

1

The longevity myth: are we really living longer? or is the headway mostly hype?

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ON ITS FACE, NOTHING WOULD SEEM TO BETTER symbolize Western progress than the impressive strides in longevity since the dawn of the Industrial Revolution.

Certainly the healthcare industry pats itself on the back for such strides, which it wants us to interpret as proof-positive of the wonders of its healing art. When it comes to taking credit for the march toward immortality, the hubris of the medical establishment is global and nonsectarian. Dr. Franz Humer, board chairman of pharmaceutical titan F. Hoffmann-La Roche, put it this way in a March 2005 presentation to an industry panel: "Looking back over the past century, it is clear that medical science has made breathtaking advances. This is shown, for instance, by the fact that life expectancy has risen enormously to around 80 years, compared with 55 in the late 19th/early 20th century when Roche was established" Similarly, in a keynote speech to a major symposium, Australian Health 2000, Dr. Michael Wooldridge, the nation's former Minister for Health, declared of his own nation's progress, "There has been a 20-year gain in life expectancy, for men from 55 years in 1900 to 76 years today and for women from 59 years to 82 years." Some self-styled medical experts unabashedly project forward, reasoning from the purported gains in longevity over the past century that humans in the next century can routinely expect to live to 120 or more.

The mainstream media fall right in step. No less a journalistic heavyweight than *Time*, commenting on life-expectancy figures released by the CDC in December 2009, uncritically repeated researchers' contention that "improvements in life expectancy are largely due to improvements in reducing and treating heart disease, stroke, cancer, and chronic lower respiratory diseases."

On paper, the upswing in American longevity since 1900 is hard to ignore: About 49 for both genders then versus about 78 for both genders today, an apparent gain of nearly three full decades. But this striking then-and-now statistical juxtaposition has been framed in the public dialogue as if mass numbers of Will Rogers' contemporaries suddenly keeled over on their 49th birthdays. Nothing could be farther from the truth. Rarely has a data set been more misleading or a statistical "fact" more specious. The credulous reporting of those "facts" is not only journalistically irresponsible, but bespeaks a woeful misunderstanding of the entire concept of life expectancy.

Most laypeople (and not a few media types) unthinkingly assume life expectancy to be a fixed number that indicates the age at which adults can expect to die. "Well, I'm 65, and life expectancy is 78, so I have 13 years left." Not so. Life expectancy--as the term is used by scientists, demographers, actuaries and allied professionals--is a sliding scale. Somewhat like a GPS navigational system that recalculates your route if you miss a turn, life-expectancy tables refigure your odds of dying at each new age plateau that you attain. That calculation is made based on the average number of additional years of life logged by others who have reached the same plateau. In actuarial circles, this is known as "life expectancy by age." Among other things, it's the primary basis for life-insurance underwriting.

When the media and the general public make casual use of the phrase "life expectancy," they intend it as shorthand for "life expectancy at birth": the mean age at death of all members of a given statistical cohort born in a specified year, encompassing everyone from that rare centenarian in the nursing home down the street to babies who barely managed to take their first breaths before dying. (The latter element is key, and we'll come back to it.) Projections of future life expectancy are based on observed experience as that entire data universe inches forward a year at a time. The most current figure for life expectancy at birth is 75.3 years for men and 80.4 years for women, which resolves to 77.9 years (rounded up to 78, above). However, this hardly implies that a given man who reaches age 75 should spend his birthday shopping for

2

caskets. In actuarial terms, a male who attains that milestone today still has a life expectancy of an additional 10.8 years. Again, that's the difference between life expectancy at birth and life expectancy by age.

Some fascinating truths can be extrapolated from even a cursory examination of the historical tables. In 1900, the U.S. death rate from tuberculosis alone was an ominous 194 per 100,000 people; the combined death rate from TB, flu and pneumonia was 396.6 per 100,000. (For the record, it is estimated that in the years 1700 to 1900, TB killed off an astonishing 1 billion people worldwide.) Life in turn-of-the-century America was also marred by "slate-wiper" pandemics such as the Great Flu of 1918-1919 as well as random but regular outbreaks of polio and diphtheria, the latter disease constituting one of the most feared blights among children prior to the 1930s. As you might imagine, these misfortunes collectively had a devastating impact on overall longevity figures from the earliest years of the 20th Century.

[ILLUSTRATION OMITTED]

And yet the most dramatic breakthroughs in the bedrock measure of U.S. mortality--deaths per 1000 people--would be achieved between 1900 (17.2 per 1000) and 1925 (11.7). By 1930 the cumulative death rate from TB, flu and pneumonia had plummeted by more than half, to 173.6 per 100,000--even though penicillin had just recently come into usage as a tool against pneumonia, the TB-zapper streptomycin was years away from being isolated (1943), and human trials of Salk's polio vaccine would not commence until 1954. Point being, these ameliorations in the death rate happened without meaningful medical intervention. Though it's impossible to adjust for all variables due to gaps in statistical reporting from that long ago, it is clear that the ostensible longevity gains between 1900 and 1925 had little to do with medicine and almost everything to do with public awareness as well as ambient "lifestyle" improvements in housing, sanitation and nutrition. It's not that the lifespan of *Homo sapiens americanus* was suddenly extended; it's more that the aberrations that threw the stats out of whack--distorting popular assumptions about longevity--began to remit on their own. And despite such subsequent medical innovations as the first influenza vaccine (1945), the first transplants of kidneys (1954) and hearts (1967), and the World Health Organization's official (albeit premature) declaration of the defeat of smallpox (1980), U.S. death rates remained remarkably level over the 60-year period between 1948 and 2007: 9.9-per-1000 in the earliest year, 8.0 in the final one. (The rate dropped below 9.0 for the first time in 1975 and has declined only incrementally since.)

The bottom line is this: Adjusting for some of the plaguelike factors that wiped out mass numbers of Americans in the bad old days, the longevity enhancements of the current era are shockingly modest. Simply put, if in years gone by you survived the bigger killer diseases, you were likely to live almost as long as your heirs today. This counterintuitive multigenerational parity is visible throughout American history. As far back as the Civil War era, a 70-year-old man could expect to live to about 80. In 1950, that same 70-year-old man could expect to live to about ... 80. No measurable gain in a full century of progress.

Not much has changed since, either, even though today's consumers benefit from the wide availability of open-heart surgery, aggressive multifocal cancer treatment, the array of pharmaceutical therapies (especially proactive drugs like statins), and the myriad socially entrenched insights about wellness and proper health maintenance. Further, over the past half-century society has witnessed the debut and expansion of health-insurance plans that put these innovations within financial reach of many additional millions of Americans. For all of that, the longevity of the average American 70-year-old has increased by about 3.5 years over what it was when JFK took office. And then there is the reality of what those few extra years are apt to look like. Sadly, it is often a nonstop dirge of progressive disability, worsening quality-of-life issues like incontinence and/or impotence, repetitive surgeries, the pain and suffering of chemotherapy and radiation, senility, dementia, and so on. In too many cases, death, when it comes, is merciful.

If the notion that today's adults aren't really living that much longer than their ancestors seems bizarrely improbable, consider the Founders. Washington died at 67, perhaps a bit young by today's standards, but Franklin and Madison were 84 and 85, respectively, at their deaths. Jefferson died at 83, poetically on the same day--July 4, 1826--as his dear friend, John Adams, who was 90. Samuel Adams was 81 at his death. John Jay reached 84. Hamilton, of course, died at 47 in the infamous duel with Aaron Burr--who lived to see 80.

And we can go even farther back. In her piece, "Dead at 40," Carolyn Freeman Travers, research manager of the Plimoth (using the colonial spelling) Plantation restoration, cites the supposition of modest life expectancy as one of "several common pieces of misinformation/mistaken beliefs about people in the past." Of Massachusetts' Andover settlement she writes, "Circumstances evidently combined to encourage a high birth rate and an exceptionally low death rate, a combination which produced a population that grew at a rapid pace." Citing the research of historian Philip Greven, she continues, "The average age of twenty-nine first-generation men at the time of their deaths was 71.8 years, and the average age at death of twenty first-generation wives was 70.8 years." The spectacularity of these trends was not lost on contemporaries. In 1644, William Bradford, who for three decades served as governor of the Plymouth Colony, wrote, "I cannot but here take occasion not only to mention but greatly to admire the marvelous providence of God! That notwithstanding the many changes and hardships that these people went through, and the many enemies they had and difficulties they met withal, that so many of them should live to a very old age!"

If they can just make it out of the womb alive ...

By far the most important variable in the science of longevity is the reckoning of citizens who become a death statistic at birth or soon after. Throughout the duration of the American experience, no single factor has caused as great a skew in longevity statistics--positive or negative--as infant mortality.

As the 19th century gave way to the 20th, in some American cities up to 30% of babies died before their first birthday. The impact of this phenomenon on mortality figures is hard to overstate. In 1900, a male child at birth had a life expectancy of about 48 years--but if he survived to age 1, his remaining life expectancy jumped immediately to 54 years. That gain represents the "write-off" of first-year mortality: With the sizable toll in infant deaths now shunted back to an earlier data set and thus eliminated from the equation going forward, the rest of the cohort "gains" an instant six-year longevity benefit. Over the ensuing decades society made progress against infant mortality and its causes, thanks to better access to healthcare as well as improvements in hygiene, nutrition and education. Accordingly, that first-year gap narrowed, then disappeared altogether. By 1980 the skew between year zero and year one had begun moving in the opposite direction: The first completed year of life now subtracted from remaining life expectancy, just as all subsequent years do.

Here's another way of looking at it. In 1920, when life expectancy at birth was a shade above 56 years, the infant-mortality rate stood at 85.8 deaths per 1000 live births; that translated to 171,000 infant deaths. By 2000, life expectancy at birth had risen to an even 77, and the infant-mortality rate had dropped to 6.9 per 1000 live births, or 28,000 infant deaths. Had 1920's rate of infant mortality still applied in 2000, the total number of infant deaths that year would've skyrocketed from 28,000 to well over 300,000. The introduction of those additional deaths at "age zero" would've chopped years off 2000's overall life expectancy of 77.

And we're not done yet. In 1920, the maternal death rate--representing women who died of pregnancy-related complications or during and immediately following childbirth--was 79.9 women per 10,000 births. That's about eight women per 1000 births, or .008 women per birth. By 2000, that grim statistic had been sliced to near-nonexistence: just .1 women per 10,000 births, or about .00001 per birth. But reverting once more to the 1920 death rate, and assuming that each of the 4,059,000 births in 2000 represented one mother (that is, leaving out for the purposes of this exercise the nominal impact of twins and other multiples), we'd have about 30,000 maternal deaths added to our hypothetical mix. Inasmuch as the average maternal age at birth is 25, those 30,000 premature deaths would lop off perhaps another year from the overall longevity figure.

Today, there remains a clear, though not always ironclad, link between a nation's infant mortality and its overall life expectancy. Angola's frightful infant-mortality rate of 184 fatalities per 1000 live births translates to an overall life expectancy at birth of just 37.6 years. In Kenya the numbers are 57.4 deaths and 55-3 years. In the UK and Greece, where infant mortality rates are just barely lower than those of the U.S., the life expectancies are just barely higher.

Medicine's apologists contend that their craft's true impact on longevity has been compromised by unfortunate "lifestyle issues" that, in recent decades, worked to offset those gains--chief among them the

ubiquitous problem of obesity. Such arguments may have merit, but they conveniently overlook the many positive ambient changes in the American landscape that should have produced even more robust longevity numbers than we currently see. A generally cleaner environment and ever-improving standards for occupational health and safety are just two factors that could be expected to help Americans live longer even if no one ever went to a doctor for anything.

In sum, there is scant statistical proof that today's "improved healthcare" has had more than a negligible impact on American longevity.

The Heart of the Matter

How can the contemporary medical arsenal not have a profound effect on lifespan? This seems so counterintuitive to everything we read and hear.

As the growing field of outcomes-research supplies volumes of new data proving or disproving the utility of this or that course of treatment, a mood of sweeping revisionism has taken the luster off some of the most formidable weapons in the physician's arsenal. A comprehensive review of all areas of medical practice is obviously far too ambitious an undertaking for one article, so let's focus on a central element of medicine's activities in the area of life extension: the heart.

Nowadays no one who is told that he requires coronary artery bypass-graft surgery (CABG) is apt to say "no thanks." And yet meta-studies of survival statistics dating from the earliest days of the procedure raise questions about whether CABG offers a meaningful longevity advantage over less aggressive treatments for patients who don't arrive at the ER in extremis to begin with. These studies tabulate the long-term results from more than 41,000 cardiac surgeries as well as population studies involving 2 million Americans with risk factors for heart disease. One particularly telling study, released by RAND Corporation in 1991, reviewed 322 papers on CABG published between 1970 and 1990. RAND flatly concluded that with the exception of one very specific set of patients, "controlled trials have failed to demonstrate any long-term survival advantage conferred by bypass." RAND also has estimated that up to 44% of the procedures are performed in medically inappropriate circumstances. More recent studies by the Department of Veterans Affairs and others suggest that CABG is no more effective at prolonging life than angioplasty (which we'll discuss in a moment). A possible explanation for such surprising findings is that unbeknown to either patient or doctor, blockages found during stress testing or other diagnostic procedures may have existed in unchanged form for many years. Therefore, one cannot assume that these blockages, once diagnosed, will necessarily reach crisis stage in the near-term. Moreover, the cardiac system has the astonishing ability to generate new networks of minor blood vessels once existing major supply vessels reach a given level of impassibility.

Whatever the case, although the overall number of CABGs is declining, about 450,000 procedures are performed annually at an average cost of \$100,522, including five-year follow-up. All of this makes CABG a \$45 billion sub-industry in its own right.

Ventricular reconstruction was once hailed as a godsend for those in the early stages of heart failure; it has typically been used as an adjunct to CABG. Cardiac surgeons hoped that cordoning off the damaged part of the left ventricle--the chamber that pumps blood to the body--would result in fewer deaths and hospitalizations, while patients would see a marked improvement in exercise tolerance. Nice theory, but it doesn't appear to work in practice, according to an analysis performed at Duke Clinical Research Center and reported in 2009 in the *New England Journal of Medicine*. Commenting on the dour results, Dr. Gregg C. Fonarow, professor of cardiology at UCLA, did not mince words: "Evidence of safety and efficacy for this surgical approach was lacking," he noted, urging that the use of such reconstructions, which have become common in some medical centers, "should, with few exceptions, now cease."

The aforementioned balloon angioplasty, with or without the mesh arterial bolster known as a stent, is a less aggressive remedy for faltering cardiac blood supply. In today's medical circles, angioplasty is referred to as PCI--percutaneous coronary intervention. But at an average five-year cost of \$81,790, it's not cheap--and according to newer outcomes data, its advantages over drug therapy are debatable. A tracking study of 2,287 patients with chronic chest pain, reported in the *New England Journal of Medicine* in 2007, revealed that after five years there were 202 deaths, heart attacks and strokes among the drug group--but 212 deaths, heart attacks and strokes among the PCI group. The same study showed only a

5

2% difference in the self-reported lessening of pain between the PCI group (74%) and the drug group (72%). Moreover, in a study presented by a German physician-researcher to the European Society of Cardiology in 2004, 90% of non-emergency heart patients who skipped PCI and turned instead to exercise were asymptomatic and apparently heart-healthy one year later. Among patients who underwent PCI, only 70% were trouble-free. About 1.2 million angioplasties are performed each year, making angioplasty a \$98 billion segment of the healthcare universe.

Thus the story for today's most common heart procedures is the same: In study after study, the life-extension benefits are revealed as either modest, inconclusive, or nonexistent. Here's the takeaway from the highly touted "Medicine, Angioplasty or Surgery Study" ("MASS II") reported in *Circulation* in 2006: "no differences in cardiac-related deaths or overall mortality in patients treated with CABG, PCI, or MT [drug therapy] during a 5-year follow-up."

What makes such findings even more provocative is the mounting evidence that cardiac drug therapy itself offers little if any provable advantage over exercise and/or placebo. Such studies only reinforce the theory that the human body may run on its own inexplicable clock, and that successfully attacking the established antecedents of heart disease does not always make the problem go away.

Trilipix is a prominent member of a new class of drugs known as fibrates. Aimed at people with high triglyceride readings, the drug is intended to be used in combination with cholesterol-lowering compounds such as Zocor. Trilipix does appear to lower triglycerides and raise HDL (so-called "good cholesterol")--but by the manufacturer's own admission, clinical trials of Trilipix have shown no added benefit in preventing heart attacks. Other drugs designed to raise "good cholesterol" have plainly gone down in flames and been abandoned. Although in trials these drugs raised HDL by as much as 61%, that had no bearing on cardiac mortality--at least not a good one. In fact, data on hospitalizations and heart attacks were "all going in the wrong direction" to quote Cleveland Clinic heart specialist Dr. Steven Nissen, former president of the American College of Cardiology. In this lackluster category was Pfizer's torcetrapib, which became one of the most colossal busts in pharmaceutical history--an \$800 million debacle--after trials appeared to show that it actually caused heart attacks.

Although Zocor, Lipitor and other statins are considered "effective," one is given pause by a particular metric clinicians use in making such determinations: the "number needed to treat" (NNT) factor. This computation indicates the size of the pool of patients who must be on a given therapy before you can be sure of having prevented a single additional bad outcome such as a heart attack or emergency CABG. In the case of statins, five-year NNT values for people with known cholesterol elevation range from 44 to 63 in the most encouraging studies; other trials put the NNT number far higher. In plain language, what this implies is that you need to treat, minimally, 44 patients with statins in order to prevent one additional occurrence of heart attack, stroke, or emergency surgical intervention. It's not the highest of bars to meet. In comparison, insulin therapy for diabetes has a usual NNT of around 2 or less: The ratio of people-treated to bad-outcome-prevented approaches 1:1.

Beta-blockers have been prescribed for over three decades to help patients manage blood pressure and irregular heartbeat. A summary section of the Drug Class Review of Beta Blockers, a massive retrospective study published in July 2009 by the Oregon Health and Science University Center for Evidence-Based Policy, states, "Beta blockers are equally efficacious in controlling blood pressure in patients with hypertension." It also adds: "Evidence from long-term trials is mixed; overall, beta blockers ... are usually no better than placebo in reducing cardiovascular events." Translation: As was true of fibrates and HDL-raising investigational drugs, we once again have a class of drugs that do exactly what they were designed to do in a narrow biological sense, but where that effect fails to deliver the cardiac protection you'd expect. Other studies reported in the prestigious medical journal *Lancet* and elsewhere have cast doubt on both the efficacy and safety of beta-blockers.

These are not anomalies. As the data pile up, so do doubts about many of the "givens" of modern healthcare. Death rates from breast cancer have moderated in recent years, but enigmatically, the incidence of "larger tumors" defined as those >5 cm, continues to rise. That is especially disturbing because those very dangerous tumors should have been caught at an earlier stage via mammograms. Skepticism of routine mammography, once limited to medical outliers, is now voiced in the pages of *JAMA* as well as by leading figures at the CDC. Some expert observers believe that screening mammograms are not only unreliable, but hazardous. The concern, aside from radiation, is the inherent breast



compression that, critics argue, could inadvertently spread diseased cells. And while the inarguable drop in prostate-cancer mortality since 1990 is touted as vindication of more aggressive testing and treatment, using 1990 as a benchmark is somewhat disingenuous. That year represented the tip of a pronounced 10-year spike in mortality, driven chiefly by a near-epidemic among nonwhites. Overall today, prostate-cancer death rates have just about settled back to where they were in the years leading up to World War II. In an interesting parallel to mammography, a troubling 2007 study appearing in the Journal of the National Cancer Institute indicts prostate-specific antigen (PSA) screening as a poor predictor of the development of lethal cancers. Researchers deemed the test particularly bad at distinguishing "indolent" tumors from "biologically aggressive" tumors that are "destined to progress."

Of course, in appraising all statistical drops in cancer mortality, we must not forget the elephant in the room: the substantial decline in cigarette smoking since the 1970s, from 40% of Americans then to 24% in the decade just ended. As was once true of TB, this begs questions about whether any success in the war on cancer says less about medical intervention than about the broader social context in which that success is taking place.

Even at the very end of life, batteries of treatments--the infamous "kept alive by artificial means" strategy--do not guarantee an extension of life anyway, at least according to a 2008 study by the Dartmouth Institute for Health Policy and Clinical Practice. "Simply receiving more health care does not result in better life expectancy" the panel noted. Too often such patients merely die a "high-tech, ICU-associated death." And a costly one at that--the panel noted that at the esteemed Johns Hopkins Hospital, Medicare spending in the final two years of a patient's life amounted to \$85,729.

It may already be clear that the medical world should spend less time congratulating itself for its role in life extension, but the final insult, perhaps, was a July 2000 article in IAMA. The article, "Is U.S. Health Really the Best in the World?", posed that healthcare itself is the third-leading cause of death in the U.S., directly responsible for between 230,000 and 284,000 fatalities per year. Shockingly, these so-called "iatrogenic" deaths--caused by doctors or treatment--place medicine behind only heart disease and cancer in mortality tables.

None of the foregoing should be read as a wholesale negation of the value of modern medicine. It would be foolish to imply that healthcare accomplishes nothing. For the purposes of this piece, we are intentionally focusing on those gray areas where healthcare's utility remains moot. There are many other areas of unquestioned success.

But it's hard to overlook a fundamental truism: While people today may be dying of different things--diphtheria then, cancer now--a lot of them are still dying at the same approximate ages. And despite the incessant, glowing coverage of this or that medical marvel, the bulk of truly great achievements have been in prevention, not treatment.

We are a people who have been conditioned to equate volume of health care with better healthcare. We want it all--every test, every procedure, every cure (or pseudo-cure). That would be fine if we could depend on all those tests, procedures, and cures to provide quantifiable improvements in longevity and quality of life. Alas, the newest research suggests that an astonishing percentage of America's \$2.4 trillion annual healthcare outlay cannot be justified in terms of longevity or quality of life.

For all the progress since Hippocrates, longevity remains a riddle, a moving target full of Butterfly Effects, unintended consequences, and contextual variables that cannot always be predicted, accounted for, or even separated out. Someday medical science may be able to keep the one unique and essential component of personhood--the brain--alive by surrounding it with replacement parts, putting an old brain in a new housing a la Dr. Frankenstein. We are not there yet. Not even close. At this juncture, we do not yet know how to fix one thing without having you die--and fairly soon--from something else.

A bit more humility would be in order. We'd do well to keep in mind that a few extraordinary cases of longevity here and there do not a trend-line make. Before we get too worked up over news stories about the latest senior citizen to reach the century mark, we should consider that the all-time record for human longevity may be held by a fellow who attributed his good fortune not to any marvels of medicine but, as he put it, to a regimen of "green cheese, onions, coarse bread, buttermilk or mild ale (cider on special occasions) and no smoking." So said one Thomas Parr, who--according to records maintained at

7

Westminster Abbey, where he was buried by order of King Charles I--died at age 152. In 1635.

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