitive functioning can make the difference between life and death. Some road accidents, for example, may be averted through increasing driver reaction speed. Unintentional injuries are the leading cause of death of U.S. citizens from infancy to middle age. Apart from road accidents, some accidental falls and poisonings might be attributable to deficient cognitive functioning.

Those caring for seniors with Alzheimer's disease take on the relentless burden of responsibility to meet their needs and keep them safe. People who have suffered some brain damage often experience changes in their moods. They may have less control over their feelings, become irritable or angry when their needs are not satisfied. Such behavior heightens the risk of harm associated with many ordinary daily activities. Prescribed drugs may not be taken as instructed; confusion may lead to exposure to household dangers of fire and electrocution; and there may be a higher risk of poisoning, tripping, falling and other accidents.

In the United States, age-specific risk of Alzheimer's and other dementias has shown some signs of declining (Alzheimer's Association 2018). In the absence of effective treatments for Alzheimer's, initiatives to reduce the prevalence of the disease are worth exploring and promoting. Barnes and Yaffe (2011) undertook a study on the projected impact of risk factor reduction on Alzheimer's disease prevalence. The seven risk factors considered were diabetes, hypertension, obesity, depression, physical inactivity, smoking and cognitive inactivity. A sizeable 10% reduction in these risk factors might yield modest reductions in Alzheimer's prevalence of 0.3%, 0.8%, 0.7%, 1.3%, 1.7%, 0.9% and 0.7% respectively.

Similar research has recently been undertaken in Italy, which has the second highest proportion of seniors in Europe, 1 million of whom have some form of dementia (Mayer et al. 2018). Both these studies affirm that what is good for the heart is good for the head as well. Cardiovascular health is a clear advantage in warding off Alzheimer's.

The brain health benefits of remaining physically, socially and mentally active throughout life are also well established internationally. Promotional efforts to encourage physical, social and mental activity should be rewarded with a modest reduction in the occurrence of Alzheimer's. Given that some studies (e.g., Bernhardt et al. 2019) have found treatment of depression in older adults resulted in improved cognitive function, a positive psychological state of seniors needs also to be promoted.

But age is the greatest Alzheimer's risk factor, with the vast majority of people with Alzheimer's being age 65 or older. U.S. prevalence of Alzheimer's increases rapidly with age: 3% of people age 65 to 74, 17.6% of people age 75 to 84 and 32.3% of people age 85 or older have Alzheimer's. So even if the risk of dementia at any given age may be decreasing slightly, the total number of people with Alzheimer's in the United States is expected to continue to increase dramatically for demographic reasons alone.

Dying with a disease is not the same as dying from it. The Centers for Disease Control and Prevention considers a person to have died from Alzheimer's if the death certificate lists Alzheimer's as the underlying cause of death, the disease or injury that initiated the sequence of events leading directly to death. Quite apart from accidents induced by cognitive impairment, severe dementia frequently causes complications such as immobility, swallowing disorders and malnutrition that significantly increase the risk of serious acute conditions that can cause death. One such condition is pneumonia, which is the most commonly identified cause of death among elderly people with Alzheimer's or other dementias. Death certificates for individuals with Alzheimer's often list acute conditions such as pneumonia as the primary cause of death rather than Alzheimer's.

MORTALITY IMPROVEMENT WITH EFFECTIVE ALZHEIMER'S TREATMENT

With the projected growth in the aging U.S. population most at risk from Alzheimer's, there will be double digit percentage increases in the number of people with Alzheimer's in the years up to 2025, and this will place a heavy burden on health care systems, as well as budgets for long-term care. The promise of a lucrative global market has incentivized the pharmaceutical industry to persevere in the search for effective Alzheimer's treatments that would lighten this burden on health care. Although no new medication for Alzheimer's has been approved by the Food and Drug Administration since memantine in 2003, and despite notable Alzheimer's Phase 3 drugs trial disappointments of the past decade, continuing pharmaceutical research does hold promise of effective Alzheimer's treatment in the future. For example, there is a treatment undergoing drugs trials that has been able to reduce amyloids in people's brains and slow cognitive decline over a year.

Future population mortality improvement has to be driven by some new mitigating factor. Statistical downward trends in death rates can always be extrapolated, but they cannot persist without causal drivers. As indicated by the age-adjusted death rates for the leading causes of death in the United States in 2016 and 2017 (Murphy et al. 2018), increasing obesity, and fluctuations in deaths from unintentional injuries and influenza can upset the downward trend in death rates if the clinical impact of medical advances is small.

Life actuaries and other longevity modelers making future projections of U.S. population mortality improvement need to estimate the potential reduction in mortality associated with the future availability of effective Alzheimer's treatments. This can be achieved through a counterfactual analysis, imagining an alternative realization of history. A counterfactual analysis can estimate how many deaths might be indirectly attributable to Alzheimer's.

This is an arduous, long and painstaking undertaking, requiring a longitudinal study of thousands of seniors, covering a period of several decades from the 1990s. U.S. longevity analysts are fortunate there have been two diligent longitudinal cohort studies: the Religious Orders Study of older Catholic nuns, priests and brothers from across the United States and the Rush Memory and Aging Project of older individuals living in Illinois (Bennett et al. 2013). Both studies required brain and tissue donations, with the autopsy rate being almost 90%. Accordingly, the ascertainment of mortality was mostly complete and dates of death reliable.

The pooled analysis included 2,566 people who did not have dementia at baseline. Over an average 8.0 years of follow-up, Alzheimer's was diagnosed in 21.8% of the participants. The mean age of incident Alzheimer's diagnosis was 86.53 years. Also during follow-up, 72% of those who developed Alzheimer's died, as did 34.5% of those who did not develop Alzheimer's. The median survival time from diagnosis to death was 3.8 years overall. Importantly, in people age 75 to 84, the rate of mortality was more than four times higher after a diagnosis of Alzheimer's; in people age 85 and older, the rate of mortality was nearly three times higher.

An associated population attributable risk analysis (James et al. 2014) estimated that as many as 503,000 deaths in Americans age 75 and older were attributable to Alzheimer's in 2010. This would elevate Alzheimer's to being the third leading cause of death after heart disease and cancer. This is a factor of six greater than the 84,000 deaths the CDC attributed to Alzheimer's in 2010. Even allowing for variability in this factor according to population, a future effective treatment for Alzheimer's should leverage a degree of mortality improvement very much greater than indicated just by the Alzheimer's mortality rates. Consequently, in setting health care priorities, Alzheimer's research should be well supported.

Living to 100 depends on good cognitive functioning and a positive psychological outlook—having a reason for getting up each morning. Physical and social activity and brain training will help seniors maintain brain health. For those who succumb to Alzheimer's in their 80 and 90s, they may yet reach 100, provided there are effective treatments available when they need them. Even if such treatments are still a decade away, younger seniors may have the benefit of such treatments in their 80s and 90s and be better able to join the expanding cohort celebrating their 100th birthday in the middle of this century.

CARE COST IMPEDIMENT TO LIVING LONGER

The main factors that determine how long a person lives after being diagnosed with Alzheimer's are age, gender and level of disability. Those frail at the time of diagnosis do not live as long. On average, life expectancy is about four or five years, with women living a little longer than men. In the early stages of Alzheimer's, cognitive impairment is not the only determinant of quality of life—the quality of care received matters for life expectancy. The extent to which a person with the disease can maintain his or her social relationships can also play a large role. Consequently, the circumstances under which care is provided are especially important.

Given the high expense of institutional care, about 70% of the elderly with Alzheimer's or dementia live in the community, and about a quarter of these live alone where they may become socially isolated. For the third of the U.S. population age 85 or more who have Alzheimer's, the stark economics of care could constrain their life expectancy. For many American middle-class families, the cost of caring for an Alzheimer's relative for more than a few years would place a severe strain on financial as well as emotional reserves.

To compound the financial strain, there may be cuts in Social Security benefits needed to help pay for some of the cost of care. As of 2018, U.S. payroll tax revenues are insufficient to pay Social Security benefits, and the deficit is having to come from reserves, which will be exhausted in 2035 (Goss 2010). It is unclear what the Social Security funding solution will be until then, but seniors may well end up receiving less than they would have planned, especially if longevity increases beyond previous projections. For some families, cost may be a bitter but pragmatic factor in the early acceptance of hospice care for a declining Alzheimer's relative.

Total annual payments for health care, long-term care and hospice care for people with Alzheimer's or other dementias are projected to break the trillion-dollar barrier in 2050. A fourfold increase in government Medicare and Medicaid funding for Alzheimer's patients may bring about calls for reducing public funding through cutting the level of care provided. Even though their physical care may be unaffected, the psychological impact of being left unattended longer could erode the will to live of elderly Alzheimer's patients.

Total per-person health care and long-term care payments from all sources for Medicare beneficiaries with Alzheimer's or other dementias have been over three times as great as payments for other Medicare beneficiaries in the same 65 or over age group. It is inevitable that some difficult care budget allocation decisions have gone against patients with Alzheimer's. Until effective treatments for Alzheimer's become available and affordable, this situation will only worsen over the next few decades with the demographic inevitability that the number of such seniors will increase significantly. More than for any other disease, a scientific breakthrough in the treatment of Alzheimer's should have the most significant impact for U.S. health economics.

Gordon Woo, Ph.D., is a longevity risk analyst at RMS Inc. He can be reached at Gordon.Woo@rms.com.

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