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The transformative promise of aging science

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The economic peril posed by burgeoning federal debt has inspired fierce political wrangling in recent years. But the elephant in the room when the issue comes up is apolitical: the graying of baby boomers will relentlessly increase federal entitlement costs in coming years, especially those for healthcare, threatening ever larger budget deficits and federal debt. Indeed, annual deficits, largely due to healthcare spending, have put us on a path of unsustainable debt growth that could lead to "financial Armageddon," according a recent analysis.[1]

While the population's rising median age is a key driver of healthcare costs, the way we buy time during our later years is arguably as important as aging itself. We're living in an era of minor miracles with major costs, such as $10,000-per-dose cancer drugs that extend average survival by a few months. Barring drastic healthcare rationing, the use of such palliatives will continue to grow in tandem with the elderly population.

But a much more efficient alternative is on the horizon: leaders in gerontology have concluded that anti-aging drugs capable of delaying all diseases of aging by about seven years are now technically feasible.[2] Such drugs would be very broadly effective preventive medicines, staving off dementia, cancer, heart failure, frailty—and a myriad other old-age ills—in much the same way that drugs that lower blood pressure help postpone or avert heart disease.

Unlike palliatives applied late in the course of diseases, the envisioned drugs would increase life expectancy by expanding the period of good health before the onset of disabling illness.[3] A 2005 RAND Corp. study of the economic implications of 10 future medical advances that may benefit the elderly concluded that such anti-aging medicines would be by far the most cost-effective means of adding healthy life years among the analyzed technologies.[4]

Interventions that slow aging in mammals have been known since the 1930s, when very low-calorie diets were found to extend rats' lifespans. In 2009, researchers showed that rapamycin, a drug used to prevent rejection of transplanted organs, significantly extended lifespan in mice in a way reminiscent of calorie restriction.[5] Intriguingly, this effect was observed in mice first put on the drug late in life, at 20 months of age, roughly equivalent to 60 years in humans; the life expectancy of the aged male rodents after initiation of the drug rose by 28% compared with controls, and that of the aged females by 38%. Many forms of age-dependent change occur more slowly in rapamycin-treated mice than in controls, suggesting that the drug has an authentic anti-aging effect.[6]

Mutations, diets and drugs that slow aging in animals delay late-life morbidity, effectively increasing healthspan along with lifespan—they don't extend the period of late-life decline, as feared by skeptics unfamiliar with the gerontology literature. For instance, mutations that delay aging in mice make them resistant to multiple diseases of aging, and the animals retain cognitive function later in life than do normal mice.[7] A sizable fraction of human centenarians, who likely possess genetic loci that effectively slow aging, remain in remarkably good health nearly all their lives.[8] The world's longest-lived human population, natives of Japan's Okinawa prefecture, suffer about 40% fewer hip fractures than US peers.[9] Remarkably, they also experience only half the rate of dementia, between 85 and 90, than their American peers do.[10]

Increasing healthy life years with anti-aging drugs would slow projected increases in medical spending and deliver large, ongoing benefits across many sectors of the economy, helping to offset the costs of population aging, reduce future budget deficits and contain the federal debt. Healthier, longer-living people can stay in the workforce longer, preserving human capital that might otherwise be lost to disability. Healthier workers are physically and mentally more robust, making them more productive and less likely to lose workdays from illness. They're motivated to make larger personal investments in developing their skills, because they expect to reap the benefits of such investments for longer periods. They save more for retirement, boosting capital formation that fuels economic growth. They pose lighter burdens on federal entitlement programs for seniors and contribute more in federal and state tax revenues. The combined effect of such factors is thought to explain why per-capita incomes of nations around the world have long risen in tandem with their populations' life expectancies.[11]

Unfortunately, there's still a wide gap between research and development in gerontology. Realizing the promise of advances in aging science, for example, will likely require the identification of well-grounded biomarkers of aging to help assess purported anti-aging interventions' efficacy in relatively short clinical trials[12]—human lifespan studies are untenable. Such research will require a major increase in funding for biogerontology studies.

Basic research on aging has perennially garnered less than 1% of the NIH's overall annual budget. Still, there have been some signs of growing support for stepping up such work. Recently, nearly 70 prominent scientists, including four Nobel laureates, endorsed a "healthspan campaign" to push for more research on aging as the common denominator of major

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diseases. Spearheaded by the Alliance for Aging Research, a nonprofit group in Washington, D.C., the campaign represents a significant preliminary step toward work that could pave the way for development of validated anti-aging drugs. Many more steps will be needed. But few, if any, areas for investing research dollars offer greater potential returns.

Note

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