SPECIAL TIME EDITION

The Science of Living Longer

SECRETS OF AGING WELL

FOODS THAT KEEP YOU FIT

23 SURPRISING WAYS TO STAY YOUNG

TIME

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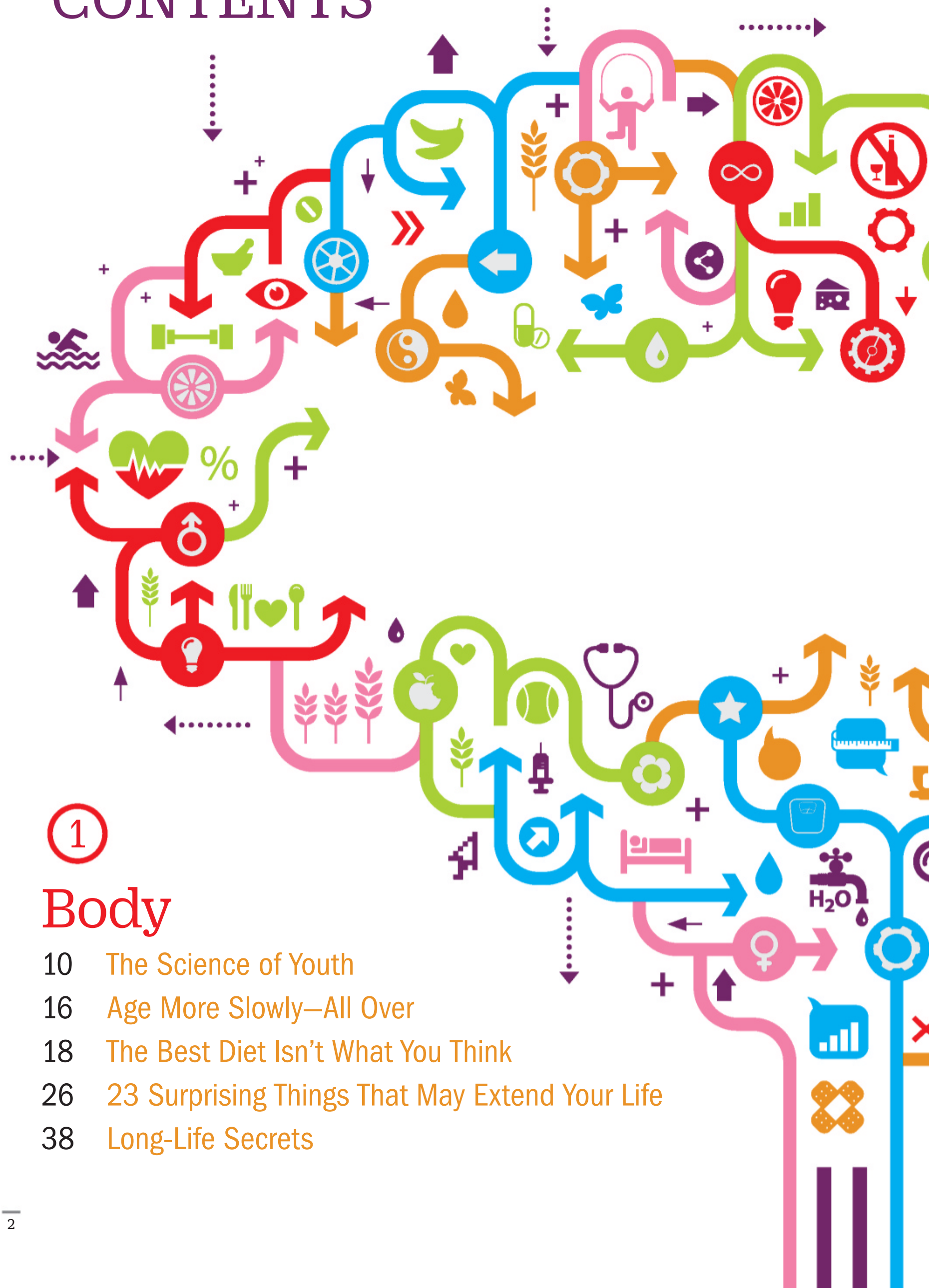

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Parts of this book appeared previously in TIME and on TIME.com and Money.com.

THE NEW AGE OF MUCH OLDER AGE

EVERYONE WANTS TO LIVE LONGER, AND SCIENCE IS STARTING TO MAKE THAT HAPPEN. BUT LIVING BETTER WILL BE THE REAL CHALLENGE AND OPPORTUNITY

BY LAURA L. CARSTENSEN

WE LIVE IN EXTRAORDINARY TIMES. AND THANKS to medical and scientific advances that even a generation ago would have sounded like science fiction, our lives are getting longer. An American born today has a projected average life span 20 full years longer than one born in 1925, and we are, as a society, growing old. In fact, the older population has been experiencing growth since about 2012. And by 2035, adults age 65 and older are expected to outnumber children under 18 for the first time.

Long life is a remarkable achievement. But our aging society presents challenges every bit as fundamental and pervasive as climate change and globalization. If we, as a society, address the reality of longevity, we can avoid a crisis altogether—and improve the quality of our lives at all ages while we're at it. We need to plan.

Because even as we look forward to more years ahead, the idea of a long life can also trigger anxiety in some of us. The unease we experience has to do with how quickly the age structure in the global population has been reshaped. In less than a century, more years were added to life expectancy than in all the years added across all previous millennia of evolution combined. Long-lived societies appeared so suddenly that culture—the crucible that holds science and technology along with wide-scale behavioral practices and social norms—has not caught up.

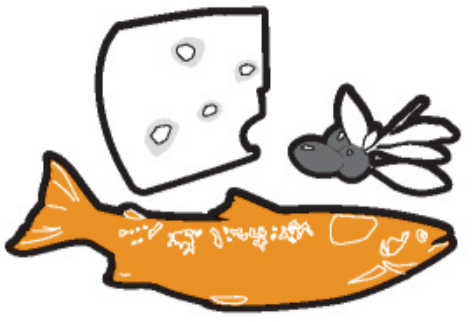
The challenge we face today is converting a world built quite literally by and for the young into a world that supports and engages populations that live to 100 years and beyond. This is no small feat. Consider, for example, that parks, transportation systems, staircases and even hospitals presume that users have both strength and stamina; suburbs across the country are built for parents and their young children, not single people, multiple

generations or elderly people who may be unable to drive. Our education system, meanwhile, serves the needs of children and young adults and offers little more than recreation for experienced people. (For 10 cities that are ready—and hospitable—for older folks, see page 66.)

Indeed, the very concept of work as a full-time endeavor ending in one's early 60s is ill suited to long lives. Arguably most troubling is that we fret about ways that older people lack the qualities of younger people rather than exploit a growing new resource right before our eyes: citizens who have deep expertise, emotional balance and the motivation to make a difference.

Science and technology are the reasons for the increase in life expectancy, and looking forward, science and medicine will be responsible for how we extend life even further. But to get a handle on where we're going—the potential for a life longer than any of us can imagine—it helps to think about how we got here.

Prize-winning economist Robert Fogel and his colleague Dora Costa describe a phenomenon called technophysio-evolution: biological changes due mainly to technologies that ensured a steady food supply. But this explosion wasn't limited to agriculture. Electricity was discovered and made widely available; refrigeration improved the safety of food; pasteurization and water purification contributed further to health; the systematic disposal of waste seriously diminished the spread of contagious disease; and medical science led to dramatic reductions in premature death, thanks to vaccination programs that effectively wiped out lethal viruses from large parts of the developed world.



EAT WHAT?
People on this diet had a 30% lower risk of heart attack than people on a low-fat diet
PAGE 18

Although we were and remain little different genetically from our ancestors 10,000 years ago, the working capacity of our vital organs has improved greatly. Average body size has increased. We have grown taller, and our brains have come to process information faster.

Longer lives and the fact that we're having fewer kids, in combination, began a global process by which population pyramids—with many at the bottom and a tiny proportion of old people at the top—are being transformed into rectangles. If you're the type of person who can get chills from population statistics, these are the numbers for you. What they mean is that for the first time in history, the majority of babies born in the developed world have the opportunity to grow old.

As much as we may fancy ourselves free-thinking, the crux of the longevity challenge is, quite frankly, that humans are creatures of culture. The culture that guides us today—that tells us when to get an education, marry, have children, buy a house, work and retire—is profoundly mismatched to the length of the lives we are living. Today's culture offers little in the way of cures or even treatments for the chronic diseases that afflict older people, nor does it offer

IS THERE SUCH A THING AS A YOUTH DRUG?
Scientists found that mice can live up to 25% longer when they eat food spiked with this ingredient, compared with mice who nosh on normal chow
PAGE 10

guidance about how to finance decades-long retirements. And so individuals worry they will succumb to dementia, run out of money, lose their relevance. But it needn't be so. Instead of hand-wringing about productivity falling and infirmity rising, we need to change the course, both biologically and socially, of long life.

With sufficient financial support, the potential of scientific advances is breathtaking. Biologists are beginning to understand, at a molecular level, the processes by which aging increases the risk of a whole range of diseases and, importantly, how to slow and even reverse some of these processes (see "The Science of Youth," page 10). The very nature of chronic, degenerative diseases is being revealed, which paves the way for interventions (see "23 Surprising Things That May Extend Your Life," page 26) and possibly even cures that were scarcely imagined a generation ago.

Meanwhile, technological advances have made available devices that can compensate for a wide range of age-related problems, such as difficulties with hearing and mobility, just as eyeglasses rendered presbyopia no more than a minor inconvenience more than a century ago. And with an investment in social science, we can develop methods that help people better envision and plan for their futures, improve fitness, remain cognitively sharp and, in some cases, reverse diseases rooted in lifestyle.

MOVE WHERE?
With top-notch hospitals and senior access to university classes, find out the sleeper hit of senior-friendly cities and nine surprising runners-up

PAGE 66

DO PRESIDENTS LIVE LONGER?
They tend to exercise, whether for fitness, photo ops or plain old sanity, and they get the best medical care—but does that mean longer lives?

PAGE 52

We can apply science so that the youngest children among us today live happy and healthy lives as centenarians. In partnerships with businesses and industries, products can be developed that help people age well. Examples include cars that brake before impact, smart homes that improve the safety of occupants, mobile devices that influence behavior and financial products that allow people to effectively finance long lives.

We might also trade retirement for new models of working longer (see "Paying for a Long Life," page 88), so that parents spend more time with young children, sabbaticals become commonplace and—imagine this—workers experience periods of leisure before they reach old age.

An essential first step is to change the way we think about our suddenly longer lives. Thirty or more extra years of life also means we can improve the way we live. To the extent that we can build a world where people arrive at old age mentally sharp, physically fit and financially secure, the problems of individual aging will recede. And finally, we can change the ongoing conversation about a crisis on the horizon to one about long life and new opportunities. □

Carstensen, a professor of psychology and director of the Stanford Center on Longevity, is the author of A Long Bright Future: Happiness, Health, and Financial Security in an Age of Increased Longevity.


BOOTY

chapter one

The latest research from anti-aging scientists is upending the way we think about getting older. No longer is it being treated as a dreadful inevitability but instead as a puzzle that can be solved—as a disease with a cure. That's because cutting-edge science is beginning to make it possible to replace worn-out tissue, and there's tantalizing evidence that aging might someday soon be reversible. Plus, if none of that works, there are also scientists experimenting with ways to quite literally pluck out aging cells like they would gray hairs. We might not be able to live forever (yet), but thanks to mind-boggling advances in science, we can begin to expect to live longer and—perhaps most important—live better too.

THE SCIENCE OF YOUTH

A DRUG FROM DIRT AND SOME SIAMESE MICE HAVE RESEARCHERS INCHING TOWARD THE SEEMINGLY IMPOSSIBLE: A CURE FOR AGING

BY ALICE PARK

IF THERE WERE GUINNESS WORLD RECORDS DEDICATED to high-achieving rodents, Mouse UT2598 would deserve a mention. The average life span for a mouse is 2.3 years—so having lived 1,259 days, or about 3.45 years, before her death in 2010, Mouse UT2598 had an improbably long life. In fact, she had a shot at beating the record for longest-lived, which stands at about 4. Translating that to a human life span, she hovered around the centennial mark, but on the outside, she looked no different from her much younger brethren. Her fur was glossy black, she was lean, and while she was a bit on the small side, she was scrappy and surprisingly active as she explored, sniffed and poked around her cage at the University of Texas Health Science Center at San Antonio (UTHSCSA).

What gave Mouse UT2598 her edge was a compound called rapamycin, which seems to slow aging and the damage it can do, at least to certain cells. Her liver and heart functioned as if they were far younger, and her tendons had more spring and flexibility than they should have had at her age. There was also less evidence of tumors in her organs than is considered normal, so she was spared the effects of cancer longer. When she was placed alongside other mice her age, the contrast was unmistakable.

Mouse UT2598 is just one example of the kind of research into aging that's producing new findings—and raising new questions—every day. In labs around the world, researchers are testing all sorts of agents, some of which already exist as drugs to treat human conditions (rapamycin is given to transplant patients to prevent organ rejection after surgery) and some of which are purely experimental. Scientists are also toying with ways to manipulate genes and pluck out aging cells, all in a race to find a way to extend longevity to its outer limits.

PUSHING THE LIMITS OF LONGEVITY

Life expectancy at birth

1925

Turn-of-the-century health regulations, requiring improvements such as clean water and better sewage disposal, curb outbreaks in the U.S. that are particularly deadly to children.

These efforts mark a push to examine the basic mechanisms of aging and find ways to counteract, or "cure," them. And they are anything but fringe. Longevity research is being conducted by respected scientists with sound reasons for staking their careers on the hubristic notion that it's possible to slow down and maybe even reverse aging.

"When I got into the field, the notion that you could actually do something about the aging process was viewed as a crackpot idea," says Richard Miller, director of the Glenn Center for the Biology of Aging at the University of Michigan. "The argument that one can slow aging, and diseases of aging along with it, used to be fantasy, but now we see it like a scientific strategy."

Nobody is talking about living forever. But as these experts see it, aging is the single most powerful factor in the diseases that are most likely to cut our lives short: cancer, heart problems, immune disorders and degenerative brain conditions like Alzheimer's. "Everybody knows that the main risk factors for heart disease are high cholesterol, obesity and high blood pressure," says Felipe Sierra, director of the division of aging biology at the National Institute on Aging (NIA). "But even stronger than those factors is just being 70 years old."

And that's why staving off aging—or at least slowing it—has become such a central focus of research. "We're going at aging itself," says David Sinclair, a geneticist at Harvard Medical School. "We might take someone who is showing signs of aging and be able to do something about it, to treat that as a disease. That's something I didn't expect to be seeing in my lifetime."

A Modern Anti-Aging Elixir

MOUSE UT2598'S RAPAMYCIN DIET CAN BE TRACED BACK TO SOME dirt samples collected in 1964 on an expedition to Easter Island. Those soil samples became the basis for developing a new antibiotic, which was named rapamycin. Researchers noticed that mice that were given the drug tended to live longer—by up to 25%, compared with those that weren't taking it. "We also discovered that rapamycin extended life span preferentially in female mice," says Z. Dave Sharp, a professor of molecular medicine at UTHSCSA, who proposed the drug as an agent of study for the NIA's Interventions Testing Program (ITP).

"Rapamycin is neat because it works in a wide variety of species, from yeast, worms and flies to mice," says David Harrison, who is studying the compound at the Jackson Laboratory, where scientists mine the genome for solutions to human diseases. "Rapamycin is also neat because it works even when you start quite late in life." Harrison and Miller—along with Sharp and Randy Strong, an associate director of the Barshop Institute for Longevity and Aging Studies at UTHSCSA, in whose lab Mouse UT2598 resided—are also testing other agents for the ITP.

Because of a delay in formulating rapamycin so it remained stable in mouse chow, the first animals to try it were already getting gray—they were 20 months old, the equivalent of 60 years in people—but they still showed slower aging once they took the compound. If the research eventually leads to a human treatment, that could

bode well for older people, who could potentially enjoy the same benefits UT2598 experienced, even if they start in their 60s or 70s.

It turns out that rapamycin interrupts the function of a gene called mTOR, found in both mouse and man, which acts as a traffic signal for directing how cells take in and use energy. If there's plenty to eat, the gene is busy green-lighting cells to absorb nutrients and grow, grow, grow. When food gets scarce, the gene goes quiet, halting the cell-growing machinery until the next feeding time. While mTOR may explain, in part, the phenomenon of calorie restriction and its ability to prolong life—in the 1930s, studies in mice showed that cutting back on their daily diet could add nearly a year to their lives—there's also evidence that it taps into other energy-related pathways to longer life as well.

The more active state—the one in which cells are processing nutrients and growing—turns out to age cells considerably: as our cells are working hard to process our food, they also spew out toxic free radicals. The goal, then, is to keep mTOR as subdued as possible, preferably without requiring animals to starve themselves miserable. And that's what rapamycin appears to do.

So far it's the most promising compound under study, and Harrison and his colleagues are optimistic, though cautious, about its future. After all, resveratrol, a compound found in grapes and red wine, showed early promise in mice that gorged on high-fat diets, extending their lives, but it wasn't as impressive in helping animals on normal diets live longer. (Researchers aren't ready to give up on it yet, however, and it's still being studied.)

While rapamycin dials up one anti-aging circuit, it's clear that it is not yet a fountain of youth. "I'm not popping rapamycin pills yet," says Harrison. Consider the downsides. In mice, it has resulted in a body size that is about 30% smaller than average, and mTOR-regulated mice were also more likely to develop cataracts and were more prone to diabetes. The males tended to experience gradual loss of testicular function—not exactly a selling point for a future longevity treatment. But findings that rapamycin were more efficacious in female mice in enhancing life span have helped to spark an expansion in studying and understanding gender differences in how these types of compounds may prevent, delay or reduce the severity of aging-associated diseases, notes Strong.

Human patients who took the drug after kidney transplants to lower their chances of rejecting the organ, for instance, also had slightly higher chances of developing diabetes, and the risk of cataracts requires more study before a broad application of the drug would be possible. Still, given the fact that rapamycin is already approved and safely taken by patients, anti-aging researchers are hopeful that they'll be able to arrive at the right doses to tip the balance in favor of longevity while minimizing potential risks.

A pilot study published in 2018 examined the safety and tolerability of short-term rapamycin treatment in generally healthy older adults, which had not been previously demonstrated. The study showed that short-term rapamycin treatment can be used safely

1955

Thanks to vaccines for smallpox, diphtheria, polio and other highly contagious—and often lethal—viruses, average life expectancy goes up.

1985

Public-health campaigns on heart health and the dangers of smoking reduce heart-disease deaths. Medical advances also help extend life.

2015

Improved drugs, diagnostic tests, surgeries, disease treatments and other medical advances reduce fatality rates for cancers and other illnesses.

in older women and men who are considered otherwise healthy. Still, a larger-size trial and longer treatment duration are warranted.

Find the Switches to Flip

FOR OTHER RESEARCHERS, THE KEY TO LONGEVITY MAY BE IN our genes. Telomeres are the timekeepers of a cell's life: each time a cell divides, it copies its chromosomes' DNA, and like a knot tied at the end of a thread, telomeres signal the end of the copying process. With each cell division, these little squiggles, which are the final segments of DNA at the ends of chromosomes, shorten—eventually disappearing altogether. And because certain things, like exposure to ultraviolet light, can cause telomeres to shorten at different rates, they're a target of a lot of new anti-aging research as well.

In healthy people there is a balancing dance between the shortening of telomeres and the work of an enzyme called telomerase, which lengthens them just a bit, to restore some of the DNA that's lost. But that doesn't happen in people with telomere-syndrome conditions, which include some bone problems, liver failure and immune-system disorders. It's what makes those terrible conditions research gold for anti-aging scientists. If they can figure out how to correct the misbehaving telomeres in those people, they may be able to correct them in normally—but inexorably—aging people too.

Mary Armanios met her first patient with such a condition while she was training with Carol Greider, a scientist who shared a Nobel Prize for the discovery of telomerase. Through their lab at Johns Hopkins School of Medicine, Armanios met a college student with a blood disorder that required regular transfusions. He was in his 20s but had a shock of gray hair that had first appeared when he was 9. This alone was unusual, but his family history also intrigued her. Almost all his relatives on his father's side died young. His paternal grandmother, who had severe osteoporosis and bone disorders, died in her 60s. His father died at 59 while waiting for a liver transplant. His aunt and uncle died of pneumonia in their 60s. The young man, too, had been in and out of hospitals most of his childhood to treat infections. He died, at age 31, of a staph infection. "The cosmetic symptom was hair graying, but they all have a form of hair graying in other organs as well," says Armanios. It turned out that the family members all had dyskeratosis congenita, a rare condition with an extreme form of telomere dysfunction.

Armanios is confident that she might learn something about how telomeres ought to work—and even how they might be manipulated and extended to halt aging-related problems, not just in those with dyskeratosis congenita but in healthy older populations as well. One strategy may involve dousing cells with the right genetic ingredients to lengthen telomeres, as Helen Blau and her colleagues have done in petri dishes at Stanford University. "We turned back the clock on the cells by the equivalent of many years in human life," Blau says.

Even more encouraging, the cells didn't continue to divide indefinitely, which might raise concerns about uncontrolled growth, as occurs in cancer. "They start to [deteriorate] normally, and that bodes

well for safety," she says. Eventually, Blau hopes, the cells will be tested in the liver or lungs of patients with dyskeratosis congenita, where they can target the rapidly aging cells. If that is successful, the same techniques might turn back the clock on aging cells in the rest of us.

So Simple and So Strange

BUT THERE MIGHT EVEN BE A QUICKER—IF ODDER—WAY TO DEFY aging that literally exploits the power of young blood. Relying on an innovative technique in which young and old mice can be conjoined, Siamese twin–style, to share the same blood system while keeping everything else separate, Amy Wagers of the Harvard Stem Cell Institute found something in the blood of younger mice that seems to rejuvenate an aging animal. The older mice that were yoked to the younger ones showed more new nerve-cell growth in their brains, their muscles were stronger, and in one study, some of the enlarging of the heart that comes with aging was reversed. "Their tissues are functioning more like younger tissues," she says.

What appears to be one of the secret ingredients here is GD11, a protein that's abundant in young animals' blood but is scarcer in older ones. Wagers is conducting more studies in both animals and people to see if longer-lived people have higher levels of GD11 or whether people with low GD11 might be more vulnerable to age-related diseases such as heart problems, cognitive decline and muscle atrophy.

And GD11 isn't alone in showing such promise. Neurologist Dena Dubal is investigating a hormone called klotho, named after the Greek fate responsible for spinning the thread of life for mortals. Increasing the klotho levels in mice helps animals live 30% longer, and 1 in 5 people also carries a version of the klotho gene that boosts its amounts. On average, those people live an extra three to four years. It's not the hormone of immortality, but it's a start.

Manipulating klotho, GD11, telomeres or any of the longevity genes could involve some invasive and high-tech interventions, including gene therapy and even cell transplants. But what if all those efforts are overthinking the solution, and it's possible to put the brakes on aging by simply removing aging cells, like plucking out gray hairs? That's what Jan Van Deursen and his team are pursuing at the Mayo Clinic. "We're getting rid of a cell type you don't have when you're born, something that accumulates over time that may not really be needed for survival," he says.

Are rapamycin-fed mice living longer because their cells are actually functioning like younger ones or because they're simply delaying aging conditions like cancer and heart disease? Are the old mice infused with young blood truly young again, or are their rejuvenated cells only temporarily acting more youthful? And while we know more every day about the role telomeres play in the aging process, is the answer as simple as finding ways to safely lengthen them through drugs? These aren't easy questions to answer, but aging experts welcome them. That's because what's happening in these labs is not so much about extending a life indefinitely but rather extending a healthy life for a little bit longer. □

2045

Regenerative medicine may interrupt aging. If not, conservative estimates put life expectancy at 81 as high obesity rates offset other gains.

AGE MORE SLOWLY—ALL OVER

AS SUDDEN AS AGING CAN FEEL, no one wakes up in a 90-year-old body without getting some warning signs first. But if you know what's coming, you can plan to give certain parts extra care early on. Already in the throes of aging? (Trick question. We all are.) Says Ronan Factora, a geriatric-medicine expert at the Cleveland Clinic, "You're never too old to do anything to help to maintain wellness of your body."

EYES

Your eyes begin "like a multifocal camera," says Rachel Bishop of the National Institutes of Health's National Eye Institute, but **by age 40, range of sight declines.** To prevent eye disease, don't smoke, and wear sunglasses to keep out UV radiation; sun exposure and smoking accelerate cataract formation.

LUNGS

Lung function begins dropping 1% a year at 30 and declines more in people who are sedentary than in those who are active, says Thomas Perls, a geriatrician and principal investigator of the New England Centenarian Study at Boston Medical Center. The antidote: exercise.

MUSCLES

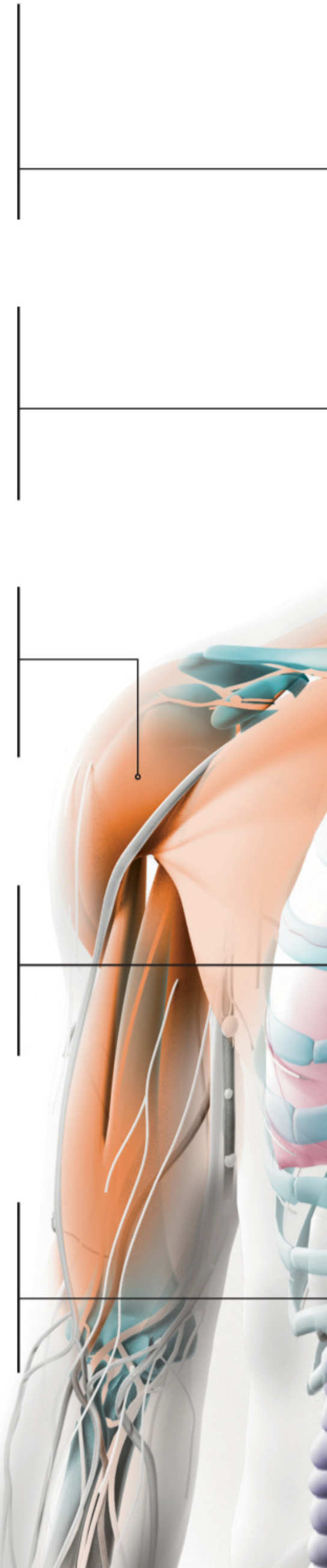
All of us lose muscle and gain fat as we age, says Luigi Ferrucci, the scientific director of the National Institute on Aging. That sad trade-off picks up at age 40. "You need to absolutely insert exercise activity in your routine if you want to avoid muscle decline," Ferrucci says.

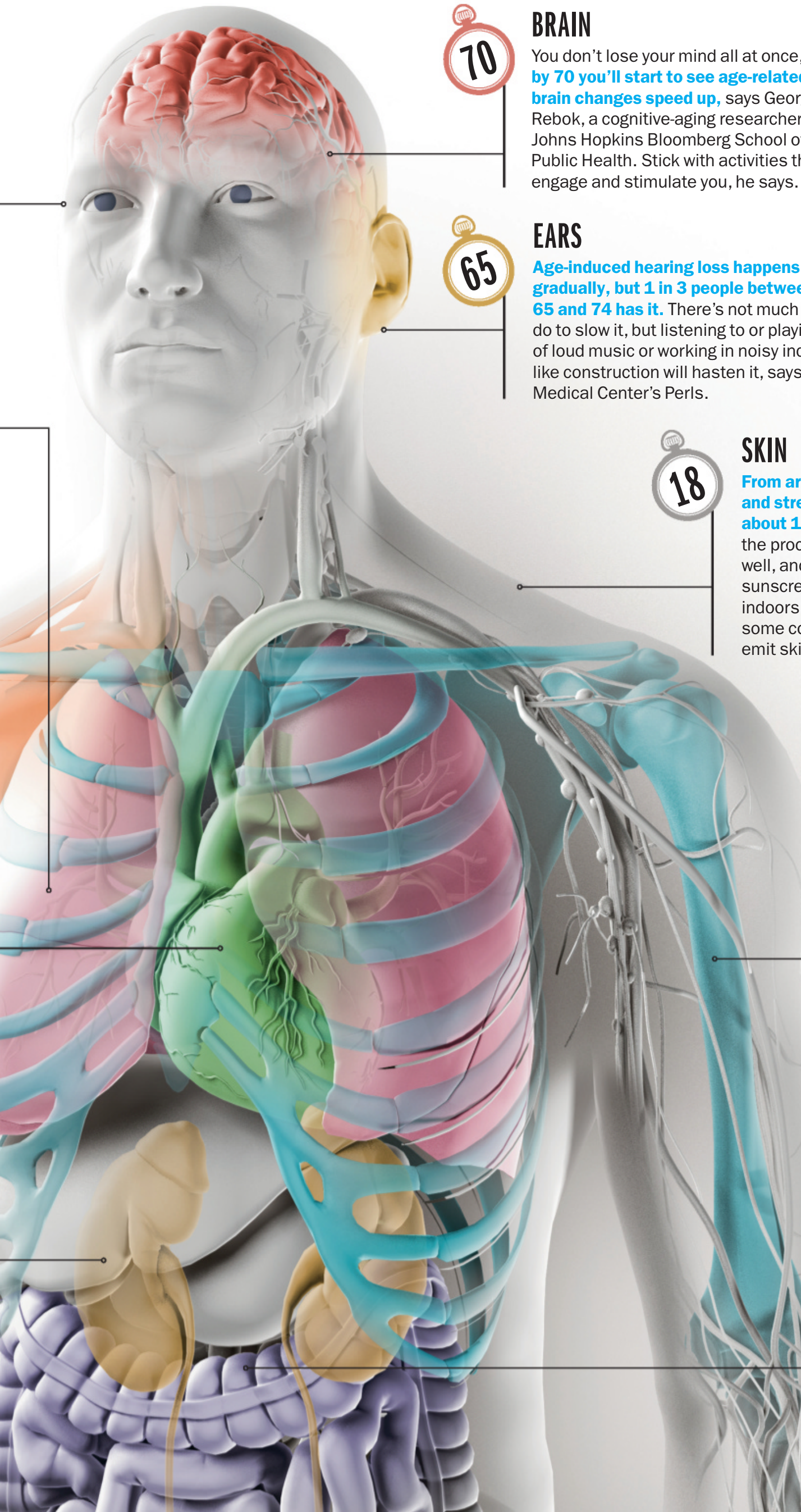
HEART

As you age, your heart-muscle cells shrink in number but expand in size, which makes your heart wall thicker. Your arteries tend to get stiffer too. Starting at age 20 to 30, peak aerobic capacity drops by about 10% per decade, and **heart disease typically kicks in around age 65.**

KIDNEYS

You won't necessarily feel it, but **decline in kidney function starts around 50.** The best thing to do is drink plenty of water. Since thirst decreases with age, you may have to remind yourself. One study found that people who drank more fluids were less prone to kidney decline.





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BRAIN

You don't lose your mind all at once, but **by 70 you'll start to see age-related brain changes speed up,** says George Rebok, a cognitive-aging researcher at Johns Hopkins Bloomberg School of Public Health. Stick with activities that engage and stimulate you, he says.

65

EARS

Age-induced hearing loss happens gradually, but 1 in 3 people between ages 65 and 74 has it. There's not much you can do to slow it, but listening to or playing lots of loud music or working in noisy industries like construction will hasten it, says Boston Medical Center's Perls.

18

SKIN

From around 18, resilient collagen and stretchy elastin decline at about 1% per year. You can slow the process by not smoking, eating well, and wearing titanium or zinc sunscreen every day—even if you're indoors. A 2012 study found that some compact fluorescent bulbs emit skin-damaging UV light.

35

BONES

Bone mass tends to go downhill at a rate of up to 1% per year after age 35 (and faster after menopause). Weight-bearing exercise makes a big difference in bone density. A 2015 study found that simply jumping 20 times twice a day significantly improved hip-bone mineral density.

60

GUT

The hairs on your head aren't the only strands to go. **Villi in your intestine—tiny hairlike projections that absorb the nutrients in food—tend to flatten out around age 60,** says the Cleveland Clinic's Factora. The loss means you'll absorb fewer nutrients.

THE BEST DIET ISN'T WHAT YOU THINK

THE HEADLINES CONFUSE. THE ADVICE CONTRADICTS. HERE'S WHAT TO DO

BY MARKHAM HEID

YOU PROBABLY ASSOCIATE THE WORD *DIET* WITH weight-loss schemes and tasteless food. But your diet is everything you eat or drink: good or bad, healthy or indulgent. And when it comes to how long you'll live, many experts say, nothing matters more.

"Approximately 25% of your risk of death is due to genetics," says Luigi Fontana, a physician and co-director of the longevity research program at Washington University in St. Louis. Of the remaining 75%, diet is likely the most important factor—even more so than exercise, Fontana says.

That your DNA alone is not your destiny should come with some comfort—after all, you can't change your genes, but you can control what you put in your mouth. But it also means that if your diet resembles the average American's, you have some work to do. As a country, we cook too seldom, eat too quickly and swallow more calories per day than any other nation. Our "Western diet," loaded with sugar and red meat, is becoming synonymous with obesity, disease and early death. Even when we try to amend our unhealthy ways, Americans tend to opt for ultra-restrictive eating plans that focus on—or forbid—entire food groups. Some of these may "torch" fat in the short term, but they don't last, and they're not doing your health or longevity any favors.

Fortunately, adopting an eating plan that will extend your life and keep you free of disease and infirmity probably doesn't require such extremes. Read on for the latest science on what works.

THE CASE FOR (MILD) STARVATION

YOU'RE ACCUSTOMED TO HEARING health experts talk about cutting calories to lose weight. This isn't that. Instead, some experts make the case that restricting the amount of food you consume may add years to your life.

Consider the case of Okinawa, a small Japanese island with a greater number of 85-year-olds per capita than almost any other place on Earth. **Okinawans growing up in the 1960s and '70s consumed 20% to 40% fewer calories than people in the rest of Japan.** "Despite sharing the same genes, these calorie-restricted Okinawans lived longer than people on mainland Japan," says Eric Ravussin, the associate executive director for clinical research at Louisiana State University's Pennington Biomedical Research Center. Their rates of heart disease and cancer were also up to 40% lower than in their countrymen, according to a 2006 study.

Ravussin says he often brings up the Okinawa research because it's difficult to study the effects of lower food intake on large numbers of genetically similar people. "We have many animal studies showing calorie restriction extends life span," he says. "But it's hard to replicate in people." (For one experiment, he and his colleagues asked a group of people to cut their calorie intake by 25% for two years. "They couldn't manage it, and we can't make someone do it," he says.) Despite those challenges, **studies of calorie restriction in humans have revealed marked improvements in insulin concentration, fasting glucose and several other biomarkers tied to longevity.**

"I can tell you 10 different hypotheses, all supported by animal research, that would explain how calorie restriction could extend life," Ravussin says. The most promising—and one that has little to do with weight loss—involves the oxidative damage your body undergoes when it breaks down carbohydrates or protein. "We know this damage contributes to aging," he says. Consuming fewer calories has been shown to improve the turnover of your cell's mitochondria, the "powerhouses" that convert the foods you eat into energy. This turnover cuts down on the amount of oxidative damage your body suffers. "This is just one beneficial factor," Ravussin says. "There are many more."

How often you eat—or, put another way, how often you don't eat—may be just as important as the number of calories you swallow when it comes to living a longer life, says

Washington University's Fontana, who is also affiliated with Italy's University of Brescia.

According to a 2014 study on meal frequency and fasting that he co-authored, our current habit of eating three meals a day (plus snacks) is "abnormal" from an evolutionary perspective. Animals—including, until recently, humans—certainly don't eat that way. Inserting foodless stretches into your daily eating routine may provide several life-extending benefits.

"Fasting for as little as 16 hours could improve some health measures and counteract disease processes," Fontana says. One 2014 experiment found that mice that consumed all their calories during an eight-to-nine-hour period lost up to 12% of their body weight and also cut bad cholesterol and inflammation, compared with mice who ate the same quantity and types of foods spread throughout the day. According to the authors of that paper, the body's natural circadian rhythms may change how your digestive system handles food at different times of the day.

So does that mean you should give it a shot? It's a little too early to prescribe fasting or calorie restriction for a longer life, Fontana says. And it's still unclear how these measures might affect older or sick adults in particular. But combined with the research-backed benefits of calorie restriction, it's possible that doctors and nutritionists might one day advise people to fast for one or two days a week—or condense all their meals into a smaller window within a 24-hour time frame.

Before we get to that point, Fontana says, it's first necessary to iron out the major kinks in our current food choices. "If you're going to reduce calories, you have to eat a very healthy diet to avoid malnutrition," he explains. That means that if you're eating poor-quality calories—a candy bar for lunch, say—and you're not eating enough nutritious calories as a result, the health risks increase.

What constitutes a "very healthy diet"? Read on for more details, but the emerging research suggests that the amount of protein you consume may play an outsize role—and not in the way you'd think.

THE PROTEIN TIPPING POINT

People tend to think of meat and dairy when they think of protein. But beans, nuts, fish, eggs and many other foods contain this macronutrient, which is essential for muscle growth and repair.

But while your body requires protein, many of us may be eating way too much of it, especially the kind that comes from animal sources. A 2014 study found that people ages 50 to 65 who eat copious amounts of protein—defined as 20% or more of their daily caloric intake—**suffer a 75% jump in mortality risk and are four times as likely to develop cancer as those who restrict protein to 10% of their calories.** That puts heavy meat consumption on par with smoking when it comes to health harms.

According to Valter Longo, a University of Southern California gerontologist and co-author of that study, eating lots of protein—particularly from animal sources—stimulates the production of two different types of growth factor, both of which speed up aging and hasten the development of some diseases. Adopters of "Paleolithic," meat-centric diets may disagree with Longo and could point to studies showing that high-protein, low-carb diets lead to less eating and lower weight. But despite that, the current research on longevity clearly favors a diet low in animal protein.

There is one very important exception: if you're older than 65—that time when the physical effects of age start to take hold in earnest—eating protein seems to have just the opposite impact on your risk for disease and death, Longo says. He has found that older adults who eat moderate-to-high amounts of protein enjoy a 28% drop in mortality risk and are 60% less likely to die from cancer. Why? Protein may help combat muscle wasting and other depredations of advanced age.

So how much protein should you be eating? **Until you hit age 65, your daily goal should be 0.37 grams per pound of body weight, preferably from plant-based sources,** Longo says. For a 150-pound person, that works out to roughly 55 grams of protein per day. According to the USDA's national nutrient database, you'd get approximately that amount from a chicken breast (~30 grams), a glass of 2% milk (~16 grams) and a couple of cups of protein-containing plant sources, like black beans (~14 grams) or quinoa (~8 grams). As long as you're not losing weight or strength, you can stick to that amount of protein even after you reach 65, Longo says. But if you notice a drop-off in muscle mass or body weight, increasing your protein consumption may be a good idea, he adds.

Two other macronutrients your body uses to create energy are fat and carbohydrates. Although fat was vilified by health authorities in the 1970s and since, recent studies suggest that many sources of fat aren't so bad. On the other hand, health experts now believe that cutting carbohydrates from your diet is more important than limiting fat when it comes to controlling your weight. That's helpful if you're trying to drop a few pounds. The only catch: lower body weight and longer life don't always go hand in hand, especially later in life.

A 2014 study in the journal *Cell Metabolism* found that mice fed a diet low in protein and fat but high in carbs lived longer than mice fed high-protein or high-fat diets. The carb-loaded rodents weren't the slimmest animals in the lab, but they did stick around longer. Although the researchers are cautious about applying their findings to people, there is some human evidence to back them up.

Research from the University of Pittsburgh found that **among people 65 and older, losing weight was associated with a 67% rise in mortality risk.** Gaining weight came with no such risk. A similar study from the University of Pennsylvania extended these findings to those older than 50. Even for the mildly obese, weight loss in the back half of life was associated with higher rates of death, the Penn study concluded. Both groups of researchers controlled for disease, so the higher

mortality rates among those who lost weight weren't due to underlying illnesses.

Your takeaway from all this research should not be that it's fine to gain weight or go carb-crazy later in life, of course. Rather, consider it as evidence that our current understanding of carbs and fat is incomplete, especially when it comes to longevity.

What we do know, however, is that nothing good comes from eating "refined" carbohydrates—the stripped-down, overly processed kinds found in sugary desserts, crackers, chips, white bread, soda and other goodies favored by a Western diet.

In terms of fat—arguably the toughest-

to-place puzzle piece when it comes to the picture of diet and longevity—there's a near consensus that sources of monounsaturated fatty acids, including nuts, seeds and fish, are excellent for your health and longevity. Indeed, in 2018, research published in *The BMJ* reported that omega-3 fatty acids, common in fish, appear to be directly linked to longevity. The study found that people with the highest omega-3 blood levels had an 18% lower risk of unhealthy aging than people with lower levels.

And that leads us, inevitably, to the topic of Mediterranean-style diets. They're popular; you hear about them all the time; but how much is hype and how much isn't? Read on.

THE TRIED AND TRUE

BY NOW YOU'RE PROBABLY TIRED OF hearing about how great "Mediterranean" diets are for your health. But while you could argue that plenty of people living in the Mediterranean don't follow their own namesake meal plan, there's lots of proof backing the life-extending benefits of their eponymous diet.

Heart disease is the No. 1 killer in the U.S. and, increasingly, around the world. For a 2013 study published in the *New England Journal of Medicine*, researchers split more than 7,000 people—all at elevated risk for heart disease—into three groups. Two ate variations of a Mediterranean diet, while the third ate a low-fat diet. **After five years, those on the Mediterranean diets were 30% less likely to have had a major cardiac event.**

Another study, this from researchers primarily based at Brigham and Women's Hospital and Harvard Medical School, examined the effects of a Mediterranean diet on telomeres. Telomeres are the bunches of genetic material that sit at the tips of your chromosomes and protect them from degradation—think of them as being like microscopic bumpers. Long telomeres are a sign of vibrancy, while short or stunted telomeres are a marker of old age and a risk factor for many diseases. Among thousands of middle-aged and older adults, those who adhered closely to a Mediterranean diet had the healthiest telomeres, the study concluded.

Immaculata De Vivo, that study's senior author and an epidemiologist at Harvard, says the Mediterranean diet's ability to combat oxidative damage may explain its links to both longer telomeres and longer life. "Key [ingredients in] the Mediterranean diet have well-known antioxidant and anti-inflammatory

effects, which can counteract telomere shortening," she explains. While there's some dispute about exactly how much of those key components you should swallow on a daily basis, De Vivo says lots of fruits, vegetables and nuts are essential.

Worth noting: De Vivo does not single out olive oil, perhaps the food most often associated with a Mediterranean diet, as one of the plan's superstars. Although plenty of benefits have been associated with "healthy" oils, like those made from olives, rapeseed and other plants, evidence suggests that you can overdo it (yes, even with cold-pressed extra-virgin olive oil).

Research from Antonia Trichopoulou, the president of Greece's Hellenic Health Foundation, has shown that regular olive oil consumption extends life. While this may be due to the oil's antioxidant and monounsaturated fat content, it could also be because of the oil's ability to improve the flavor of vegetables and other healthy foods, making people inclined to eat even more of them. But you can still overindulge, and simply substituting olive oil for margarine or other cooking oils won't lead to all the health benefits associated with a Mediterranean diet.

In fact, efforts to distill the Mediterranean diet into a few lifesaving components have met with failure—for now. One prominent example: the case of resveratrol, a type of phenolic compound found in grapes and wine. Numerous studies have linked regular, moderate consumption of wine—the type of mealtime sipping associated with Mediterranean diets—to a multitude of health perks, but attempts to isolate and concentrate resveratrol have not yet produced consistent benefits. Research from Johns Hopkins University found no association between resveratrol consumption and lower rates of mortality or disease.

"When it comes to diet, health and aging, things are not simple and probably do not boil down to one single substance, like resveratrol," says Richard Semba, the lead author of the Johns Hopkins study.

Semba's point about resveratrol rubs up against a larger truth when it comes to longevity, the Mediterranean diet and diets in general: no one food—nor even one category of food—can provide all the good stuff your body needs for a long, disease-free life. Health experts love the Mediterranean diet precisely because it's not restrictive.

Though exact definitions vary, most agree that the diet places an emphasis on eating lots of vegetables, fruits, nuts and whole grains. The diet also allows for moderate amounts of fish and poultry, as well as wine with meals. The diet tolerates (but generally discourages) red or processed meats, most dairy products, snacks and sweets—all the things linked to death and disease when consumed frequently.

You'll notice there's no mention of supplements, lemon-water binges or any of the other "miraculous" shortcuts so often lauded by trendy diets. A truly healthy diet is both more complicated and less tiresome than swallowing a pill or limiting yourself to the same "superfoods" day in and day out. Semba says many whole foods pack a nutritious cocktail of polyphenols, amino acids, fiber and other healthy nutrients that must be ingested in concert and can't be broken down into pills or supplements.

So what's the best diet for a long life? Stick mostly to the range of foods championed by the Mediterranean diet, ideally prepared yourself from scratch, and you can get away with a dessert here or a steak there.

At least, that's your best bet today. A burgeoning area of study could soon change the way we eat to dodge disease and live a long life. And it all revolves around the teeming bacteria that live in your gut.

No one food—nor even one category of food—can provide all the good stuff your body needs for a long, disease-free life.

THE GUT, CHECKED

YOUR BODY AND DIGESTIVE SYSTEM house hundreds of trillions of living microorganisms. (In fact, some scientists like to say that there are more of them in and on you then there is "you.") Collectively, these microorganisms are referred to as your microbiome, and the ones that are beneficial are called "probiotics." The varieties and proportions of the probiotics living in your gut may influence everything from your risk for disease to your mood and brain function. An example: research has shown that specific colonies or "strains" of probiotics can fortify the lining of your stomach, preventing inflammatory agents from penetrating that lining and adulterating your blood. What does this have to do with your diet?

The types of probiotics found in fermented foods like yogurt, kefir and kombucha can change the makeup of your digestive system in ways that combat gut-related diseases, research shows. "There is serious potential in managing the microbiome to improve human health and longevity," says Heinrich Jasper of the Buck Institute for Research on Aging.

Jasper's own experiments have shown that it's possible to manipulate the microbiomes of fruit flies in ways that lengthen the flies' lives. He says this same effect should be applicable to humans: "It's clear the microbiome has important digestive and metabolic functions, that it evolves with age and that its deregulation contributes to inflammatory conditions."

What's not known is whether healthy adults can strengthen their microbiome simply by eating certain foods. "We clearly don't understand much yet and often don't even know what we don't know in this area," Jasper says of dietary probiotics and the microbiome. Among those unknown unknowns: how the microbiome may evolve as a person ages, whether these changes positively or negatively affect the immune system and—most significantly—whether eating certain foods can change the microbiome in ways that improve health and extend life.

Eating to buttress or bolster the probiotic makeup of your gut may one day be a pivotal component of disease prevention and longevity. But that day is still a ways off. ◻

23 SURPRISING THINGS THAT MAY EXTEND YOUR LIFE

YOU DON'T HAVE TO HIT THEM ALL, BUT WHEN IT COMES TO HEALTH, THE LITTLE THINGS ADD UP

BY MANDY OAKLANDER

FROM THE MOMENT WE UNDERSTAND THAT NO, we're not actually going to live forever, we humans start bargaining with ourselves. "If I can't have forever, I can surely have a few more years than most people, right? Just tell me what to do."

You'll be happy to hear that the answer isn't that you must subsist on food that tastes like cardboard and use all your vacation days to sit on a mountaintop meditating. Stressed-out and overworked as Americans are, we're living longer than ever, and the latest longevity research shows that you may be able to push that number even higher with some easy lifestyle interventions.

Exercise is widely thought to be one of the best ways—if not the best way—to stretch your timeline, but you can make many more changes for a longer life. Stress, friend dates and even happy hours can all play a part in nudging up your expiration date if you're smart about it. With these surprising tricks, growing older can actually seem like . . . fun.

1. Steam in the sauna

Sweating isn't good for you only during hard-core exercise. You can get a similar health boost simply by sitting naked in a hot wooden-walled room. A 2015 study in *JAMA Internal Medicine* looked at more than 2,000 middle-aged Finnish men who frequented saunas and found that over 20 years, those who went to the sauna more regularly had a lower risk of heart failure, coronary artery disease and death than those who didn't go as much.

The researchers in this study think the reason is that sweating and heat get your heart rate up—just like light exercise.

2. Get mindful

OK, a little meditation time is important (though the mountaintop is optional). Simply closing your eyes and settling your mind can lengthen your timeline. And that just might happen by lengthening your telomeres, the protective caps on the ends of chromosomes that have been linked to longevity. After a group of people went on a meditation retreat for three months, they had 30% more telomerase—the enzyme that helps repair telomeres—than people who didn't go on the retreat.

Can't afford to zen out for three straight months? Mindfulness manifests in different ways, many of which have been shown to be beneficial in everyday ways. People who meditated for 25 minutes a day for three days reported being less stressed than a control group. And older adults with depression who practiced the meditative martial art tai chi saw reductions in depressive symptoms and improvements in energy levels and life quality in general.

If you'd prefer your meditation with a little more movement, try yoga. It improves your health in all of the usual ways. But yoga might come with a special twist: the practice has been linked to lengthening telomeres and improved immunity.

3. And don’t get steaming mad

Blowing off steam may seem like a good idea for heart health. Better than holding it in, right? But according to a 2015 study, getting really mad actually comes with an increased heart risk. People who have had an angry outburst had an 8.5-fold greater danger of a heart attack within the next two hours. A study published in 2014 found anger is especially risky for older adults, in whom it is linked to higher levels of IL-6, an inflammatory hormone.

The most common anger triggers are fights with family members, followed by arguments with friends, then work disputes and road rage. Instead of erupting, try deep breathing; meditation (see left) calms the rage and helps the heart.

4. Hit happy hour (in moderation)

Moderate drinking—up to one drink per day for women and two for men—is associated with living longer, according to some research. Alcohol is linked to lower risk of heart disease, heart failure, stroke and dementia, possibly because it increases blood flow and helps lower pressure. But even if it can indeed extend your life span, don’t go overboard: a 2018 meta-analysis in *The Lancet* found that globally, drinking was the seventh leading preventable cause of death, claiming 2.8 million lives in 2016, the sample year on which the study focused.

5. Phone a friend

Having a vibrant social life is as healthy for you as quitting smoking, a review of 148 studies found. So healthy, in fact, that people who had good social relationships were 50% likelier to survive across an eight-year span than people with inadequate social ties. Not being socially connected was a stronger risk factor for death than not exercising and obesity.

Other research has shown that those who have a tiny social network are more than twice as likely to die from heart disease as those who weren't as isolated.

"Strong social relationships support mental health, and that ties into better immune function," said Debra Umberson, a sociologist at the University of Texas at Austin.

The link between sociability and longevity is especially marked among seniors. The 2019 National Poll on Healthy Aging found that 34% of seniors said they felt a lack of companionship and 27% said they felt isolated from others. Of those who felt a lack of companionship, 26% reported fair or poor physical health, versus 13% of those who rarely lacked companionship.

Friends are so powerful in part because they help you protect your emotional health and cope with stress and trigger happy-making endorphins with each belly laugh.

6. Marinate your meat

When grilled or heated at high temperatures, meats form several suspected carcinogens. With a humble marinade, though, you won't necessarily have to forgo the filet. Marinating beef with fresh lemon juice before cooking it at a high temperature was shown to slash a certain carcinogen by 70%. In another study, a marinade with thyme, red pepper, black pepper, allspice, rosemary and chives cut heterocyclic amines—HCAs, suspected human carcinogens—by 88%. Want to use a different part of your spice rack? Other blends were also effective. A marinade of oregano, basil, garlic, onion, jalapeño, parsley and red pepper cut HCA levels by 72%, and a Southwest mix of paprika, red pepper, oregano, thyme, black pepper, garlic and onion lowered levels by 57%.

7. . . . But don't go crazy on it anyway

Meat eater? Overeating red meat can lead to a shorter life. A Harvard University study found that for every three ounces of meat eaten each day, a person's risk for death by cardiovascular disease shot up. On the flip side, another study showed that vegetarians have a 12% lower risk of death than do eat-whatever-I-want types. Adding to that, a vegetarian diet has been linked to reduced risk of colon cancer, diabetes, obesity, high blood pressure and becoming overweight. So indulge if you like; just do it responsibly—which means, as with all things, in moderation.

8. Get physical (with a partner)

For proof that touch is healing, look no further than the massage table. In one experiment, enviable research subjects got either a 45-minute deep Swedish massage or 45 minutes of a light-touch massage. Researchers analyzed the participants' blood and found that those in the deeper-touch group had positive changes in their white blood cells that improve immunity, lower levels of a hormone linked to aggression, and lower levels of cortisol.

But touch may mean even more when it comes from someone you love. Science shows that you can boost immunity with each embrace from a pal or partner. One study exposed a group of volunteers to a cold or flu virus and tracked who got sick. They found that people who reported being hugged regularly had less severe symptoms than people who weren't hugged as much. Just one a day will do it, says study author Sheldon Cohen, a professor of psychology at Carnegie Mellon.

Oxytocin, known as the love or bonding hormone, also gets a boost from hugs. Women who said they got hugged more by their partners had more oxytocin and lower blood pressure than those who weren't hugged as much, found one study.

9. Drink coffee

Here's a little-known fact about java: coffee is considered a major source of antioxidants for Americans. It has hundreds of beneficial compounds, which is one reason many studies have come down squarely in the pro-coffee camp. Research shows that coffee may help prevent some types of cancer, as well as Type 2 diabetes and Parkinson's disease.

Despite some controversy over caffeine, most of the science finds that coffee is indeed a health tonic. It even appears to be good for your heart. Regular coffee drinkers have a lower risk of death from heart disease than those who don't sip the brew. And in a study of thousands of Americans ages 50 through 71, those who drank about three cups of coffee each day had a 10% lower risk of dying during the study period.

That doesn't mean you should drink bottomless mugs of the stuff. Experts recommend an upper limit of about four cups a day.

10. . . . And tea

Coffee isn't the only morning brew that can keep your life long. Tea is another powerful source of antioxidants, and it protects the heart.

Japanese people who drank at least five cups of green tea per day enjoyed a 26% lower risk of dying from heart attack or stroke. Other research has found that compounds in green tea called catechins can significantly lower LDL ("bad") cholesterol and triglyceride levels.

Tea can also help your blood pressure. A 2014 analysis of tea studies found that people who made a habit of drinking it for at least 12 weeks had lowered blood pressure, reducing their risk of death by 4%.

According to published research, green tea appears to have the most profound effects, followed by black tea, but decaf seems to work just as well as the caffeinated kind. Teatime, anyone?

11. Use sunscreen

It's a beauty secret of the ageless: wear a broad-spectrum sunscreen every day. Those who do show 24% less aging of the skin compared with those who don't use it every day. And it does more good for your skin than just prolong its youthfulness. Slather on a broad-spectrum SPF, and you could cut your risk for skin cancer in half. In an Australian study, researchers assigned one group of people to wear sunscreen every day for four years and another group to wear it as they pleased. A decade after the study ended, the people who wore sunscreen daily had developed 50% fewer melanomas than those who weren't specifically instructed to use it daily. That's worth taking an extra minute in the morning to apply it, isn't it?

12. Go nuts

Nuts of all types may help you live longer; they're full of protein, vitamins and good fats. In a study looking at 76,000 women, those who regularly ate nuts of any kind had a 20% lower death rate after four years than women who didn't have nutty diets. Looking to mix it up with a new favorite nut? Try walnuts. One study found that adding them to a diet was linked to lower cholesterol and blood pressure. Research also shows that walnuts may even calm the body's stress responses.

13. Find a good boss

If you hate your boss, you could be in trouble. Working for a bad boss is linked to a rise in heart disease risk. On the flip side, one study found a lower rate of heart-related death in employees who felt there was a high level of justice in their workplace. And when employees had bosses they liked, their blood pressure was lower than when they worked under a supervisor they didn't like.

14. Stop smoking

In case you needed another reason not to smoke, you can now add to the list seven more deadly diseases. A study published in 2015 found that smoking may be responsible for far more deaths than the ones for which it's officially given credit. When researchers analyzed the causes of death among smokers and eliminated diseases currently linked to lighting up, they found 17% were due to other causes. The good news? Once people stop smoking, their risk drops dramatically.

15. Eat more fat

Thankfully, the days of fat-bashing are over. Fat is back—as long as you eat the right kind. Nuts are packed with the good stuff, and other fatty foods help you live longer too. People with higher levels of the fatty acids DHA, EPA and DPA—all richly contained in fish—have a 35% lower risk of death by heart disease than their peers with lower levels of the fats. (The best serving size seems to be two meals of fish a week.)

Research now even favors full-fat dairy over low-fat versions; a review in the *European Journal of Nutrition* found that eaters of full-fat dairy didn't get cardiovascular disease and Type 2 diabetes more often than those who ate the low-fat. An added benefit: those who ate whole-fat dairy tended to weigh less, gain fewer pounds and enjoy a lower risk for obesity, according to many of the studies included in the review.

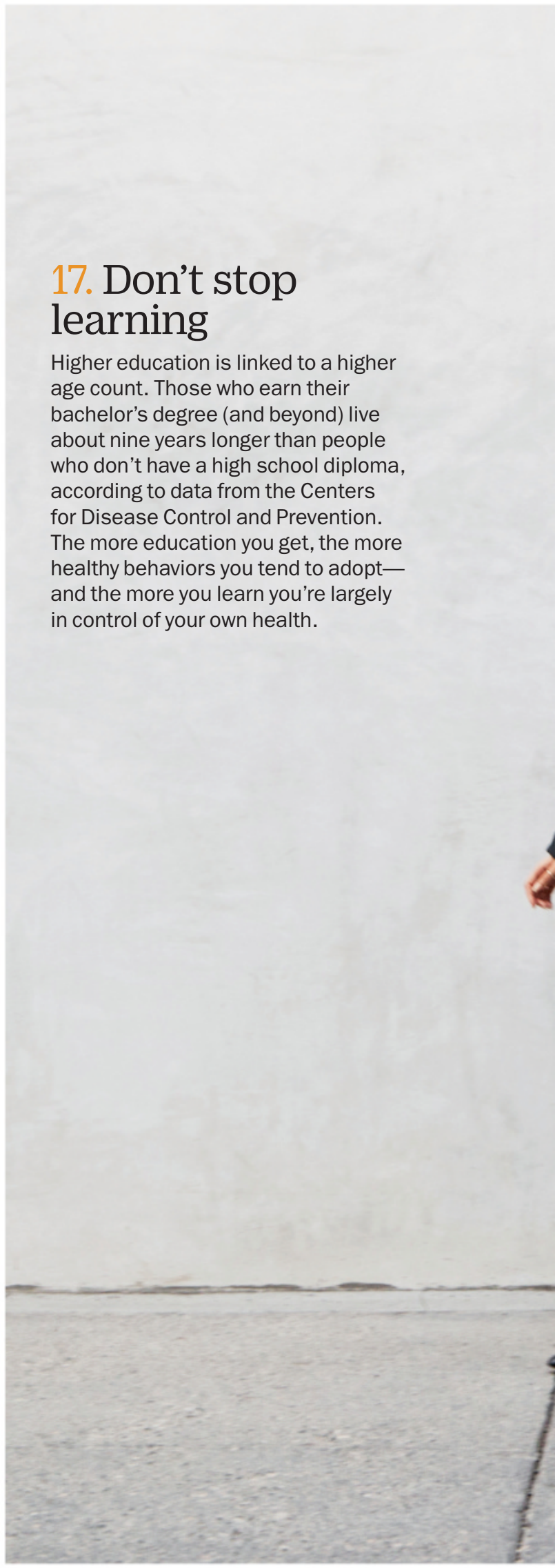
With evidence continuing to mount that low-fat diets aren't very effective, a better bet is to slash added sugar. One study showed that drinking a daily 20-ounce soda aged immune cells by nearly five years.

16. . . . And vegetables

You don't have to go full veg to get massive benefits from produce. Eating seven or more servings of fruits and vegetables every day seems to reduce your risk of dying by 42% at any age. It even reduced risk of dying from cancer by 25% and risk of dying from heart disease by 31%. Slip vegetables into every nook and cranny of your diet, but it's OK to fall short of the seven-plus goal sometimes. The study also found that eating just three to five portions of produce was linked to a 29% drop in risk of death.

17. Don't stop learning

Higher education is linked to a higher age count. Those who earn their bachelor's degree (and beyond) live about nine years longer than people who don't have a high school diploma, according to data from the Centers for Disease Control and Prevention. The more education you get, the more healthy behaviors you tend to adopt—and the more you learn you're largely in control of your own health.



18. Give time

Do unto others, and you'll do a whole lot for your health. A review of 40 studies on volunteering found that regular do-gooding can cut the risk for early death by 22% compared with those who don't volunteer. People who did had longer—and better—lives.

Volunteerism is linked to lower rates of depression and greater well-being. Additionally, according to one survey, providing continuous care for a loved one is linked to lower mortality for the caregiver.

19. . . . And give money

Some research suggests that stinginess breeds stress. In some studies, those who chose to give less had higher heart rates, more of the stress hormone cortisol and a greater sense of shame than those who gave more generously. Giving might also do good for your mood. When researchers gave women $100 and the choice to keep it or donate it to a food bank, brain imaging revealed that those who chose charity had more brain activation in pleasure regions of the brain than those who kept it.

20. Work hard

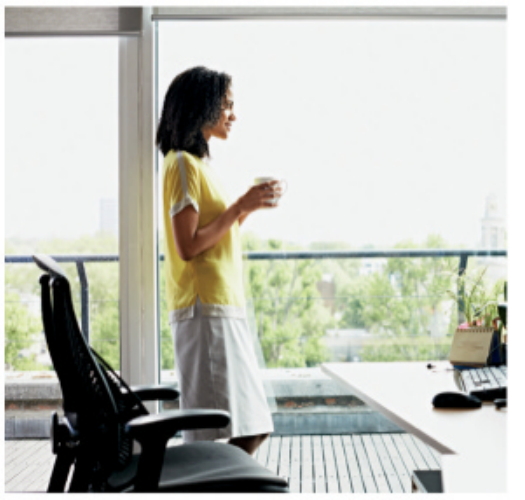
Think a long life comes solely from living a life full of languorous, stress-free days? Nope. People who work the hardest at meaningful jobs seem to live the longest, found Howard S. Friedman and Leslie R. Martin, authors of *The Longevity Project,* a book based on the findings of an eight-decade-long aging study. “The results were very clear: those with the most career success were the least likely to die young,” the authors write. The most successful men lived five years longer than the least successful men. The researchers chalked up that difference to more ambition, perseverance, impulse control, conscientiousness and motivation, all of which help bolster resilience at work. “Productive, hardworking people (even in old age) are not stressed and miserable, but tend to be happier, healthier, and more socially connected than their less productive peers,” the authors write.

21. Exercise a little bit

Research shows that you don’t have to exercise as long as you thought in order to improve your health. An analysis of 250,000 older adults found that getting less than an hour of moderate physical activity a week was associated with a 15% lower risk of death. And runners enjoyed a 30% lower risk of death from any cause and a 45% reduced risk of death from heart attack or stroke, even if they ran for only an hour a week. Weight-bearing exercises (such as hiking, climbing stairs and dancing) are helpful as well, strengthening bones as they require you to work against gravity. If you do put in more exercise time, a 2018 study published in *Mayo Clinic Proceedings* found that team sports or paired sports like tennis can pay bigger dividends than solitary exercise—one more piece of evidence on the power of social connections.

22. Adopt a pet

Owning a dog is associated with a lower risk of heart disease, according to the American Heart Association. In fact, one study found that the risk of death from cardiovascular disease was four times as high for people who don’t own dogs. Studies also show that people who own pets have significantly lower blood pressure. That’s in part because dogs don’t walk themselves, so having one means you’ll exercise more. One survey of 5,253 Japanese adults found that dog owners were 54% more likely to get the recommended amount of physical activity than others. And a 2019 University of Michigan National Poll on Healthy Aging found that nearly 90% of older respondents said their pets made them feel loved—a hedge against loneliness. Not a dog person? Pet owners of all kinds who had cardiovascular disease were more likely to survive for a year than people who didn’t own pets.



23. Get vertical

You don't have to go from couch potato to exercise fiend to make a difference in your life span. Research shows that getting big benefits from physical activity is super simple: just stand up more.

A study found that sitting for longer than three hours a day shaved two years from a person's life expectancy. Watching TV is even worse: one study showed that people who put in six TV hours a day had life spans 4.8 years shorter than those who didn't watch TV.

Sitting, experts often say, is as bad for you as smoking, which has doctors and health experts calling for a paradigm shift. "In the same way that standing up is an oddity now, sitting down should be," says James Levine, the director of the Mayo Clinic–Arizona State University Obesity Solutions Initiative.

Levine is probably best known as the inventor of the first treadmill desk. "My argument is that whatever building it is—a movie theater, airport, arts complex—a fundamental part of our thinking has become that people who enter that space will need to be seated." And that's what got us into all this trouble in the first place.

For now, the solution is as easy as avoiding your chair. Take more office walks during the day, and consider a standing desk. The more you move the better you'll do, but if you feel the need to start slowly, you'll still benefit. A 2019 study published in the *American Journal of Epidemiology* found that replacing just 30 minutes of sitting a day with light physical activity could mean a 17% reduced risk of early death. ☐

LONG-LIFE SECRETS

Wisdom from elders who defied the odds

“MIND YOUR OWN BUSINESS AND DON’T EAT JUNK FOOD.”

—BESSE COOPER, AT AGE 116

“My secret to a long life has been staying away from men. They’re just more trouble than they’re worth. I also made sure that I got plenty of exercise, eat a nice warm bowl of porridge every morning, and have never gotten married.”

—JESSIE CALLAHAN, OLDEST WOMAN IN SCOTLAND, AT AGE 107

“Have a good wife, two scotches a night, and be easygoing.”

—SAMUEL BALL, AT AGE 102

“KINDNESS. TREAT PEOPLE RIGHT AND BE NICE TO OTHER PEOPLE.”

—GERTRUDE WEAVER, OF ARKANSAS, AT AGE 116

“I PARTICIPATE IN LOTS OF ACTIVITIES. I PLAY BINGO, DO MEDITATION AND CRAFTS, AND ATTEND FITNESS CLASSES, LIKE ZUMBA, CHAIR YOGA AND SITTERCISE.”

—MAE LEWIS, AT AGE 100

“RAISING MY KIDS HELPED ME LIVE THIS LONG. MY FAMILY HAS ALWAYS GIVEN ME MEANING. HAVING FRIENDS HELPS TOO.”

—JUSTINA SOTOMAYOR, AT AGE 100

“I LIVE ON GREEN VEGETABLES AND FRUIT. I BATHE MY FEET EVERY NIGHT AND MASSAGE THEM IN OLIVE OIL.”

—BERNANDO LAPALLO, AT AGE 111

“I WONDER ABOUT THAT TOO.”

—MISAO OKAWA, AT AGE 117, ON HOW SHE LIVED SO LONG

Ages and quotes as reported in 2015

"I DO A LOT OF GOOD DEEDS, SO MAYBE THAT'S HELPED."

—ROSE STRASSBURGER, AT AGE 100

"FRIENDS, A GOOD CIGAR, DRINKING LOTS OF GOOD WATER, NO ALCOHOL, STAYING POSITIVE AND LOTS OF SINGING WILL KEEP YOU ALIVE FOR A LONG TIME."

—CHRISTIAN MORTENSEN, AT AGE 115

"I DON'T EAT VERY MUCH. BUT I ALWAYS EAT A FRUIT, A VEGETABLE AND A LITTLE MEAT."

—LOUIS CHARPENTIER, AT AGE 99

"If you're positive you can get through [life] OK. When you think negatively, you're putting poison on your body. Just smile. They say laughter is the best medicine there is."

—ELSA BAILEY, AT AGE 100

"Love people. Find something to like about the person—it's there—because we're all just people."

—LUCILLE BOSTON LEWIS, AT AGE 100

"I left school when I was 12, but I traveled the world, and that was my education. People interested me then and still do . . . I remain very curious about life, and if something new happens, I want to be involved."

—LILI RUDIN, AT AGE 100

"I used to own a restaurant and worked 14 hours a day, six days a week. . . . These days I just try to stay independent."

—HARUO ITO, AT AGE 100

"I'VE NEVER BEEN TO A BEAUTY SHOP. I'VE NEVER BEEN VAIN."

—ADELINA DOMINGUES, AT AGE 114

"THERE IS NO NEED TO EVER RETIRE, BUT IF ONE MUST, IT SHOULD BE A LOT LATER THAN 65."

—SHIGEAKI HINOHARA, AT AGE 100

Sources: TIME.com; the *Daily Mail*; ABC News; the *New York Times*; *Extraordinary Centenarians in America*; RealSimple.com; EverydayHealth.com; NBC News; The Huffington Post; *Times Free Press*


Mind

chapter two

Genetics plays a part in the way you age, of course, but the more scientists and doctors learn, the more they're able to prove that when it comes to aging, your DNA is not your destiny. That means your future is mutable and your destiny is (mostly) in your hands. So what to do? Sure, you would be wise to fine-tune your diet, hit the gym a few times a week and make sure you clock your eight hours every night. But there's another critical component to aging well that may be as—if not more—important: your outlook. Researchers are learning that there's something to the old adage "You're only as old as you feel"—that it's not only true; it's true at the cellular level. Maybe aging is a matter of the mind after all.

A MATTER OF MINDFULNESS

CUTTING-EDGE SCIENCE IS SHOWING THAT YOUR OUTLOOK CAN CHANGE HOW YOU AGE—AT THE CELLULAR LEVEL. HERE'S HOW

BY JEFFREY KLUGER

WE TEND TO FACE AGING WITH FEEL-GOOD slogans, bringing platitudes to a knife fight. "I'm 70 years young!" we say, ignoring the fact that, going by average U.S. life expectancy, it won't be long before we're 78 years dead. "Fifty is the new 40," we tell ourselves, when the mathematical reality is no, it's not.

Then comes a bit of wisdom that, if anything, seems like the most shopworn of all: "You're only as old as you feel." As sentiments go, it has the twin flaws of being both banal and blaming—as if feeling old is your own fault. It turns out, however, that whoever coined that one may have been on to something big.

It's no secret anymore that the familiar mind-body divide, with your head home to the abstract and ethereal and your flesh home to the messy and mechanical, is nonsense. Your moods, feelings and thoughts all influence your physiology. Learn to relax and your blood pressure goes down; emerge from depression and your immune system picks up; take a pharmacologically useless sugar pill that you're told is a powerful drug for your headache or backache or infection and, as if by magic, you get better.

The tantalizing question, then, has always been this: If the mind can heal the body, can it also rejuvenate it? Can it make it physically, measurably younger or, at the very least, slow the aging process? The people who research such things already accept that the way we think and feel can increase the population of disease-fighting white blood cells and lower the level of the hormone that raises blood pressure, so why couldn't it help recalcify bones or reverse heart disease or preserve the brain cells

that are lost with age? "You're only as old as you feel" may merely be part of the equation. Perhaps, within reason, you're only as old as you bloody well choose to be—because research is mounting that your outlook, your personality and, frankly, how upbeat you are have a profound impact not just on how you feel but also on how your cells age.

"Let's treat 'mind' and 'body' as just words," says Ellen Langer, a professor of psychology at Harvard University who has been studying aging, mindfulness, decision-making and health since the late 1970s. "Let's put them together as one thing and say: anywhere you put the mind, you also put the body."

Once you make that leap, the medical tool kit becomes a lot larger. It includes not just pharmacology and surgery but also things like meditation, optimism, resilience and social connections—all the stuff that's always been far outside medicine's visible wavelength but is suddenly finding a place comfortably within it.

Consider one study, for instance, showing that even a single day of a mindfulness meditation practice can down-regulate a gene that codes for inflammation, one of the greatest drivers of aging. Or the one showing that reducing stress can reduce the cellular damage from the highly reactive oxygen atoms known as free radicals. Or the research that found, most remarkably, that the telomeres within your cells—the little cuffs that cap chromosomes and erode over your life span—can actually be made to grow longer, provided your mind is in the right state to make it happen.

"It comes down to daily behavior and the choices we make," says Elissa Epel, a professor of psychiatry at the University of California, San Francisco (UCSF), who studies stress and aging. "We have a growing set of studies of people from around the world showing that aging is not just an aspect of genetics but of how we live." Deciding to live better, it increasingly seems, is the same as deciding to live younger.

Winding Back the Mind

IT WASN'T UNTIL THE LATE 1970S THAT RESEARCHERS began seriously thinking about using the mind to arrest the aging process, and it was Langer's landmark "counterclockwise" study that really got things started. In 1979, when she was just beginning her Harvard teaching career, she recruited a group of eight men in their 70s for a five-day stay at a retreat in New Hampshire. The men were in neither good nor bad health but what was considered age-appropriate health—which is to say slow, bent and easily fatigued. But Langer was determined to change that.

The retreat, as the men discovered when they arrived, was a former monastery designed to look as the world did to them in 1959. Vintage programs were showing on vintage TVs. Midcentury music played on midcentury radios. The men were treated, too, as they would have been back then—no one offered to help them with their bags or fetch them a blanket. They kept their conversation to the topics they would have discussed in 1959—the doings in the Eisenhower White House, say, or the Dodgers–White Sox Series face-off. And lest the men get a glimpse of themselves and break the spell, all mirrors were removed from the space.

At the beginning and end of the five-day span, Langer administered a series of physical and cognitive aptitude tests to the men, and the result was as she expected: on virtually every metric, their performance improved dramatically, and in many cases it was closer to what would be expected for men a decade or two younger.

"The study spoke volumes to the potential we have to change our health," Langer says. "At some point people just tell us we can't. If you're 20 and you hurt your wrist, you expect it to get better. When you're 70, you've bought into the mindset that you're falling apart, and then you do."

Langer went on to test the same premise in other ways. After recruiting a sample group of hotel maids who were battling their weight, she told half the sample that studies showed that the work they did every day was actually a vigorous form of calorie-burning exercise. The other women were given no such information. At the end of the study, the women who believed that their work was a workout lost more weight than those in the other group.

Langer's studies, compelling as they are, are not complete. They do a very good job of proving that thinking young appears to make the body young—or at least younger—but they don't say why. Langer herself is more philosophical than empirical on this. "The mechanism is the part that's so hard to get across to people," she says. "But when the mind and body are one, there's no mediator needed."

Maybe. But even if she doesn't need a mediator, other scientists do, and they're looking hard for it—starting inside human cells, at telomere.

The Levers of Aging

OVER THE COURSE OF A LIFETIME, TELOmeres burn down like a sort of candle wick, leaving the chromosomes vulnerable to damage and starting the aging process.

Investigators have understood the basics of telomeres since 1978, when then postdoctoral fellow Elizabeth Blackburn, now at UCSF, first mapped their structure and later, with her collaborator Jack Szostak of Harvard, their function. In 1984, Blackburn and her graduate student Carol Greider, now at Johns Hopkins School of Medicine, discovered the enzyme telomerase, which repairs and maintains telomeres—at least when it's around at sufficient levels. When those levels fall, which happens as we get older, the aging process is kicked off. The discovery won all three of them the 2009 Nobel Prize for Medicine.

> "It comes down to daily behavior and choices. Aging is not just an aspect of genetics but of how we live."
>
> —ELISSA EPEL, PROFESSOR OF PSYCHIATRY, UCSF

"When studies look at which individuals will die in the next three years," Blackburn says, "the chances are higher if your telomeres are shorter. Telomere shortening plays into cardiovascular disease, immune-system problems and maybe diabetes by affecting beta cells in the pancreas—though that one's been shown only in mouse models so far."

The question is, Are there ways to intervene to spare the telomeres and preserve your health? The answer—at least preliminarily—is yes, and stress reduction is one powerful method. In 2014, Epel and her colleague Eli Puterman, also of UCSF, studied 239 healthy postmenopausal women over the course of a year. Many of the subjects were experiencing at least one of 13 major life stressors, which included unemployment in the family, financial woes, divorce and the illness of a child.

The length of their telomeres was measured at the beginning and end of the year, and the more life stressors these women experienced in that time, the more their telomeres shortened that year. But some of the women also practiced good health behaviors: they exercised, ate well and slept well. Consistently, the women who also practiced good health behaviors maintained their telomere length. "The question had always been whether the telomeres respond to daily lifestyle changes or if the system is chronic and proceeds at its own pace," Epel says. "In our study, it was lifestyle, with damage occurring mostly in people who were sedentary."

Worse, telomere-shortening stress is not confined to older people and does not even have to be experienced firsthand. Epel cites studies showing that when cord blood is drawn from newborns, the babies whose mothers had experienced more stress when they were pregnant showed shorter telomeres than those whose moms had easier pregnancies. "We replicated that original finding," she says, "and it suggests healthy telomere maintenance doesn't start when you're born but before you're born."

Some researchers believe that improvements in exercise and other healthy behaviors can increase the output of telomerase, and animal studies in test tubes show that increased telomerase may in turn make telomeres grow. Telomerase supplements, however—either synthetically produced or in the many herbal supplements that claim to include the enzyme—are not the answer. If telomeres never burn down, you get immortal cells, which is another way of saying cancer cells.

"Cancers love telomerase, and a number of cancers up-regulate it like crazy," says Blackburn. "But some cancers are also related to low telomerase, because that makes telomeres less stable." Trying to boost telomerase through supplements is a very dangerous game to play, at least given the current state of medical knowledge. "We don't know how to strike some kind of balance," says Blackburn. "My feeling would be that if I take anything that would push my telomerase up, I'm playing with fire."

Putting Out Fires

TELOMERES AREN'T THE ONLY BIG, STRESS-related players in the aging game. Another is chronic inflammation. When you're anxious, the sympathetic nervous system—which is not known for thinking things through too clearly—assumes you're about to encounter a predator or some other life-threatening challenge. The brain thus sends a signal to the adrenal gland to start secreting the hormones epinephrine and cortisol; together, these hormones signal the immune system to release proteins known as inflammatory cytokines. These prepare white blood cells and other infection fighters to rush to the site of an anticipated wound.

That works quite well when there really is a wound, or when the danger is fleeting and you escape without injury. Either way, the system, thanks largely to cortisol, dials itself back down. But what if you're always braced for a battle of some kind—with your boss, your kids, your credit-card statements—and the body is always flooded with inflammatory chemicals? In those cases the body suffers from what's known as inflammation—and that's bad.

"There is no invader as there is with a wound, but we're reacting as if there is anyway," says Epel. "That creates a friendly environment for cancer, brain deterioration, cardiovascular disease." In other words, for many of the main killers of aging.

One of the best ways to battle this is with a settled psychic state, through meditation and mindfulness exercises. Increasingly, researchers are finding that a particular form of meditation known as Mindfulness Based Stress Reduction (MBSR)—which, as its name suggests, includes paying close attention to feelings, thoughts and other stimuli while meditating—can calm an inflamed immune system in the same way it can calm an inflamed mood.

In 2013, Richard Davidson, a neuroscientist and the founder of the Center for Healthy Minds at the University of Wisconsin–Madison, conducted a pair of studies showing just how powerful an effect MBSR can have on the body. In one, he and his colleagues compared 40 subjects, 21 of whom engaged in eight hours of a combination of guided meditation, meditative walks and lectures on meditation, and 19 of whom engaged in equally relaxing activities but without the meditation. At the end of even so brief a period as eight hours, the meditators showed a decrease in the expression of the very genes that regulate inflammation—meaning a decrease in inflammation itself too.

> "When studies look at who will die in the next three years, the chances are higher if your telomeres are shorter."
>
> —ELIZABETH BLACKBURN, PROFESSOR OF BIOLOGY AND PHYSIOLOGY AT UCSF

Another study replicated the findings over the course of eight weeks, and at the end, the experimenters used a suction device to raise a small blister on the arms of the subjects. When fluid was withdrawn, the meditators showed significantly lower levels of inflammatory cytokines—the same cytokines that do so much damage when they circulate in the body chronically.

"The regular practice of certain contemplative methods seems to be able to alter the trajectory of age-related changes," Davidson says. "Some studies even show that meditation can slow the age-related decline of gray matter in the brain."

On this last point, Davidson understates things. Exciting research published in 2015 out of UCLA compared two sample groups of

50 people, ranging in age from 24 to 77—a good demographic slice, since gray matter actually begins declining when we're in our 20s. One group was made up of people who did not meditate, the other of people who had been regular meditators for anywhere from four to 46 years. All 100 subjects' brains were scanned with magnetic resonance imaging, and the results were unmistakable: the meditators showed less gray-matter loss in several regions of the brain compared with the nonmeditators.

"We expected rather small and distinct effects located in some of the regions that had previously been associated with meditating," says Florian Kurth of UCLA's Brain Mapping Center and a co-author of the study. "Instead, what we actually observed was a widespread effect of meditation that encompassed regions throughout the entire brain."

The Optimism Effect

ALMOST AS POWERFUL AS MEDITATION—AND certainly easier for people who would be perfectly happy to set aside time for solitary contemplation in a quiet place if they could find the hour and the place and the quiet—is simple optimism. Challenges and setbacks and even tragedies are nonnegotiable parts of life, but what is negotiable is how you face them.

> "Regular practice of meditation seems to be able to alter the trajectory of age-related changes."
>
> —RICHARD DAVIDSON, NEUROSCIENTIST AT UNIVERSITY OF WISCONSIN–MADISON

Hilary Tindle, a physician and clinical investigator at Vanderbilt University, has produced a body of work on the connection between attitude and health, and all of it points to the improbable power of just being hopeful. In one massive 2009 study, Tindle analyzed data from 97,253 women who had filled out questionnaires for the National Institutes of Health's Women's Health Initiative, trying to correlate hopefulness and mortality. The results showed that women who had scored high on optimism—being hopeful about the future—had significantly lower rates of heart disease, cancer and mortality than women who had scored high on pessimism.

Tindle also studied cynicism, which can be described as feelings of pessimism about other people, expecting them to be untrustworthy and even harmful. Women with lower cynicism, compared with those who viewed most other people with suspicion, had lower risk of death.

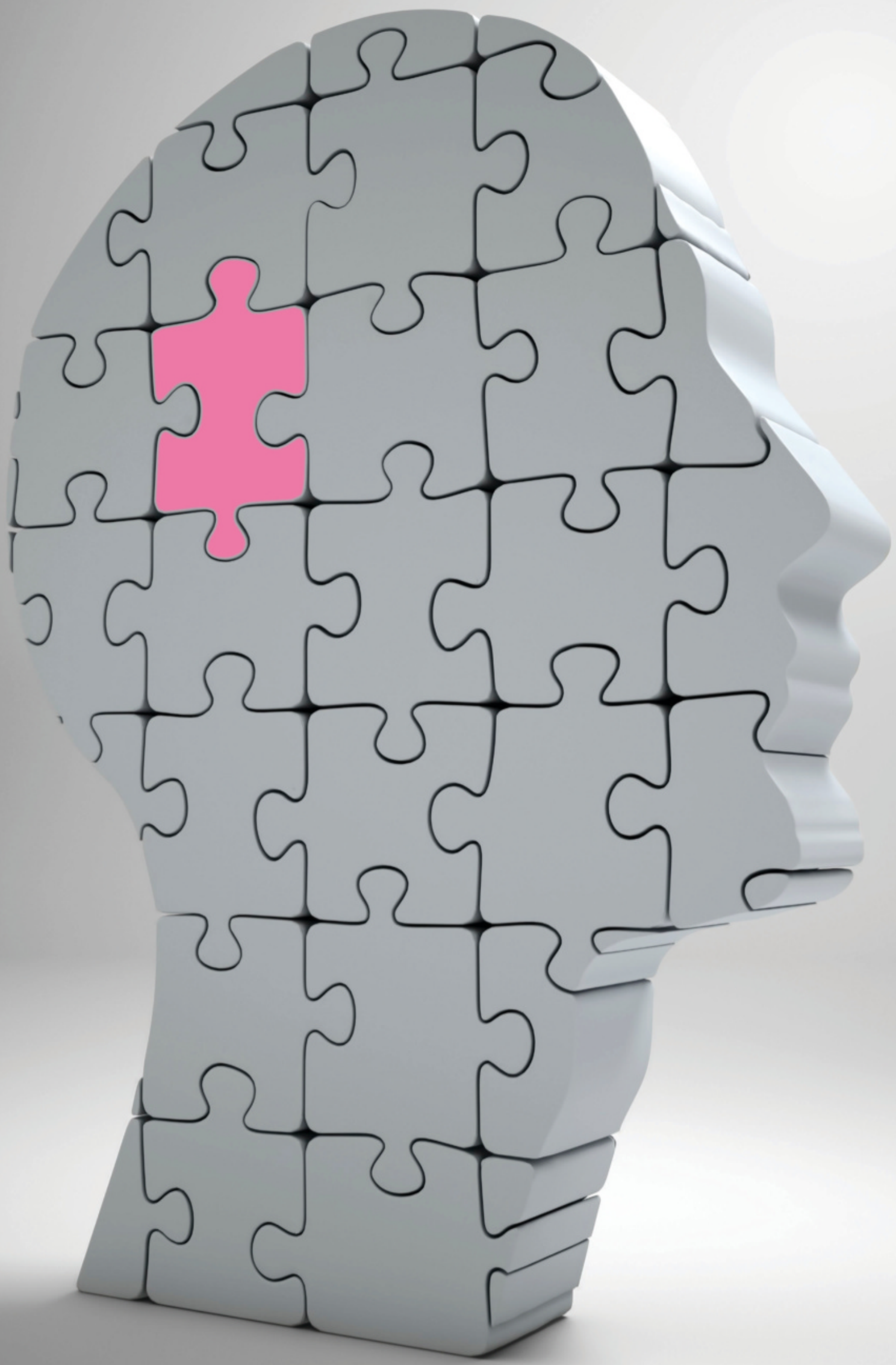
In a 2012 study, she compared more than 430 people who had undergone coronary-bypass surgery, 284 of whom were diagnosed with at least low-level clinical depression and 146 of whom were not. The subjects all took the same optimism survey that the sample group in the other study had. Within eight months after surgery, the depressed pessimists had more than twice the complication and rehospitalization rate of the optimistic group.

"As a doctor, my goal is to help people understand this connection more than they do," Tindle says. "But they need to do so in a way that makes it actionable. In other words, how do we put all these new findings to work?"

That, ultimately, is the critical question. Researchers are divided on how possible it is for people who have made it to middle age cynical or stressed or sedentary to undo all the damage to their systems through outlook change and meditation alone. But the research is piling up that it can help—and it certainly can't hurt.

As with most matters involving health, it boils down in large measure to lifestyle: diet, exercise, adequate sleep and a positive attitude. That's not sexy, but when it comes to longevity, take what works over what makes headlines. The fact is that the aging odometer never runs backward. The 70-year-old will always be 10 years older than the 60-year-old. But if you're talking about how many years both of those people have remaining, put your money on a happy, active 70 over a cynical, sedentary 60.

That, if nothing else, puts a sweet twist on the rule that all lives must end: enjoy the time you've got, and you just might get more of it. ☐



HOW TO GIVE YOUR BRAIN A WORKOUT

WHEN IT COMES TO KEEPING YOUR MIND SHARP, NOT ALL STRATEGIES WORK. HERE'S WHAT DOES

BY JUSTIN WORLAND

MAJID FOTUHI WAKES UP AT 5 A.M. EVERY DAY for boot camp. In the evenings, he and his wife will occasionally hit the dance floor for a tango session. But Fotuhi, a neuroscientist and the author of three books on brain science, doesn't go to boot camp to build his muscles or dance to increase his stamina. Fotuhi's dedication to exercise is part of a larger brain-training regimen designed to keep his brain fit and ward off cognitive decline, he says.

As Americans live longer, they are increasingly looking to scientists like Fotuhi for guidance on how to keep their brains as fit as their bodies while they age. In a sense, research on cognitive decline is on the cutting edge. Researchers have conducted many of the most important studies in the field in just the past 20 years. And while they've made some progress, there are several areas of study where the jury is still out.

Still, effective interventions that measurably improve brain health have emerged from the myriad old wives' tales about how you can keep your brain fit. And in many cases, the answers may run against the grain of traditional wisdom. Indeed, the most-advertised, best-marketed tricks for preventing cognitive decline may be great at making you better at those games, but are they making your mind sharper?

For now, experts say, you should focus on health interventions

that are seemingly unrelated to the brain—exercising frequently, eating healthfully and doing what you can to take the edge off chronic stress. Challenging the brain to learn new things doesn't hurt either.

Marketers have taken advantage of the consternation of America's aging population to sell a variety of products that imply—if not claim outright—that they can slow or stave off cognitive decline. Brain games, a billion-dollar industry, according to neuroscience-market-research firm SharpBrains, represent perhaps the greatest example of this kind of marketing. Which is why you would be forgiven for believing that by regularly visiting a brain-games website or downloading the right app, you'll be fighting the inexorable decline of your mental functions. But existing research suggests that's far from true.

In fact, concrete proof about the benefits of brain games is hard to come by, experts say, when it comes to measurably improving aspects of mental fitness, such as having a good memory or sound reasoning. "People would really love to believe you could do something like this and make your brain better, make your mind better," says Randall W. Engle, the primary investigator at the Attention & Working Memory Lab at the Georgia Institute of Technology. "There's just no solid evidence."

That's not to say brain games are without benefit altogether. Experts say these kinds of mental exercises can change your brain, just not in a way that necessarily slows its aging. The brain changes with just about everything you do, including mental training exercises. But numerous studies have shown that brain games lack what researchers call "transfer." In other words, repeating a game over and over again teaches you how to play the game and get better at it but not necessarily much else.

"It's like, you walk through fresh snow, you leave a trace. If you walk the same route again, the trace gets deeper and deeper," says Ursula Staudinger, a professor of sociomedical sciences and a professor of psychology at the Robert N. Butler Columbia Aging Center at Columbia University. "The fact that structural changes occur [in the brain] does not imply that in general this brain has become more capable. It has become more capable of doing exactly the tasks it was practicing."

Still, the brain-game industry has continued to grow—and the skepticism has grown right along with it. More than 70 prominent brain scientists and psychologists signed a withering statement on the subject in 2014. The open letter, organized by the Stanford Center on Longevity and covered by media outlets around the world, argued that claims on behalf of brain games about improvement in cognition were "frequently exaggerated and at times misleading." The scientists also laid out criteria that the games would have to meet to persuade them of their merit. It's a tough list.

The Mind-Body Connection

BRAIN-GAME PRODUCERS MAY ONE DAY develop effective methods for their users to improve their cognition by playing fun online games, but until then, scientists say, other practices will slow the aging of the brain. In fact, a study in the prestigious *Lancet* journal found that up to half of cases of Alzheimer's disease may be triggered by factors determined by lifestyle: diabetes, high blood pressure and cognitive inactivity, to name a few. But your ability to influence your brain health goes beyond ceasing negative behaviors. There's a whole host of practices associated with improved brain functioning that you can do now.

Most scientists agree that the intervention most clearly proven to slow aging in the brain is aerobic exercise. Working out triggers a whole slew of processes and changes in the brain. Perhaps most obviously, exercise increases the size of the hippocampus, a part of the brain that plays a key role in memory storage. Participants in a highly cited 2011 study experienced 2% growth in the size of their hippocampus after completing a one-year exercise regimen that consisted of 40 minutes daily of aerobic exercises. Control-group participants, whose exercise consisted only of stretching and toning, actually saw the size of their hippocampus shrink by the end of the study.

"We know that physical activity does won-

ders in the brain for really making a burst of new neurons," says Eli Puterman, an assistant professor at the University of California, San Francisco, School of Medicine.

So how much exercise do you need? Puterman bases his research on the relationship between exercise and aging on federal guidelines that say adults need 150 minutes of moderately intense aerobic exercise or 75 minutes of vigorous aerobic exercise each week.

Many of the commonly recognized benefits of working out also improve brain health. Working out helps with obesity, diabetes and heart problems, which are worth addressing in their own right—and which are also risk factors for cognitive decline.

Making the Most of Memory

THE EXACT MECHANISMS BY WHICH STRESS erodes brain functioning remain unclear, though research suggests it's related to the ability of exercise to maintain telomere length, a key factor in aging. Regardless of the mechanism at play, the correlation should be clear. Exercise protects against stress and, consequently, defends the brain from harmful pressures.

Of course, exercise is not the only or even the most direct way to reduce stress and in turn benefit the brain. Fotuhi says that simple things like taking a few moments out of the day to relax can go a long away. "Just try to be happy. Life will go on," he says. "If you're late, it is what it is. Getting stressed over it will not help."

Meditation—another stress reliever—seems to offer benefits similar to those of exercise. Though further research is needed to prove causation, a study from 2015 found that meditators tend to have better-preserved gray matter in the brain, especially the hippocampus, than their counterparts who don't meditate. While emphasizing the preliminary nature of his research, University of California, Los Angeles, doctor Florian Kurth says that meditation may both expand the brain's gray matter and reduce stress along the same lines as exercise.

If you have time left between exercising and meditating and you still want to improve your brain health, you may want to try what the experts call cognitive stimulation. In common parlance, it simply means learning new things and then applying that knowledge in practice.

Taxi drivers in metropolises like London learn the intricacies of the city's geography and traffic patterns and then apply that knowledge in ever-changing circumstances. This actually affects the structure of the drivers' brains, according to a 2000 study, which was conducted before the era of universal GPS. Cabbies' posterior hippocampus, the part of the brain typically associated with spatial memory, grew throughout their career.

"By learning and creating new knowledge, the gray matter got bigger," Kurth explained. He likens this effect to the way that weight training affects muscles. The more you work out, the more a certain region improves. But, as with weights, the gains in brain development can be erased if you don't continue to work that region.

Of course, a job as a taxi driver isn't the only way for employment to provide the kind of stimulation that grows the brain. Learning new things is key. People past the point of formal schooling—which is to say, most of us—might want to try taking up a new language, learning to play an instrument or mastering juggling. Whatever you do, make sure you don't just learn it. Apply it frequently.

Like anything in science, none of these interventions to prevent or slow cognitive decline come with satisfaction guaranteed. Some people certainly defy the trends, and recommendations evolve as research changes. But although scientists and doctors love to say "More research is needed," the existing research does support exercise, meditation and lifelong learning as reliable ways to work your mind.

"People don't realize that memory loss has many treatable components, and if you treat those components, people improve," says Fotuhi. "People need to take responsibility for their brain health the same way they take responsibility for the health of their teeth. These are simple interventions with profound benefits." ◻

WHY DO PRESIDENTS LIVE SO LONG?

BY NANCY GIBBS AND MICHAEL DUFFY

HERE IS A CLASSIC CONUNDRUM of cause and effect: the men who survive the crushing pace (not to mention lethal diet) of multiple U.S. presidential campaigns and go on to hold one of the most stressful jobs in the world also have a habit of outliving the rest of us.

In the fall of 2012, Jimmy Carter took his place in history as the president who had lived the longest after leaving the White House—31 years and 231 days, breaking the record of Herbert Hoover, who died in 1964. It's now more than 38 years since Carter, who's set to turn 95 in October 2019, left office in January 1981. He went back to Georgia and proceeded to teach, improve his Spanish, paint, produce poetry, win the Nobel Peace Prize and write more than 20 books about, among other things, how to find a second career. That's extraordinary. But Carter's longevity is not outlandish for a former president. Ronald Reagan lived until 93. So did Gerald Ford. George H.W. Bush died last year at 94, more than a quarter century since his time in the White House. Granted, the presidential demographic typically enjoys access to better nutrition, health care and living conditions. Yet these men also knew pressure that few of us can imagine, and stress is a proven toxin.

So does the presidency endow people with some special life force, or do they share some quality that helps get them to the White House in the first place? Is there something about holding the office that forces men—and presumably one day women—to live a healthy lifestyle rather than just aspire to it?

For starters, there is constant vigilance. Ignoring troubling symptoms is not an option for someone who has a doctor following him virtually everywhere he goes; medical teams are steps away at all times. Even when presidents return to private life, they are shadowed by Secret Service details, albeit smaller ones. Among those agents, an EMT is always on duty. Think of it as a retirement benefit.

At least since the mid-1970s, nearly every president has been devoted to some kind of exercise. If some of that recreation was done for PR purposes, many presidents come to rely on it for sustenance. The elder Bush, who as president would sometimes engage in three or four different sports in a day, took exercise to extremes and jumped out of airplanes with Army skydivers at ages 80, 85 and 90. "I want people at my age to know they don't have to slow down," he said.

There's body, and then there's mind. We all may know we need to manage our stress, but for a sitting president this is imperative, a consistent part of the advice they give one another. Rest. Take your vacations. Use Camp David. After the hard-fought 1960 election, Richard Nixon and John F. Kennedy met in Key Biscayne, Fla., where Nixon made an unsolicited promise. I may criticize your policies, he told Kennedy, but "of one thing I can assure you: I shall never join in any criticism of you, expressed or implied, for taking time off for relaxation. There is nothing more important than that a president be physically, mentally and emotionally in the

best possible shape to confront the immensely difficult decisions he has to make."

For many presidents, stress acts as a force multiplier. The toll of stress, research has shown, depends on how it's viewed. What is harmful becomes helpful when it is treated as a fact of life or a chance to learn. The more powerful a person is, the more in control, the better the odds he has learned to use stress to his advantage. For people with that kind of resilience—sometimes called adaptive competence—stress can correlate with a longer life.

Out of office, the challenge changes. Presidents tend to be not just type-A but triple-A personalities, people who don't spend a lot of time lounging around checking their Twitter or Facebook feeds. Slowing down isn't something they really want to do. "When I got out of the White House," Carter recalled, "I had a life expectancy of 25 [more] years, and so I needed to figure out how to use it."

Former presidents are particularly well positioned to do good: to engineer an immense humanitarian rescue effort, as Hoover did in the years after World War II, or to promote reform and democracy, as Ford and Carter did as unlikely partners. Bill Clinton launched his Global Initiative, while George W. Bush has focused on veterans. Less than two years removed from office, Barack Obama and former first lady Michelle Obama entered into a multiyear agreement to produce films and series with Netflix under the banner Higher Ground. Engaging in meaningful work also correlates closely with longevity—and modern presidents have typically made it their mission to leverage their fame for causes they believe in. From a psychological standpoint, they settle in for the long haul.

Of course, ex-presidents have something else to keep them going: a need to burnish their reputation for history, particularly if their time in office didn't go exactly as they had planned. Most of us are not quite as likely to have accumulated as many well-known regrets and scars, nor are we in as strong a position to do something about them. Correcting—or whitewashing—the record probably helps keep the former presidents alive a little longer, if only because there is often so much work to be done.

It may even be that unloved presidents have an edge in this area. Few wept when Harry Truman left Washington in 1953, ceding the White House to the wildly popular Dwight Eisenhower. But Truman lived another 19 years, until he was 88, and his reputation improved annually. Even Nixon, who resigned in 1974, lived two more decades, writing books, opening a think tank and driving his successors more or less crazy. Asked once how he had survived all the criticism aimed at him during the Depression, Hoover said simply, "I outlived the bastards."

Recent years have seen not only older ex-presidents but older presidents and hopefuls as well. In 2016 Donald Trump became, at 70, the oldest president ever inaugurated. And the field of 2020 contenders includes Elizabeth Warren, who'll be 71 on Election Day, Joe Biden, who'll be 77, and Bernie Sanders, who'll be 79. ◻

HOW TO LIVE TO BE 100

A SUPER-LONG LIFE WAS ONCE A RARE THING. NOW, AS SCIENCE UNRAVELS THE SECRETS OF CENTENARIANS, THAT'S CHANGING

BY ALICE PARK

Siblings in the national Long Life Family Study

Peggy
The youngest of six, she followed in her long-lived siblings' footsteps

Helen
She still drove in her 80s and volunteered at a local hospital

"DON'T WRITE THAT DOWN! PUT YOUR pencil away!" Agnes Buckley, née Hurlburt, was trying in vain to head off an entertaining story her sisters are telling me about how she used to sneak out of the house as a teenager. (She had a thing for boys with motorcycles.) When their father hid her shoes to keep her at home, Agnes simply bypassed the front door and leaped out the window. "Everyone is going to think I was a troublemaker," she lamented.

Troublemaker or not, Agnes had a lifetime of evidence to prove she'd grown into respectability—a lifetime, that is, that already included a full decade and a half more than the 80 years that a girl born in the U.S. today can expect to live. Agnes was born in 1913—the year that Grand Central Terminal opened in New York and the U.S. Postal Service began delivering packages as well as letters. Two of her 11 brothers and sisters made it into their 90s too. And, as Agnes points out, "none of us [used] canes."

As reported in 2015

Millie
Physically active like the rest of her family, she exercised twice a week for an hour

Peter
He taught himself to play the piano, and he wrote all his children's wedding songs

Agnes
In her 90s, she still made Christmas dinner and baked scones for her brothers in California

Muriel
Always creative, she wrote poetry and sewed quilts for the family

18+

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Walter
He was an avid painter in his 80s and recalled eating fresh-caught fish from the river near his home growing up

James
Also a painter, James developed a relationship with a new girlfriend around age 90, which tickled his children

In fact, the entire Hurlburt family, pictured on the previous pages in a photo shoot from 2010, is a model of long-lived, healthful vigor.

That's what made the family a perfect candidate for the Long Life Family Study (LLFS), an investigation that began over a decade ago into why some families have so many members who live into their 80s, 90s and even 100s. The study, sponsored by the National Institute on Aging, part of the National Institutes of Health, includes investigators from four U.S. research centers and one Danish one. The idea, says Thomas Perls, the principal investigator at the Boston University Medical Center location, is to figure out which genetic, environmental and behavioral factors contribute to longevity.

"When it comes to rare genetic variations that contribute to longevity, family [analysis] is powerful," he says. "But just because something occurs in a family doesn't mean it is necessarily genetic. There are lots of behaviors and traditions that happen in families that play a role in longer life expectancies. We want to use these families to ferret out what these factors are."

There's no denying that longer life expectancy is swelling the number of people over age 65 in the U.S. But it's those over age 85, in particular the centenarians born in the late 1800s, who are of most interest to researchers.

Uncovering the Mysteries

IN THE MOST RECENT CENSUS, HEALTH OFFIcials predicted that by 2050, close to 1 million Americans would be pushing into their second century of life. And if current longevity trends continue, that number will grow. By all accounts, these new centenarians are far from the frail, ailing, housebound people you might expect. In contrast, the majority of them are mentally alert and relatively free of disability and remain active members of their communities. They may simply represent a new model of aging, one that health experts are hoping more of us can emulate, both to make our lives fuller and to ease the inevitable health-care burden that our longer-lived population will impose in coming decades.

Most people today fall prey to chronic diseases that strike in mid- to late life—conditions such as cancer, heart disease, stroke and dementia—and end up nursing disabilities stemming from these illnesses for the remainder of their lives. Centenarians, on the other hand, appear to be remarkably resilient when it comes to shrugging off such ailments; they seem to draw on some reserve that allows them to bounce back from health problems and remain relatively hale until their final days.

Dozens of studies have investigated such individuals, with the goal of picking out the secrets to their salubrious seniority. Those analyses, however, have generally followed two separate, if parallel, tracks.

The traditional approach has been to study the lifestyle and behavioral components of vigorous aging—the good habits, such as a healthy diet, regular physical activity and mental exercises that might keep the elderly vibrant through their golden years. The New England Centenarian Study, which includes 801 people entering their 100s, for example, has identified several behavioral and personality traits that seem to be critical to longevity, including not smoking, being extroverted and easygoing and staying lean.

Separately, biologists and geneticists have pursued the secret to longevity on a cellular or molecular level, first in animals and more recently in people. The goal is to identify genes associated with slowing normal aging and avoiding the chronic illnesses that accompany it.

But with advances in genomic technology that allow scientists to scan thousands of genes from a single sample at a time and then link them to specific functions in the body, researchers on aging can finally begin to knit together their two strands of inquiry.

The result is an intricate tapestry that is starting to reveal exactly how we can best push the limits of life span. These findings could eventually lead to drugs or other compounds that help stretch lives a bit longer. If we can't stay chronologically young, the scientists reason, we can at least live and feel as if we are.

"We are going through a revolution," says David Sinclair, a professor of genetics at Harvard Medical School who has studied aging in animals. "I think we might have our first handle on the molecules that can improve health." Even if we are not endowed with the genes that can

ease us into our 100s, most of us can certainly learn something from families like the Hurlburts, who apparently are.

Lifestyle or Genetics

UNTIL RELATIVELY RECENTLY, THE BEST clues about the factors involved in growing old came not from healthily aging humans but from less sexy species, like yeast. These organisms offered scientists the first hints about how much of aging was due to genes and innate biology and how much was the product of other variables. It was yeast and, later, flies and rodents that provided the first findings about caloric restriction, the intriguing hypothesis that a drastically reduced intake of calories can extend the human life span.

While there is no firm evidence that the same phenomenon occurs in humans, researchers like Leonard Guarente of the Massachusetts Institute of Technology found yeast genes that appear to cause a food-restricted metabolism to use energy more efficiently, burning through caloric inventory at just the right rate to maintain life-sustaining processes and store enough for future use. Sinclair calls these "survival genes." When they're activated, they stabilize DNA and, in the yeast's case, extended survival 30% beyond what is normal. So far, Sinclair and others have identified a dozen similar genes in people. They are hoping to find a way to turn these pathways on without forcing the rest of the body to hunker down in survival mode.

But while genes are certainly an important component of aging, they may not be the most relevant factor, if only because we don't have much control over them. The good news is that, according to animal studies, only 25% to 30% of aging is genetically based, which means that the majority of other variables are in our hands.

Not only can getting such factors under control help slow the aging process before it starts, it can also help those who are in their golden years improve their fitness and strength. Recent studies have shown, for example, that when seniors from ages 65 to 75 exercise with resistance weights, they can improve their scores on cognitive tests of memory and decision-making. Other research, in Germany, found that regular physical activity lowers the

Others in the LLFS

Rosa
She dreamed of traveling the world as a missionary, and at age 106, she continued to read the Bible every day

Otis
He was born in Oklahoma before it became a state, and at age 106 he was still preaching every Sunday

risk of developing cognitive impairment in people over age 55.

The 70%-30% split between environment and genes, however, doesn't apply to everybody. For lucky oldsters like those who qualify for the LLFS study, the reverse seems to be true. Perls has found that in centenarians, it's principally genes that are the secret to extra years. That's not surprising, since these people represent the extreme limit of our species' life expectancy.

But the centenarians' happy accident of birth may benefit the rest of us too, if Perls and his colleagues are successful in their work. Their first goal is to draw a complete map of their subjects' genomes, to figure out what makes their mortality clocks tick so slowly and for so long. "We think centenarians are going to be really powerful when it comes to genetic variations or combinations that are important to living to really old age," says Perls.

The challenge for researchers is to identify those genes that contribute not just to longevity but to healthy longevity in particular. Based on its unique collection of genetic data from the New England Centenarian Study, Perls's team is close to identifying such a suite of genes.

From the evidence gathered so far, it appears that for the most part, people who live to 100 and beyond do not necessarily avoid the chronic diseases of aging that normally claim the rest of us after midlife. About 40% of centenarians have experienced one of these illnesses in their lifetime, but they seem to push through them without long-term problems or complications. And when they do get sick, according to a study Perls conducted in 1996, they are less likely to log time in the intensive-care unit and often require less-expensive care per admission—at least compared with the cardiac surgery, chemotherapy and other ICU procedures that many of their younger elderly counterparts need.

Even as the LLFS investigators look for the full suite of genes behind such resilience, other researchers are focusing on individual areas of the body, particularly the brain. Bruce Yankner of Harvard Medical School is studying what distinguishes brains that make it to 100 with limited cognitive decline from those that succumb to the ravages of Alzheimer's disease or other forms of dementia before age 85.

Yankner zeroed in on genes in the frontal cortex—which is involved in higher learning, planning and goal setting—of people ages 24 to 106. That's a big chronological span, and it netted a big genetic haul: the research identified no fewer than 440 genes that start to slow down after age 40. Using that set as a starting point, Yankner's group is trying to determine just what those genes do to affect individual aging processes.

The virtue of such an approach is that it gives you a look at the entire developmental trajectory of the key genes throughout the adult life span. The disadvantage is that it lacks specificity: you can't ever know which 24-to-80-year-olds will actually make it to 90 and beyond, so you can't be certain from looking at their brains which genes are really at work in extreme old age and which eventually deteriorate. For that reason, Yankner's team—like the LLFS investigators—is also studying the brains of a separate group of people who have already achieved extreme old age. Coming at the data from two different directions could better pinpoint the genes that are truly in play and lead to a reasonable library of targets for deeper research.

"It's a work in progress, but we believe that the expression of genes in the brain and how they are regulated is at least an indicator of how well someone is aging," Yankner says. "It may play a causal role as well."

Indeed, a causal role is precisely what the early results suggest. The key function of the collection of brain genes Yankner has identified is to regulate the connections between neurons—vitally important, since it's healthy connections that keep neurons alive. Among the first ones to go when brain cells start dying are those involved in learning and memory. This may help explain why even the sharpest oldsters are prone to so-called senior moments, a tendency to forget newly learned information or repeat stories or questions, sometimes over and over again. Other genes in the collection have more-precise repair duties, fixing small nicks and mistakes in DNA. Without such maintenance work, normal genetic activities are slowly compromised.

Yet despite his excitement over his genetic findings, Yankner too is adamant that DNA is

Irving and Helen
This brother and sister kept busy and up to date on the news, the markets and even the movies well past age 100

not destiny. Just as you can keep your body fit with good lifestyle habits and by avoiding pollutants, toxins and carcinogens, you may be able to keep your genes healthier. Environmentally triggered alterations in genes—known as epigenetic changes—can affect when a gene is activated, how robustly it is turned on and how it interacts with neighboring genes. Free radicals provide a very good case study of how epigenetic processes play out.

As the brain ages, it weathers a constant onslaught from these destructive oxygen ions. The body is able to patch over tiny dings and cuts in the genome, but over time, the genetic fixers can no longer keep up, and the function of the gene is compromised. The balance between wear and repair may be the key to a healthily aging brain. By scanning the genomes of centenarians, Yankner hopes to isolate the genes—and the biological processes attached to them—that help them stay ahead of the damage. Those might then be harnessed to give noncentenarians the same edge.

That work might also begin to explain the growing body of evidence behind the use-it-or-lose-it hypothesis, which suggests that people can improve their odds of remaining mentally alert by keeping their minds engaged. Learning a new language, picking up a hobby and maintaining a rich network of social connections are all ways to keep brain neurons firing. Yankner and others hope to isolate which brain circuits seem to be most active in this process.

A Different Kind of Youth

IF EVERYONE COULD BEGIN TO MIMIC WHAT the centenarians do naturally, we'd all benefit—as the Hurlburts have vividly illustrated. Agnes was mentally nimble enough as she aged that she learned to drive when she was 63, and she didn't give up her license until she was in her 90s. "I was a very fast driver, but they never caught me," she confessed.

Walter continued to paint into his 80s; Muriel wrote poetry and sewed quilts; her brother, James, also penned poetry; Peter taught himself to play the piano and ice-skate after midlife; Millie routinely burned through half a dozen books every few weeks ("I like exciting books with a lot of action," she said); Helen liked to sew intricate dolls, complete with period costumes; and Peggy, the baby, loved to cook and read. Even when they were watching *Jeopardy!*, says Peter's granddaughter Nicole, they called out the answers—in the form of a question, of course.

If studies are going to determine how such behaviors can influence and strengthen genes, they're going to need a lot of volunteers, and the LLFS, like the New England study, is ready. So far, the trial includes 539 families like the Hurlburts, with 4,953 family members who were at least 79 when they enrolled in 2006, along with many of their children. All of the participants signed on knowing they'd provide in-depth interviews, recount family histories, and provide blood and DNA samples.

"I am interested to see if their influence can carry over to our generation," says Janet Kinnally, 61, who joined the study along with her mother, Helen. "I hope the research leads to things that are helpful for generations to come."

None of this means that centenarian studies will produce a youth pill for the rest of us anytime soon—or ever, despite all the overblown claims made by hawkers of anti-aging compounds such as human growth hormone or resveratrol, an ingredient found in red wine. The goal, at least at first, will be merely to give us back some of what we lose by living a modern—which is to say, overfed, overstressed and underactive—lifestyle. "One misconception of aging research is that we are looking to prevent aging," says Sinclair. "What we are hoping to do is to come up with something that will give us a lifestyle that now only centenarians enjoy."

That's an idea that certainly appeals to the Hurlburts' three dozen children, who like to believe that their parents' genes give them a leg up but aren't taking any chances. "Our lifestyles are more stressful than theirs were," says Maureen Miraglia, 62, one of Agnes's daughters. "But I am trying to change to be more like my mother. Most of my friends are talking about retiring, but I look at my mother, and I'm looking forward to my next decade and trying to figure out what I want to do." As studies of the longest-lived among us continue to reveal more secrets to living well into old age, we can hope that's a happy dilemma that more of us will have. ◻

IT'S NEVER TOO LATE

THE TERM "LATE BLOOMER" HAS A kind of pitiful ring to it, and it's no wonder: we live in a world obsessed with youth and fascinated by child prodigies. From Mozart to Bobby Fischer, preternatural talent is revered and celebrated—always has been, always will be. But there is something special about people who do things on a different timeline, with the experience and wisdom and chutzpah that come with age. With experience and a few more years under their belt, here are people who prove it's never too late to change course and make your mark.

ELLEN DEGENERES
The actress and comedian married for the first time

RONALD REAGAN
The actor left the screen for public office, as California governor

RAYMOND CHANDLER
His classic *The Big Sleep* was also his first

HELEN MIRREN
The British actress won her first Academy Award, for her role in *The Queen*

JULIA CHILD
The beloved chef moved to Paris and began learning how to cook

TONI MORRISON
She was a professor and single mom when her first novel came out

ANG LEE
The Taiwanese director released his first English film, *Sense and Sensibility*

MARK TWAIN
The author wrote his best-loved book, *Huckleberry Finn*

PHYLLIS DILLER
The comedian got a late start to the stand-up-comedy stage

GEORGE FOREMAN
Became world heavyweight champion—for the second time

COLONEL SANDERS
After working odd jobs, he opened the first KFC franchise

LAURA INGALLS WILDER

Published her first book in the famed *Little House* series

FRANK MCCOURT

Published his first book, *Angela's Ashes,* which won a Pulitzer

LOUISE BOURGEOIS

At 71, the French artist gained fame late in her long career

JOAN DIDION

The award-winning author landed a modeling gig for the high-end brand Céline

MILLARD KAUFMAN

The Mr. Magoo co-creator wrote his first novel, *Bowl of Cherries*

HARRY BERNSTEIN

Catapulted to fame with the publication of his memoir

70 80 90 100

ALEXANDER FLEMING

He won the Nobel Prize for his earlier discovery of penicillin

GRANDMA MOSES

This celebrated artist swapped crochet needles for paintbrushes

HELEN HOOVER SANTMYER

The teacher and librarian's 1,388-page novel became a huge best seller

MOTHER TERESA

After decades of missionary work, she won the Nobel Peace Prize

FRED STOBAUGH

Wrote his first song, "Oh Sweet Lorraine," which hit No. 42

FAUJA SINGH

The Indian-born man was the first 100-year-old to complete a marathon


Lite

chapter three

There are surely a few reasons people who dwell on sun-kissed islands, subsisting on fresh fruit and locally grown vegetables, tend to live so much longer than the rest of us. But as the science mounts, one thing has come into focus: you really don't need to become a snowbird or stow away to the other side of the earth in order to extract health benefits from the place you live. In fact, research shows that the healthiest place for people over 65 is wherever they've spent most of their adult lives. That's because geography (and genetics) only means so much. Your social ties, how you make use of what's on offer in your neighborhood and even your budget all have an impact as well.

THE BEST PLACES FOR AGING WELL

YES, IT CAN BE COLD. BUT WITH STIMULATING ACTIVITIES AND A ROBUST WEB OF SOCIAL SUPPORT, THE TWIN CITIES TOP OUR LIST OF THE BEST PLACES FOR OLDER ADULTS

BY DAVE BEAL

Frozen wonderland
The City of Lakes Loppet Ski Festival brings thousands out for winter activities amid luminaries made of ice.

FOR OVERALL WELL-BEING
MINNEAPOLIS–ST. PAUL, MINN.

IT'S AN ANNUAL RITE OF SUMMER FOR WOMEN OF A CERtain age in the Twin Cities area. Wearing fire-engine-red T-shirts emblazoned with the motto "Aging but Dangerous," up to 100 brave souls between the ages of 50 and 80-plus leap from planes over the cornfields of western Wisconsin, 40 miles east of St. Paul. Flying tandem with professional jumpers, they descend euphorically in free fall for the better part of a minute before brightly colored parachutes pop open to slow them to a gentle touchdown. That's when elated friends and relatives rush over to hand them a celebratory martini.

"The hardest part is getting out of that airplane," says Jean Ketcham, 75, who has four sky jumps under her belt, including one with her father when he was 91 and one with the celebrated polar explorer and local hero Ann Bancroft. "I've had more fun in my 70s than I've ever had in my life," says Ketcham, who was in the fab-

Taking a leap Jean Ketcham, Ann Bancroft, Donna Chicone and C. Suzanne Bates celebrate after a skydiving event. Opposite: Aging but Dangerous participant Mary Sue Palazzari soars with a pro.

As reported in 2015

THE BEST PLACES TO LIVE . . .

This is no ordinary listing of retirement towns. Believe it or not, a little hustle and bustle is good for older folks. According to the think tank the Milken Institute, cities big and small are the ideal places to grow old, thanks to the availability of transportation, health care and community engagement. Because everyone's needs are different, we broke down Milken's "Best Cities for Successful Aging" report to show some great spots for the 65-and-over crowd to settle in based on personal preferences.

FOR THE MEDICINE CONNOISSEUR

IOWA CITY, IOWA

Iowa City offers easy access to some of the nation's best medical treatment. According to the Milken report, its strong standing in health care among all small cities helps make it an enticing spot to call home for older residents. Iowa City also has invested heavily in building up its specialized care offerings, like Alzheimer's disease care, geriatric facilities and hospices. Health-care expenses are affordable, and there are plenty of primary-care physicians available.

ric and clothing trades before retiring and co-founding Aging but Dangerous with longtime friend C. Suzanne Bates. The group is dedicated to "inspiring, empowering and challenging women over 50," says Bates. In addition to the annual Martini Jump Skydive, which raises money for a local shelter for battered women, the group has staged fashion shows, target practice and even a colonoscopy party (not its most popular event) for older women.

The Aging but Dangerous events are a colorful indicator of what makes the Minneapolis–St. Paul area an unusually good place to grow older. With 3.4 million people, it is home to 3 out of 5 Minnesotans and functions as the hub for the state's robust networks serving older people. There is a substantial amount of evidence to suggest that this web of support has been effective. In 2014, the United Health Foundation ranked Minnesota as the healthiest state for seniors. The previous year, the American College of Sports Medicine rated the Twin Cities area as the healthiest, fittest metropolitan area in the nation for the third straight

year. The latest comparison by the U.S. Centers for Disease Control and Prevention found that the life expectancy of Minnesotans at birth is 79.3 years, placing the state second only to Hawaii. And in 2013, Minnesota led the nation for overall quality of health care, according to the U.S. Agency for Healthcare Research and Quality.

The Theater of the Seasons

HOW CAN THESE NUMBERS BE SO GOOD IN A PLACE WHERE THE climate gets so harsh? The winter of 2013–14 was one of the 10 coldest since record-keeping began in 1873, with 50 days of below-zero temperatures. Even less brutal winters have persuaded many Minnesota retirees to spend the icy months as snowbirds in places like Naples, Fla., and Sun City, Ariz., or to resettle in the Sun Belt. But far greater numbers of retirees stick with Minnesota's kaleidoscopic "theater of the seasons."

Joyce Solberg remembers how her father tried numerous times

Warm glow The Twin Cities don't come to a halt for winter. Rice Park alights during the St. Paul Winter Carnival.

FOR THE MONEY-SMART
SIOUX FALLS, S.D.

For those who like to save, Sioux Falls should top the list. Over the past several years, the city has seen significant income growth. The city is a leader in infrastructure and medical services for senior citizens. Sioux Falls also has some of the lowest inpatient medical costs in the country and very short emergency-room wait times. The city says it's preparing for its growing elderly population, but housing costs are on the higher end for a small metro.

FOR REAL-ESTATE BUFFS
TOLEDO, OHIO

Toledo ranked high in Milken's list for having a lot of housing options for the elderly beyond independent living. There's a wide range of specialized-care housing facilities, from nursing homes to continuing-care centers. Housing and rental prices are also low, and thanks to overall affordable living costs, residents can get more bang for their buck.

FOR SOCIAL BUTTERFLIES

OMAHA, NEB.

According to the authors of the Milken report, Omaha has lots of fitness centers and recreational activities and a volunteer-oriented senior population. The city has a vibrant arts, entertainment and recreation scene that caters to the elderly, and it has put significant funding into these programs. The area is also known for its public libraries, where older men and women can partake in a variety of activities with like-minded individuals. The greater Omaha area has a low unemployment rate, and many older adults are able to find jobs.

to persuade her and her husband, Pete, to relocate to Arizona, as he had, but they never gave the idea serious consideration. The Solbergs, who both retired a few years ago in their mid-60s—Joyce from her job as an elementary-school technology director and Pete from an accounting management position—didn't want to leave friends and family, their cabin in northern Minnesota or the Galilee Lutheran Church, where they have been members for 42 years. "I like the quality of life," says Joyce, and that includes the intellectual stimulation of a big city. Pete, in fact, is pursuing a history degree at the University of Minnesota, where, thanks to a senior discount, his tuition costs him less than the parking. They even enjoy what Joyce calls the "challenge of winter," saying, "The more the snow, the more I like it."

The downtowns of both Minneapolis and St. Paul feature extensive, weatherproof skyway systems that tie into a growing array of housing plus parking ramps, restaurants, hotels, offices, and civic and cultural venues. Winter events such as the St. Paul Winter Carnival and the City of Lakes Loppet Ski Festival in Minneapolis draw large crowds. Hockey is hugely popular. In a salute to the changing seasons, four massive embroideries, executed by local stitchers and based on designs by the late Pauline Baynes—illustrator of books by J.R.R. Tolkien and C.S. Lewis—embellish the walls of the Plymouth Congregational Church near downtown Minneapolis. And whatever the weather, getting in and out of the Twin Cities is generally no problem. The MSP International Airport has won the Balchen/Post Award for snow and ice control at a major North American commercial airport more often than any of its peers.

And perhaps because of the massive influence of the University of Minnesota (a.k.a. "the U"), this is a place that takes lifelong learning as seriously as it takes winter readiness.

Food for the Aging Brain

NEARLY 160 SENIORS SHOW UP FOR J.B. ANDERSON'S 15TH LECture on Franklin D. Roosevelt's time in the White House, part of Anderson's multiyear course The Presidents, offered by the Osher Lifelong Learning Institute, known as OLLI. Most arrive early to partake of a spread of fresh strawberries, granola, doughnuts, cookies, Hershey's Kisses and Danish pastries.

Anderson, a clergyman, educator, curator and writer, engages the class with a rapid-fire flow of graphics, anecdotes and revisionist history. He allows questioners to interrupt his presentation, sometimes drawing them into humorous exchanges. "I think, Linda, that your father-in-law fought in the Spanish Civil War," he says as he heads into an explanation of fascism and communism. "My ex-father-in-law," she replies with a smile. Anderson plans four more lectures on Roosevelt, and then it's on to the Truman presidency. "William Henry Harrison didn't get a full session," he explains. "He was president for just 30 days." After each 90-minute class, Anderson invites any and all comers to continue

Classic Philip Brunelle conducting the Vocal-Essence Chorus and orchestra

FOR WELLNESS JUNKIES

BRIDGEPORT-STAMFORD-NORWALK, CONN.

This metro area is a haven for people seeking a healthy lifestyle. The region has very low rates of obesity, chronic disease and diabetes. It's also artistic and has a wide range of cultural services. Those who enjoy the outdoors will appreciate the close proximity to the Long Island Sound, and nearby parks offer year-round wooded walking trails. Many of the residents are well-educated, and it's considered a safe area to live if you can put up with the high cost of living.

FOR CULTURE MAVENS

NEW YORK, N.Y.

The city that never sleeps is also one of the most accommodating for older people. Not only does it have one of the best transportation systems in the world, it's also home to some of the world's most celebrated museums, theaters, parks and libraries. The city makes it easy for people of all ages to get around by providing low-cost transportation. And because it's such a dense city, restaurants, pharmacies, groceries and entertainment are often within walking distance.

the discussion over a Dutch-treat lunch at one of the many nearby restaurants.

The Presidents is the most popular course offered by OLLI—a national organization that focuses on education for people over age 55—in the Twin Cities, where it has a particularly active chapter that's affiliated with the university. Roughly 300 courses are offered, ranging from Thinking About Capitalism to Ethnic Dining. Anyone can take up to seven courses a year for an annual fee of $210. OLLI administrators have also organized 37 special-interest groups, including a *New Yorker* magazine discussion group; another focused on Norwegian fjords, folklore and food; and one on kayaking and canoeing.

Across town, 82,000 seniors have enrolled in classes offered by the Selim Center for Learning in Later Years at the University of St. Thomas, paying just $80 per course. Days after Anderson's spring class began, Nick Hayes, who holds a chair in critical thinking at St. John's University, began his spring opus: A Century of Total War, 1914–2014. Hayes once drew more than 700 seniors to a class, and 100 had to be turned away for lack of space. Seniors can also audit the school's undergraduate courses.

The elderly of the Twin Cities need not look far to find high-profile exemplars of enduring mental and physical vigor. There's former *Prairie Home Companion* host Garrison Keillor, still performing at 72; Bancroft, who at 59 still leads expeditions; her fellow explorer Will Steger, 70; music conductor Philip Brunelle, 71; and long-distance bicyclist Dan Buettner, 55, who has become a leading voice on healthy aging and longevity.

Brunelle has led both the nationally known VocalEssence Chorus and the choir at the Plymouth Congregational Church since 1969. He notes that music is often an important part of the lives of older people and says most local churches meet that need with thriving choirs. He runs three miles every day to keep in shape and jokes that he intends to keep conducting until he's 95. "Singing keeps you young," he says.

Buettner, born and raised in the Twin Cities, is the author of the best-selling 2008 book *The Blue Zone: Lessons for Living Longer from the People Who Have Lived the Longest*. It explores four places in the world, which he labels Blue Zones, where people live exceptionally long lives: Sardinia, Italy; Okinawa, Japan; Nicoya, Costa Rica; and Loma Linda, Calif. Researchers at the University of Minnesota's School of Public Health helped Buettner develop the Vitality Compass, an online tool that uses epidemiological data to measure how much behavioral changes will boost longevity. Buettner says more than a million people have taken the Compass survey, which his firm, Blue Zones LLC, promotes with its partners AARP and National Geographic. While the Twin Cities area is not one of the world's Blue Zones, Buettner says it is an excellent place to grow old. In contrast to cultures that emphasize youth, he says, "in Minnesota it is easy to live in your own skin and pursue work that is meaningful to you."

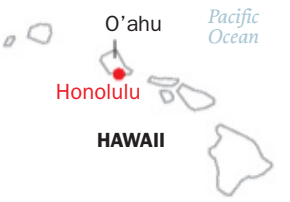
Finding Purpose

A CONTINUING SENSE OF PURPOSE, FEELING VALUED AND SUPported by your community, remaining physically active and doing meaningful work (paid or unpaid) well into old age—these are some of the qualities that Buettner found in his Blue Zones, and they are largely present for older citizens of the Twin Cities. Staying active is made easier by the area's superb parks; Minneapolis ranked No. 1 in the nation in the 2014 ParkScore ratings by the Trust for Public Land. Staying involved in some kind of work is not difficult either, given the strong local economy. The Twin Cities area, buttressed by a vibrant and diverse corporate sector, ended 2014 with the lowest unemployment rate among the nation's 49 largest metro areas: 3.3%. This means that many older workers can find the part-time, flexible or contract work they often prefer, says Chris Farrell, who covers the economy for the radio show *Marketplace*, which is produced by St. Paul–based American Public Media. "If you're 65, that's great."

Volunteerism is another way to find purpose and meaning. According to the U.S. Census Bureau, in 2010–12 the Minneapolis–St. Paul area led the nation's 25 largest metro areas with volunteer rates of 36.5% for residents 65 and older and 40.3% for those 46–64. As is usually the case across the U.S., a good deal of this is through churches, but the region boasts unusual additional resources for older volunteers. The Vital Aging Network, a nonprofit founded in 2001 by former Minneapolis deputy mayor Jan Hively, among others, focuses on developing leadership among older adults. One of its efforts is an initiative called Evolve, led by former 3M executive Mark Skeie, which has trained 260 enrollees older than 50 to be civic leaders.

Cathy Desutter, 56, is one of them. She had been working part time as assistant controller for her family's business. When the company decided to turn the job into a full-time position, she opted instead for a new career as a volunteer community leader. For her project at Evolve, she created a plan to help the Lakeville Resource Center Food Shelf buy and install commercial refrigeration units so it could provide a consistent supply of fresh and perishable foods to its needy clients. Desutter has fond memories of helping an elderly Russian immigrant do her grocery shopping. "Her eyes lit up when she saw all the fruits and vegetables and greens—spinach, lettuce. I got the biggest hugs from her." Desutter went on to become active in Second Harvest Heartland, the Upper Midwest's largest food-relief organization, chairing a $600,000 fundraising effort for its annual gala. Today she divides her 25-hour-a-week volunteer work evenly between food-relief activity and her local community college. "It's the best job ever," she says of her volunteering.

The region is teeming with activity at religious organizations and at midsize and smaller nonprofits as well. Lutheran and Catholic social-service organizations offer endless opportunities for volunteers and have long provided many services for seniors, helping to lessen the isolation that can lead to depression among older people.



FOR PROUD WORKAHOLICS

HONOLULU, HAWAII

Hawaii may be low in manufacturing, but its economy is high in leisure services. That's a perk for older adults who want to keep working. The tourist destination provides plenty of employment opportunities, and the city has a very low unemployment rate. Older adults may need job retraining if they want to return to the workforce, and Honolulu has plenty of programs at its universities and nearby community colleges that can offer career-related education.

FOR ETERNAL STUDENTS

MADISON, WIS.

Home to the University of Wisconsin, Madison, the city provides older residents with access to excellent continuing-education opportunities. Thanks to the university, the city is growing economically, and individuals who want to take classes or enroll in programs can get a high-quality education. The city also boasts numerous recreational options for seniors as well as community engagement. For those seeking more intellectual invigoration, there are plenty of libraries and museums.

A History of Health Leadership

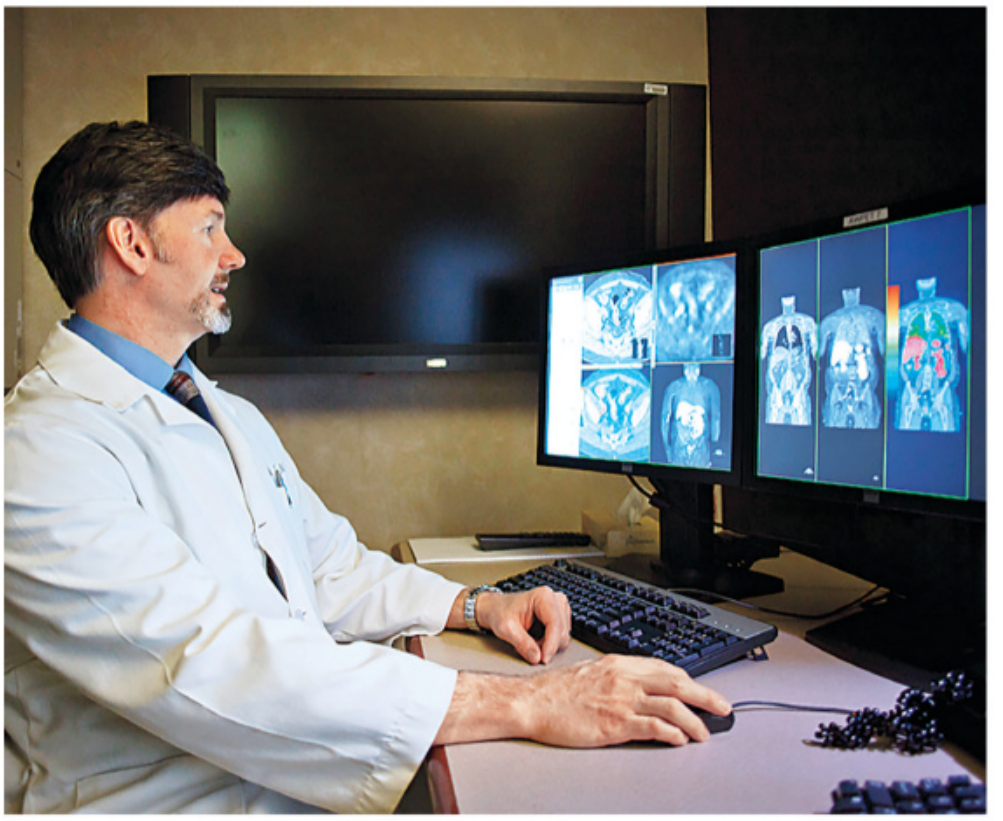
IT'S IMPOSSIBLE TO TALK ABOUT HEALTHY AGING IN THE TWIN Cities without citing one of the region's greatest assets: the Mayo Clinic, just 90 miles south in Rochester and arguably the nation's best medical center. Certainly no other institution can match its 2014–15 ranking by *U.S. News & World Report* as among the top three U.S. hospitals in 12 different specialty areas, including cardiology, oncology and geriatrics. According to Mayo, most medical insurance plans in Minnesota provide in-network coverage at the clinic—a huge advantage for state residents. Residents also benefit from research collaborations between clinicians at Mayo and investigators at the University of Minnesota, through the Minnesota Partnership for Biotechnology and Medical Genomics, to confront a wide variety of diseases that strike the elderly.

The Twin Cities are also the birthplace of managed care, which puts an emphasis on disease prevention, cost containment and coordinated care; these become increasingly important with advancing age. While the practice of managed care arrived first on the West Coast, the term "health maintenance organization," or "HMO," was coined by the University of Minnesota pediatric neurologist Paul Ellwood Jr. in 1970. Ellwood's advocacy of HMOs at Interstudy, his Twin Cities health-policy think tank, helped lead to the Health Maintenance Organization Act of 1973, an early step toward making health care more accessible for everyone.

Government safety nets are another important part of the support structure for older people, and they are an area where Minnesota shines. The state tops the AARP/Commonwealth Fund/Scan Foundation's 2014 report card on long-term services and support for older Americans. "We have a rich series of benefit programs," says Jean Wood, director of the quasi-independent Minnesota Board on Aging. She cites two Minnesota programs aimed at needy seniors who may not qualify for Medicaid: the Living at Home/Block Nurse and Faith in Action initiatives, both of which pair older people with volunteers who help with chores and transportation. Families dealing with dementia benefit from the broad array of online resources offered by ACT on Alzheimer's, which leads a Twin Cities–based private-public partnership of nearly 70 organizations.

Of course, even in the Twin Cities there is room for improvement. Farrell of *Marketplace* cites the need for more investment in the public-transportation system that serves the sprawling Twin Cities region. As baby boomers age and drive less or not at all, they and their caregivers will need more transit options. Another problem is that the demand for chore and companion services is exceeding the supply, at least for now.

Chances are these shortcomings will be addressed by government officials, corporate leaders and ever-ready volunteers of the Twin Cities. Because in the end, this is a community that believes in investing in the common good. It's a value that, like so many Minnesotans, has its roots in Scandinavia—another great



First-rate care Oncology is one of the areas in which Mayo leads.

The Mayo Clinic, 90 miles south of the Twin Cities, is arguably the nation's best medical center, with top ratings in 12 areas of medicine. Most Minnesota health plans cover diagnosis and treatment there.

place to grow old if you can stomach the weather. In his 2011 award-winning book *American Nations*, Colin Woodard described Minnesota as a western outpost of "Yankeedom," one of the 11 geocultural regions he defines in the book. "From the outset, it was a culture that put great emphasis on education, local political control and the pursuit of the 'greater good' of the community, even if it required individual self-control," he wrote. The state's early leaders sought to build a more perfect society through social engineering, citizen involvement, education and faith in government. That's still true today, says John Adams, a retired University of Minnesota geographer who has written extensively about the Twin Cities, and it explains a lot about the enduring well-being of its older citizens. "Around here," says Adams, "we take care of one another." □

Beal, a freelance journalist based in the Twin Cities, was a longtime business editor and columnist for the St. Paul Pioneer Press.

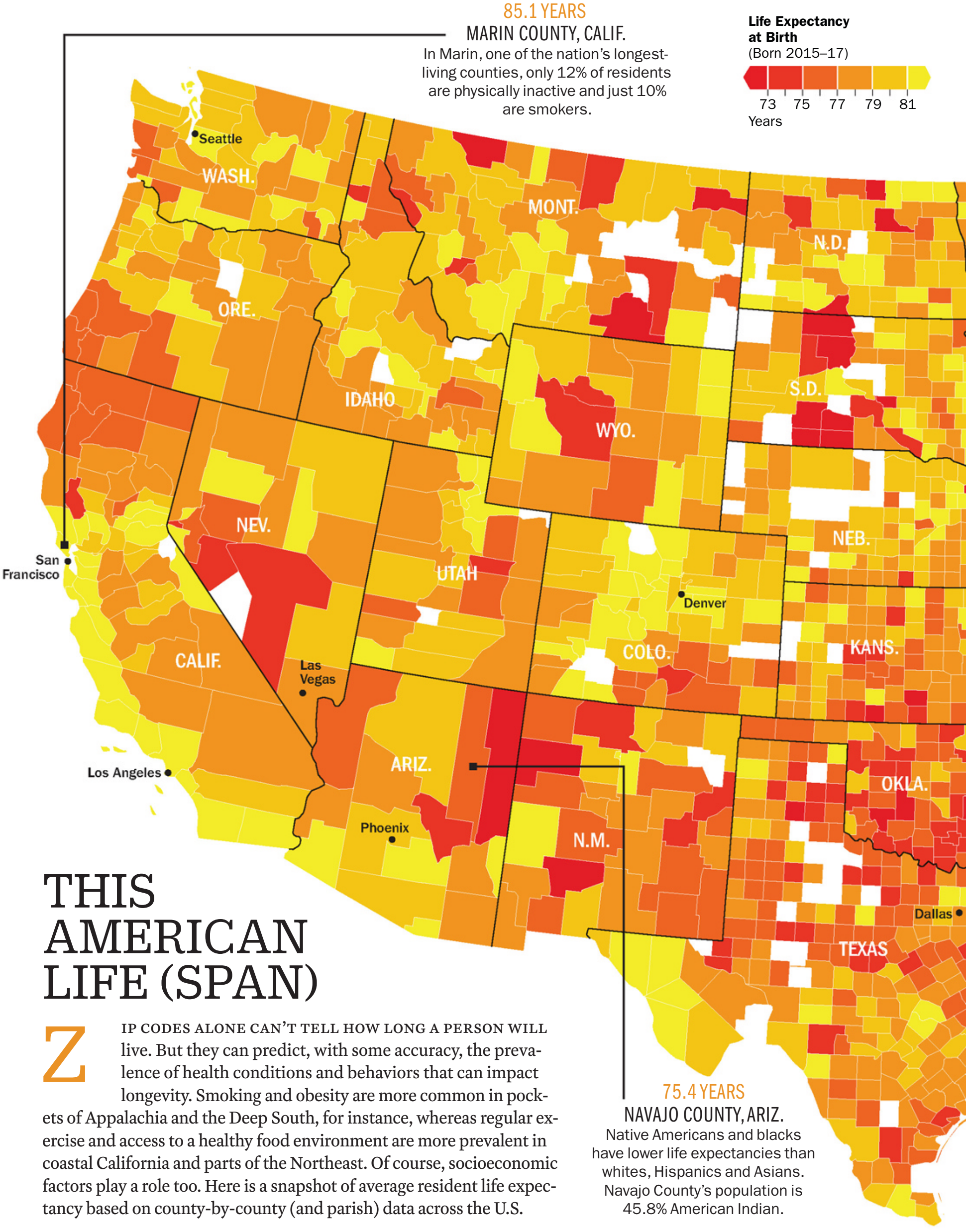
FOR OUTDOORS LOVERS

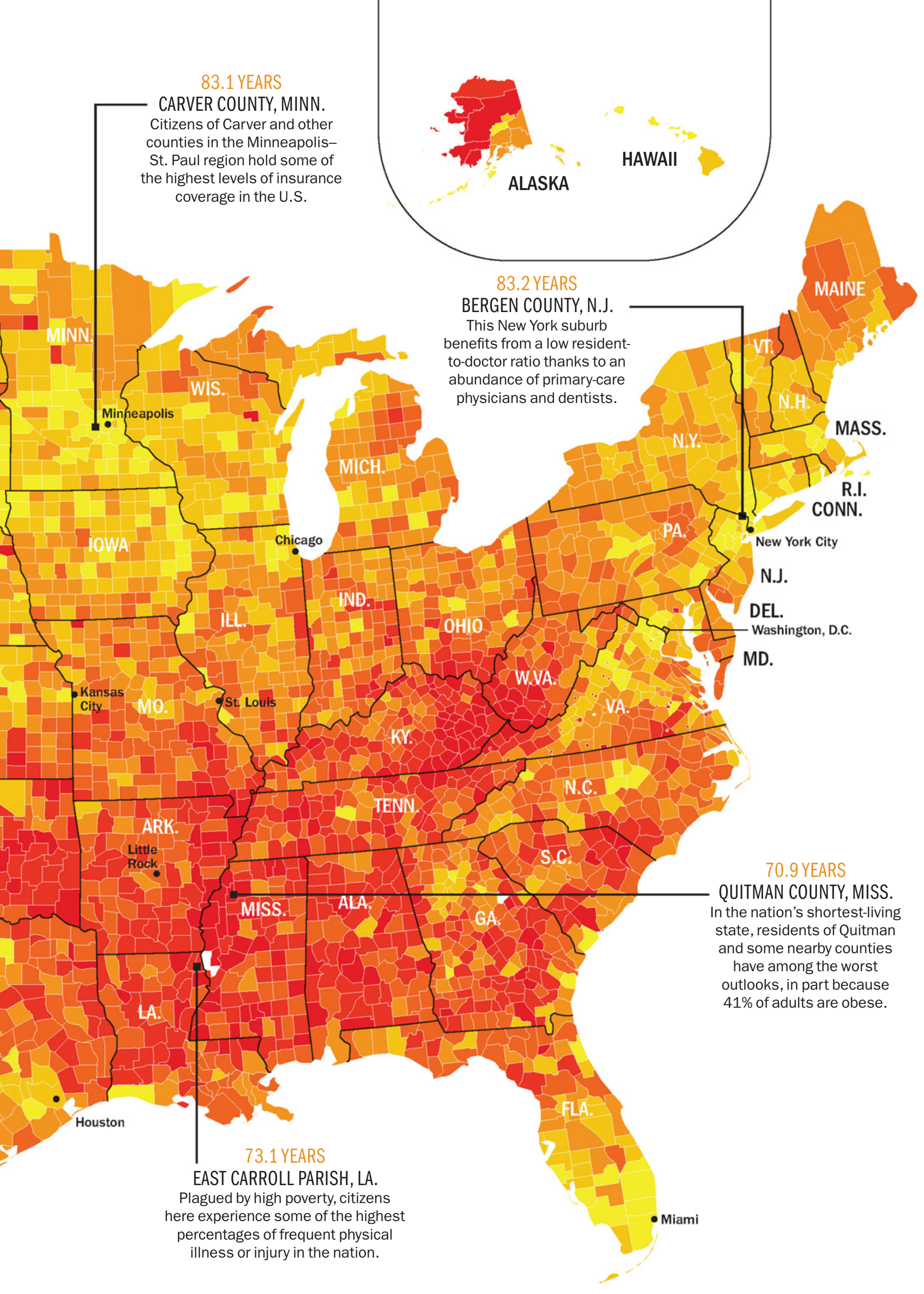
MISSOULA, MONT.

The city is surrounded by mountain ranges and seven wilderness areas, and it sits at the confluence of three rivers. Missoula promotes outdoor activity and has lower rates of obesity and diabetes than many other counties in Montana. In addition to close-by hiking and bike trails, the city has some of the best bird-watching opportunities, with common sightings of bald eagles, woodpeckers, blue herons and osprey. It's easy to get to state parks like Yellowstone or Glacier National Park for a weekend trip.

THIS AMERICAN LIFE (SPAN)

ZIP CODES ALONE CAN'T TELL HOW LONG A PERSON WILL live. But they can predict, with some accuracy, the prevalence of health conditions and behaviors that can impact longevity. Smoking and obesity are more common in pockets of Appalachia and the Deep South, for instance, whereas regular exercise and access to a healthy food environment are more prevalent in coastal California and parts of the Northeast. Of course, socioeconomic factors play a role too. Here is a snapshot of average resident life expectancy based on county-by-county (and parish) data across the U.S.





83.1 YEARS

CARVER COUNTY, MINN.

Citizens of Carver and other counties in the Minneapolis–St. Paul region hold some of the highest levels of insurance coverage in the U.S.

83.2 YEARS

BERGEN COUNTY, N.J.

This New York suburb benefits from a low resident-to-doctor ratio thanks to an abundance of primary-care physicians and dentists.

70.9 YEARS

QUITMAN COUNTY, MISS.

In the nation's shortest-living state, residents of Quitman and some nearby counties have among the worst outlooks, in part because 41% of adults are obese.

73.1 YEARS

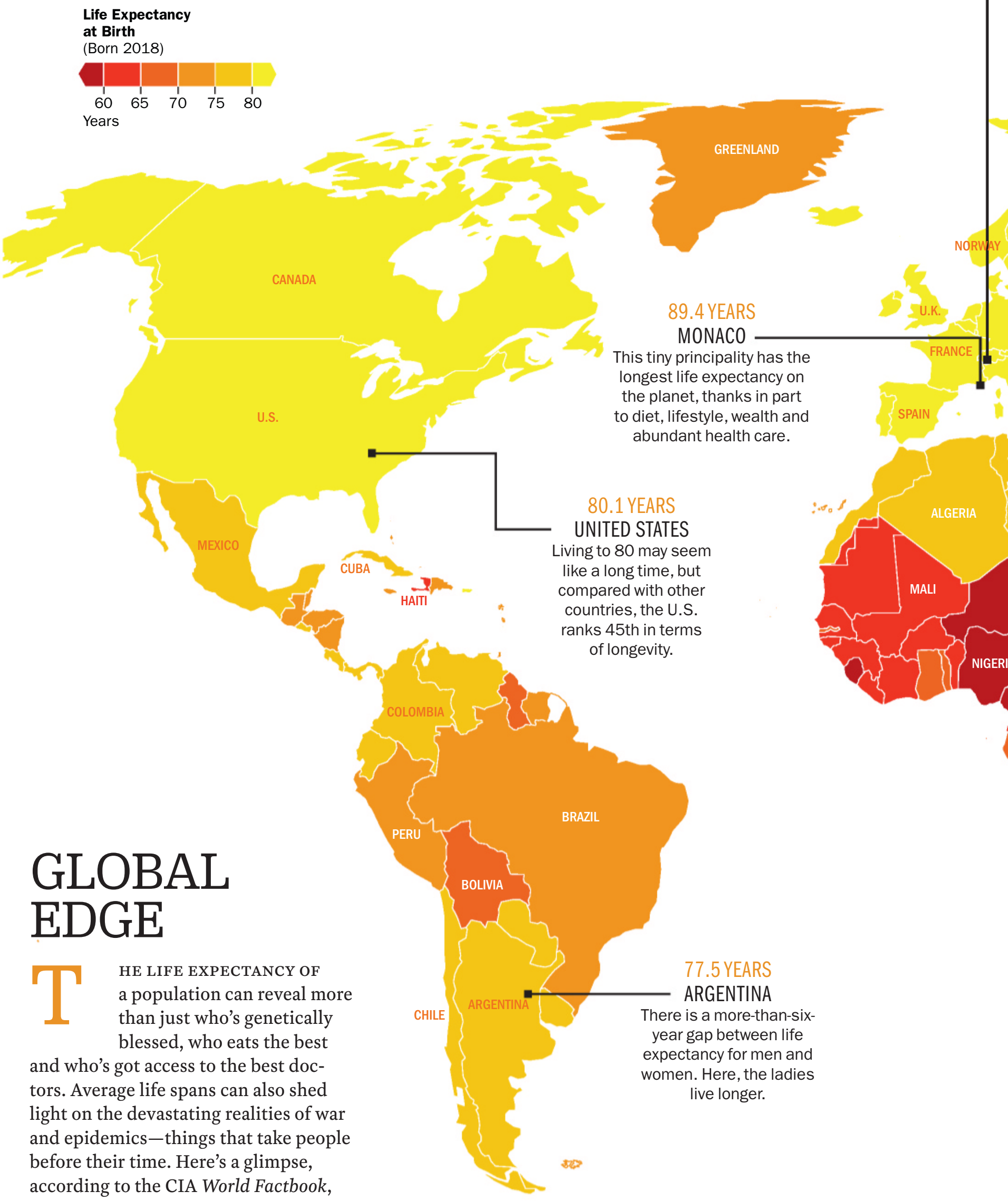
EAST CARROLL PARISH, LA.

Plagued by high poverty, citizens here experience some of the highest percentages of frequent physical illness or injury in the nation.

NOTES: Some counties are missing data due to low population counts.
SOURCE: The University of Wisconsin Population Health Institute

GLOBAL EDGE

THE LIFE EXPECTANCY OF a population can reveal more than just who's genetically blessed, who eats the best and who's got access to the best doctors. Average life spans can also shed light on the devastating realities of war and epidemics—things that take people before their time. Here's a glimpse, according to the CIA *World Factbook*, of how different countries stack up.



82.7 YEARS

SWITZERLAND

A good economy, low obesity rates and excellent health care contribute to its being one of the oldest-living European countries.

52.1 YEARS

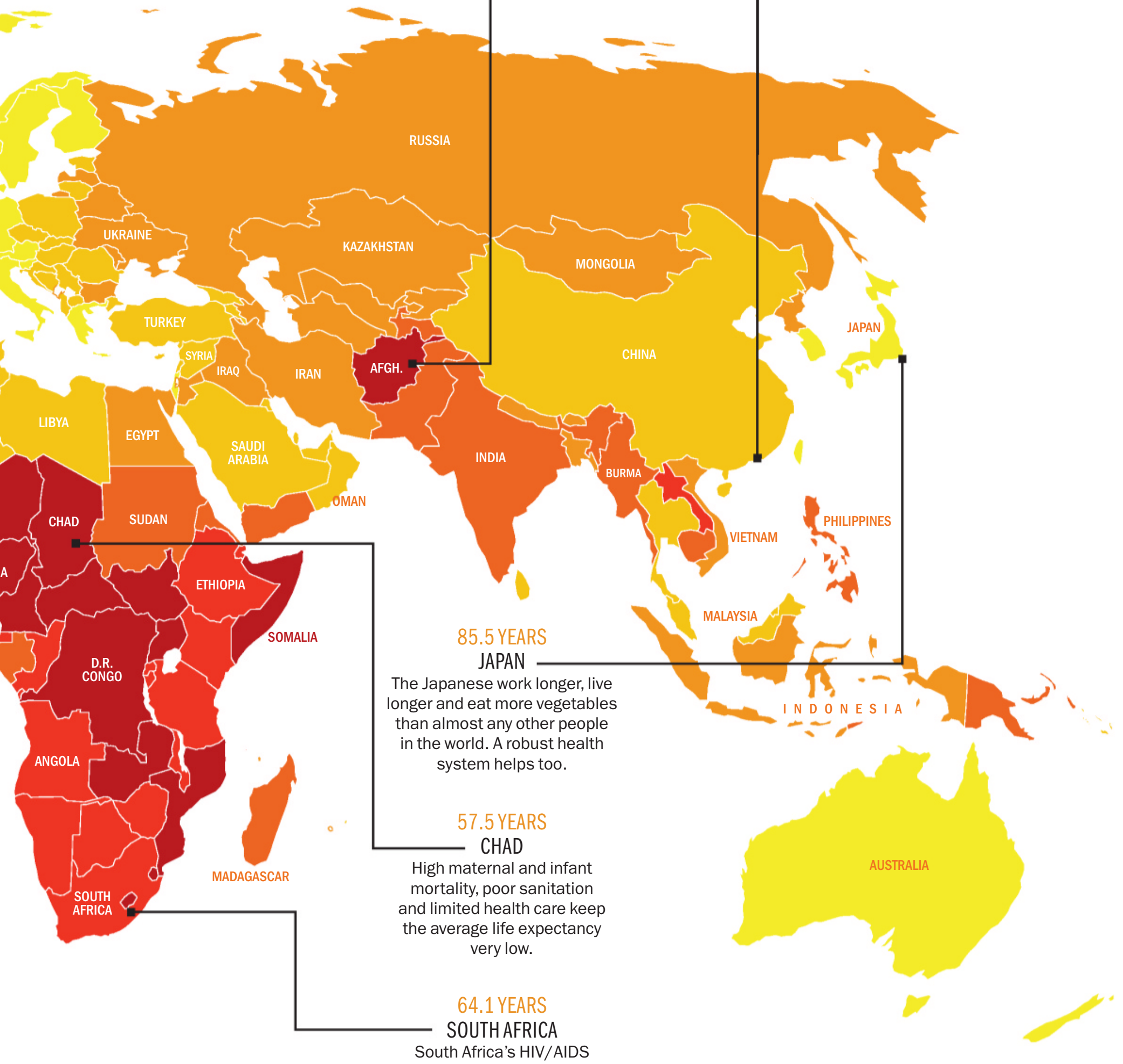
AFGHANISTAN

Afghanistan has the lowest life expectancy in the world. Ongoing war and instability in the region are factors.

83.1 YEARS

HONG KONG

Life expectancy in Hong Kong has increased dramatically in recent decades, thanks in part to modern health care, lifestyle and diet.



85.5 YEARS

JAPAN

The Japanese work longer, live longer and eat more vegetables than almost any other people in the world. A robust health system helps too.

57.5 YEARS

CHAD

High maternal and infant mortality, poor sanitation and limited health care keep the average life expectancy very low.

64.1 YEARS

SOUTH AFRICA

South Africa's HIV/AIDS epidemic in part accounts for its short life expectancy.

SOURCES: CIA *World Factbook*; The World Bank

DO MARRIED PEOPLE LIVE LONGER?

SORTING OUT WHAT LOVE'S GOT TO DO WITH LONGEVITY– FOR MEN AND FOR WOMEN

BY ALEXANDRA SIFFERLIN

These photographs first appeared in *The Lovers*, a book by Lauren Fleishman that documents couples who have been together for more than half a century.

Joseph and Dorothy Bolotin
Married on June 16, 1938

THE SHORT ANSWER: MARRIED PEOple do, in fact, outlive singletons—but there are still plenty of caveats.

"Marriage, if you stay married, is wonderful social support," says Peter Martin, a professor of human development and family studies at Iowa State University. Having a partner during middle age, when chronic diseases often first appear, is protective against premature death, according to a 2013 study that Martin and his co-authors published in *Annals of Behavioral Medicine*. They also found that people who never married were more than twice as likely to die early as people in stable marriages. "Being married is a big factor in survivorship," Martin concluded.

Martin's team isn't the first to make the connection between marriage and longer life. One study of 15,330 cardiac events showed that married people have considerably better prognoses than singles. Other research indicates that married people are more likely to have their cancer detected early and less likely to die early from it.

Longevity researchers believe it's tied to the live-in support. When you have someone around all the time, it means you have someone to remind you to take your meds and go to the doctor. And if you fall down or otherwise hurt yourself, there's a good chance there will be someone around to help you. Married people are also more likely to adopt healthy behaviors like exercising and quitting smoking if their partner does. Martin, who interviews centenarians, says he's heard many of them say they abide by healthy behaviors that their long-deceased spouse used to remind them about. "Some of the marriage benefits seem to outlast the partner who doesn't make it to very old age," he says.

The so-called marriage effect doesn't appear to benefit men and women equally, however. The Terman Life-Cycle Study—an ongoing project that started following more than 1,500 people in 1921—found that whereas steadily married men were likely to live substantially longer than divorced or remarried men, divorced women lived almost as long as their married peers.

"Women who thrived in a good marriage stayed especially healthy," explains Howard S. Friedman, a professor of psychology at the University of California, Riverside, and the author of *The Longevity Project,* which breaks down and

Matts and Britta Mattson
Married on
May 15, 1959

continues to build on the Terman research. "But women who stayed single, got and stayed divorced, or were widowed often lived quite long without the burdens of husband trouble. They had good friends instead." (Research shows that whether people are married or not, strong social connections and friendship are especially important factors in healthy aging.)

Researchers are also learning that the quality of the marriage might matter—a lot. The husband-and-wife research duo Janice Kiecolt-Glaser and the late Ronald Glaser, who died in April 2019, conducted a number of experiments at Ohio State University on the topic. In one, they brought couples into their lab, inserted IV blood-collection catheters and then asked them to talk through an especially troublesome aspect of their marriage—things like finances, sex or in-laws. They found that couples who are hostile toward each other tend to have more stress hormones in their blood, less-adaptive immune systems and slower metabolic rates after eating high-fat meals. "The way people treat each other on a daily basis clearly impacts physical health," says Kiecolt-Glaser. Poor marital quality and associated stress are linked to differences in inflammation, a marker for disease, she adds. "That's a great pathway to all the nastiness that comes with aging." One 2019 study expanded on the extent of this benefit, showing that among participants 50 and over, those who had a happy spouse at the beginning of the study were 13% less likely to pass away over the next eight years than participants who had less-happy partners.

Even the best-case scenario of a long, happy marriage can come with a sad, if darkly romantic, twist: couples who die in old age within days or months of each other. America mourned in 2018 when President George H.W. Bush died just eight months after Barbara, his wife of 73 years. Their deaths were hardly surprising—Bush was 94 and Barbara was 92—but something colloquially called "broken-heart syndrome" could also be at play. Though the mechanism is not fully understood, experts suggest that the trauma of sudden widowhood can lead to a tsunami of stress hormones that causes the heart to temporarily expand, limiting its ability to pump. Still, that's a risk most couples are willing to take for a satisfying relationship—and a longer life. ◻

Fortunato and Maddalena Corso
Married on
Feb. 4, 1941

Jake and Mary Jacobs
Married on
April 27, 1948

Lucien and Fernande Einaudi
Married on April 9, 1959

Aldo de'Spagnolis and Maria Filiozzi
Married on Oct. 23, 1949

Dick Dehn and Gary Payne Together since Sept. 2, 1957

Albert McKay and Delsa Erickson
Married on April 9, 1951

Richard and Julianne Gunter
Married on Sept. 11, 1961

PAYING FOR A LONG LIFE

HERE ARE THE TIME-TESTED STRATEGIES THAT WILL KEEP YOU LIQUID AS LONG AS YOU LIVE

BY MATT VELLA

WHEN THE ROMAN STOIC SENECA TURNED HIS attention to the problem of human evanescence in a letter that became *On the Shortness of Life* around the turn of the first millennium, he chided his contemporaries for making poor use of their time. His famed conclusion: "Life, if well lived, is long enough." In our age, the old sage's advice may hold firm, but the truth is that life, no matter how it's lived, is getting longer for many people—and it's getting expensive too.

Consider recent data from the Society of Actuaries. For a couple who are at age 65 today, there's a 50% chance that one will reach at least age 92. As Joe Coughlin, the director of the MIT AgeLab, told *Money* magazine in 2014, "We've pushed out the longevity calendar from close to 50 years in 1900 to close to 100 today." And that longer life is likely to be more active: researchers at the University of Massachusetts Medical School found that older Americans are showing fewer signs of impairment while performing everyday tasks and displaying more energy than previous generations.

These happy facts are not without their downsides. Chief among them is a sense of panic—and the scrambling that ensues—at the very notion of retirement. Golden years are turning into golden decades, bringing with them significant financial challenges. Financial planners, who had once advised building a nest egg large enough to last 30 years, now routinely advise clients to think about 35 to 40 years. In a presentation, Laura L. Carstensen, the head of the Stanford Center on Longevity, put the conundrum this way: "Most people can't save enough in 40 years of working to support themselves for 30 or more years of not working. Nor can society provide enough in terms of pensions to support nonworking people that long."

To afford a longer life, Americans are going to have to rethink how they save and spend. For most people, this will also require adjusting their expectations about what happens after 65. Gathered here are strategies from TIME and *Money* to begin doing just that. If current trends persist, future generations of Stoics are likely to spend their time composing missives not about what to do with one's life but how to finance it all.

1. RETHINK THE WAY YOU SAVE

THE MOST OBVIOUS KEY TO A LONGER retirement is to save more while you can. For people still early in their careers, this option is not particularly daunting. Slowly ramping up 401(k) and IRA contributions is a natural part of the savings equation. Older workers who are getting closer to retirement but still have time to turbocharge their savings—taking on freelance work, for instance, or not spending bonuses—should also pad their nest eggs as much as possible while they can.

For those close to retirement and who are already saving as much as possible, some adjusting in spending and investment mix are in order. That will allow you to capitalize on the extra years of compounding portfolio growth that a longer life span allows.

Before you can begin altering your existing plans, though, you have to have an estimate of how long you'll live. Online calculators can give you a rough idea based on your lifestyle, your health history and other factors. The idea of doing this may sound discouraging—even a little sinister—but many people find they're surprised by the results. And many calculators can help you pinpoint factors or behaviors that will ultimately help you lead a healthier, longer life.

Once you have a decent projection for your life span, you can reasonably determine the number of years you are likely to spend in retirement. That information is crucial in guiding future decisions about how to invest your savings, when to take Social Security (many people are deferring longer) and what you can spend from savings annually. Clearly, padding out your results with as much extra as you can will lead to better results down the line.

Next, you want to pace yourself. Once you have an estimate for life expectancy, you can surmise how much you can withdraw from your portfolio. *Money*'s rule of thumb: You

can comfortably pull out 4% of your balance in year one of retirement, then adjust the amount for inflation in later years if you expect to live an additional 25 years. For your money to last 30 years, that "safe" rate drops to 3.4%, and to 3% to make it 35 years.

You also want to simplify your strategy. Never mind the science that shows that memory lapses and mild cognitive decline are inevitable in a long life; it's just one more thing to worry about. To make things easier, consolidate your accounts at a single brokerage. That will make it much easier to keep track of your cash, whether you're the one balancing the books or someone else is doing it for you. Keeping your assets with one brokerage will also boost your total balance, which may qualify you for lower fees.

So-called longevity annuities kick in after a decade and a half or two decades, depending on which you choose. They're akin to insurance for old age. Rates and payouts vary, but a 60-year-old woman investing $100,000 could receive about $24,000 in annual payouts starting at age 80, for example. But make sure that the annuity is backed by an insurance company rated A or better by A.M. Best or AA or higher by Standard & Poor's.

2. WORK LONGER

LIFE FOR OLDER WORKERS IS GETting better. The unemployment rate for those over age 55 is now about 2.7%, compared with 3.6% for the total population. The number of long-term unemployed, which rose dramatically during the recession, is coming down. Age-discrimination filed charges have fallen for the past two years. And as the economy continues to grow, companies are increasingly trying to retain older workers. Twenty years ago, less than a third of people ages 55 and over were employed or looking for work, according to the St. Louis Federal Reserve. Today the share is about 40%.

Many workers over 50 have started contemplating working into their 70s to be able to finance a longer retirement. Companies are trying to accommodate them. The global bank Barclays offers an apprenticeship program that includes looking at candidates past age 50, considering workers from unrelated fields and requiring only practical experience. The bank figures that individuals with more life experience may better relate to customers.

Other firms have made similar moves. Goldman Sachs started a "returnship" program in the throes of the recession, a highly selective eight-week retraining exercise, with competitive pay. The nonprofit Encore.org offers older workers a fellowship of six months to one year, typically in a professional capacity at another nonprofit, to help them re-enter the job market. (It's a temporary arrangement that pays $20,000 to $25,000.)

And more than 1,200 employers have signed the Employer Pledge Program, a national initiative created by the AARP committed to creating age-inclusive environments. Companies from various backgrounds, including Ace Hardware, Brooks Brothers, MGM Resorts International, National Institutes of Health, Nestlé, PayPal, Scripps Health, Vanderbilt University, and Yellowstone National Park Lodges pledge to recruit all applicants across diverse age groups on an equal basis.

3. PLAN AHEAD FOR HEALTH CARE

THE COST OF HEALTH CARE IN RETIREMENT has been rising at twice the rate of inflation, and it will reach more than $318,000 in out-of-pocket expenses per retiree over a 30-year stretch, research shows. The fear factor is most acute among the affluent, because they have more to lose. Some 60% of individuals with assets greater than $5 million name health-care costs as their top retirement concern, compared with 35% of those with less than $250,000 in investable assets. Those findings come from a health and retirement report from Bank of America Merrill Lynch and aging consultants Age Wave.

Overall, 41% of those age 50-plus name health-care costs as their top financial concern; 29% say it's outliving their money; and just 11% cite Social Security cuts.

Putting in the effort to do the right things now will make your retirement easier to pay for. Max out your 401(k), invest in lower-cost funds, diversify and keep your debt low, and it will all add up to more income later, experts conclude.

Preventive self-care can go a long way in staving off illness. That means doing all the things you know you should be doing: working out regularly, eating a balanced diet heavy in plant-based foods and staying up to date on your physician visits. These moves will result in better health, a longer life and more time in retirement, which you will have to find a way to finance. If you know you have high fixed medical costs—if you have a chronic condition that needs to be managed, for example, or a disability of some kind—you'll need to be conservative with your spending.

You can also consider fixed annuities. They can, for a lump sum, guarantee a lifelong payout. But since today's low interest rates mean payouts are small, experts suggest buying in chunks over time.

4. CONSIDER GETTING A SIDE GIG

ROUGHLY EVERY DECADE OR SO, THE term "the new economy" comes to mean something different. These days, the moniker is likely to be synonymous with what is called the "sharing economy" or "1099 economy." Whatever you choose to call it, a raft of technology companies like Airbnb and beyond have made it much simpler to pick up a part-time career, either to supplement your main income or to help finance your lifestyle during retirement.

It's easy to underestimate how much companies like these are poised to change the definition of traditional work—but that would be a mistake. In 2008 the concept of building a business out of letting strangers stay in your house was so preposterous that Airbnb was rejected by almost every venture capitalist it pitched itself to. Now an average of 2 million people use it every night worldwide, and the company is valued at about $38 billion. Ten-year-old Uber, which gets people to operate as cabdrivers using their own vehicles, is valued at around $82.4 billion. But recent scandals, including claims of sexual harassment and driver misconduct, may have tarnished the brand. Still, there are at least 10,000 companies in the sharing economy, allowing people to run their own limo services, hotels, restaurants, kennels, bridal-dress-lending shops and equipment-rental services, and all of them need workers, increasing the options available for mostly unskilled work.

The key to this shift has largely been the discovery that while we distrust strangers, we trust people—significantly more than we trust corporations or governments. Many sharing-company founders have one thing in common: they worked at eBay and, in bits and pieces, re-created that company's trust and safety division. Rather than rely on insurance and background checks, its inno-

vation was getting both the provider and the user to rate each other, usually with one to five stars. That eliminates the few bad actors who make everyone too nervous to deal with strangers. And that also means new opportunities to generate additional income that are well worth considering. **Here are three with a low barrier to entry that you might consider:**

Lyft

What Is It? Uber's rival Lyft, which allows individuals to share rides with one another, is a little easier to set up for the average person. After a brief training, drivers use the company's app to find passengers, guide them to their destination and handle payment.
How Much? Lyft says its drivers can make up to an average of $30 per hour, not including expenses. However, a 2018 poll from Ridester found drivers averaging $17.50 per hour.
Drawbacks? Lyft is not as widespread as Uber; check its website to see if it is available in your location.

Airbnb

What Is It? Allows users to rent out rooms or their entire homes on a short-term basis.
How Much? Renters can set their own rates, most of which are based on the size of the property, number of beds, amenities and the local market. The site takes a 3% host service fee to cover the cost of processing bookings and insurance.
Drawbacks? The site has run into legality issues in certain cities like San Francisco and New York.

TaskRabbit

What Is It? An online marketplace that lets users outsource small jobs and tasks in their neighborhood. A good option for someone looking to make use of short bursts of their free time.
How Much? Tasks range from a few dollars up. The company says that Taskers make an average of $35 per hour, and they set their own rates.
Drawbacks? Available jobs are highly dependent on your local market. ◻

YOUR LIVING-LONGER TOOLBOX

Some resources to plan for and live out your longer retirement more comfortably

BOOKS

Unretirement
By Chris Farrell
Farrell argues that we are on the verge of a massive positive transformation of our economy.

The 5 Years Before You Retire
By Emily Guy Birken
A comprehensive guide to making sure your retirement plan is as solid as possible.

Get What's Yours
By Laurence J. Kotlikoff, Philip Moeller and Paul Solman
Promises (and delivers) secrets to maxing out your Social Security.

ONLINE

livingto100.com
Will help you calculate an estimated life span depending on your health history and lifestyle.

kaiserhealthnews.org
A stellar national health-policy news service, an independent program of the Henry J. Kaiser Family Foundation.

money.com
Covering every aspect of personal finance and retirement—of every variety.

ADVICE FROM GURUS

THESE ANTI-AGING EXPERTS DON'T JUST STUDY THE FACTS. THEY PUT THEM INTO PRACTICE, TOO

"I TAKE RESVERATROL, ALPHA LIPOIC ACID AND FISH OIL, EXERCISE TO EXHAUSTION ONCE A WEEK AND SKIP DESSERT. I HAVEN'T GAINED MORE THAN A FEW POUNDS IN 30 YEARS. I LIVE EVERY DAY LIKE IT'S MY LAST AND DID MORE THAN I EXPECTED TO IN TWO LIFETIMES."

David Sinclair, geneticist at Harvard Medical School ***Age: 45***

"MY LOW-PROTEIN DIET IS ALMOST COMPLETELY PLANT- AND FISH-BASED. I HAVE ONLY ONE MAJOR MEAL A DAY: DINNER."

Valter Longo, director of the USC Longevity Institute
Age: 47

"Oddly enough, I don't think much about chronological age. I do think a lot about physical and psychological health. I keep my priorities clear. Exercise and persistently trying to solve big problems is what keeps people sharp and makes life satisfying."

Laura L. Carstensen, director of the Stanford Center on Longevity
Age: 61

"I DON'T GET STRESSED ABOUT COMBATING AGE, WHICH LEADS ME TO TAKE CARE OF MYSELF NATURALLY, WITHOUT AN AGENDA. I LIKE TO PLAY TENNIS AND TAKE WALKS BECAUSE IT'S FUN TO DO SO. WHEN WE NURTURE OUR MINDS, WE'RE TAKING CARE OF OUR BODIES."

Ellen Langer, professor of psychology at Harvard University ***Age: 68***

"I don't have a great relationship with relaxation. Exercise is one way I relieve stress. I find nothing more satisfying than going to bed at night and being so physically tired I can hardly lift my arms or my legs. If I died in a climbing accident at the age of 90, that would be perfect."

Steven Austad, researcher on aging at the University of Alabama at Birmingham ***Age: 68***

"I AM AN AVID READER, ATTEND LOTS OF PLAYS AND CONCERTS, AND JOG SEVERAL TIMES A WEEK. I DEVELOP COGNITIVE INTERVENTIONS FOR OLDER ADULTS, WHICH HELPS ME AS MUCH AS I HOPE IT HELPS THEM. I HAVE NO PLANS FOR RETIREMENT ANYTIME SOON."

George Rebok, cognitive-aging researcher at Johns Hopkins Bloomberg School of Public Health ***Age: 65***

As reported in 2015

TIME

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ABOUT THE ARTIST
The intricate and whimsical work of Russian-born artist Yulia Brodskaya graces the chapter openers in this book. Using the centuries-old art form of quilling, Yulia spent more than 70 hours creating the pieces using only two simple materials: paper and glue.

Credits

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THE CENTENARIANS

AN ISLAND PAYS TRIBUTE TO THE CONTRIBUTIONS OF ITS OLDEST AND WISEST WITH A COMMEMORATIVE STAMP COLLECTION AND A CELEBRATION OF LONGEVITY

BY EMILY JOSHU

On the island of Barbados, reaching the impressive age of 100 is a badge of honor—or, in this case, a stamp. To celebrate the people attaining this feat, in 2016 the Barbados Postal Service created commemorative stamps for centenarians, semi-supercentenarians (those who are 105 to 109 years old) and supercentenarians (those who are at least 110 years old—which reportedly only 1 in 1,000 centenarians achieves). The people of Barbados believe that these citizens' longevity has brought recognition to the island. The "Centenarians of Barbados" collection featured 20 stamps and a souvenir sheet with seven super- and semi-supercentenarians. According to the Barbados National Committee on Ageing, 114 Barbadians fell into these categories in 2016; only 11 were men.

Making the Most of Your Years

Here are ways to keep your body, mind and life in top shape, helping you live not just longer but better.