Adapted from Milken's new book
Faster Cures: Accelerating the Future of Health

The Best is Yet to Come

***Michael Milken** says an astonishing medical revolution is just getting started.*

One lesson from fifty years of philanthropic work is that simply writing checks rarely achieves lasting change. There's nothing wrong with giving money to good causes. We've done it extensively. Such charitable giving, however, is not enough to change underlying processes, whether in education, medical research or any other field.

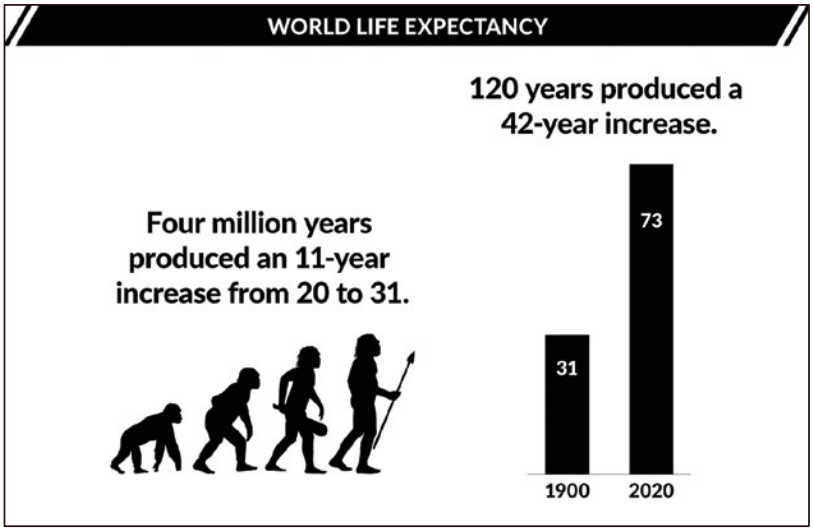
After two previous decades of supporting health programs, my colleagues and I set out in the early 1990s to build a more effective and efficient model for medical science. It involved more than spending money. Our purpose was to create a new template for basic, translational and clinical research that others, including government and industry, could follow. A first step was to recruit top scientists and physicians to research careers and remove bureaucratic roadblocks that impeded their efforts. We helped instill a culture of greater collaboration and stressed the importance of acting with a sense of urgency.

Why health and medical research?

The new book, *Faster Cures: Accelerating the Future of Health* (HarperCollins, 2023), discusses this process. It focuses on health and medical research because:

- Health affects everyone on the planet.
- We all learned crucial lessons from the Covid pandemic, which stimulated development of new strategies. Now it's time to build on those strategies and accelerate research so we're better

More than 2,200 research programs have received our support.



prepared next time. We can't afford to slow down.

- The future of bioscience is incredibly promising. For the first time in history, we can discover cures faster than the historical trend suggests and realistically aspire to eliminate much of the burden of serious disease.

Science as we know it, especially medicine, evolved only over the past two centuries and the *rate* of change is accelerating. As recently as the 19th century, people suffered through gruesome surgeries without anesthesia, childbirth without antiseptic procedures and all manner of intractable infections. Fortunately, medicine has advanced from that dark past to the prospect of a bright future that will transform society in the years ahead.

When faced with dire predictions of rampant disease during the last 100 years, science responded with such advances as polio vaccines, effective public health campaigns, statins, antiretroviral therapy cocktails, precision nutrition, genome sequencing, immunotherapies, monoclonal antibodies, mRNA vaccines, non-invasive surgeries, powerful new diagnostic scans, artificial intelligence, and CRISPR gene editing.

The greatest achievement

These breakthroughs contributed to the 20th and 21st centuries' worldwide extension of life spans and improvements in quality of life— the greatest achievement in the history of civilization. Consider how far we've come. Our earliest pre-human ancestors survived for about 20 years. Millions of years later, people throughout the world still lived an average of only 31 years, although by 1900 it was 47 in the United States. Of course, that average was reduced by the prevalence of infant mortality, especially in poverty-stricken developing nations. Still, it's surprising that in the entire development of our species up until 1900, the *average* increased only 11 years.

One hundred years later—the blink of an eye in evolutionary terms—life spans on earth had more than doubled to 67. Today they're nearly 74 worldwide.

At the beginning of the 20th century, one of every five newborns in America died before celebrating a fifth birthday. The leading causes of death were pneumonia, tuberculosis, and enteritis with diarrhea—all infectious. Thanks largely to progress in sanitation and the development of vaccines and antibiotics, those diseases are now far less common.

There's also a remarkable economic benefit. In real, inflation-adjusted terms, the per-capita productivity of advanced economies is eight times that of the 19th-century average. The late British economic historian, Angus Maddison, calculated that half of all economic growth over the past 200 years is directly linked to progress in medical research and public health.

Unfortunately, these benefits are not evenly distributed. Those of us in the wealthier nations live years, often decades, longer than the average African, Latin American or South Asian. And in the developed world, serious health inequities persist.

Changing the process

My focus on research grew when several members of my family faced serious health issues. A major inflection point was 1976, the year my wife Lori and I thought our oldest son might die. (Fortunately, he recovered and now he and his wife have five children of their own.) Later that year, I learned that my father's cancer had spread without hope of any effective treatment.

Reflecting on the years before and after 1976, it's clear that *annus horribilis* was the fulcrum of my life. I'd achieved substantial success in my financial career and was just starting on the quest to advance medical solutions. After 1976, the search for faster cures became as important as my work in finance. It started with a few diseases—melanoma, breast cancer, epilepsy—and then, when we'd created the template, to all potentially fatal conditions.

Becoming a patient

In 1982, the first in a series of our private foundations began making grants to support innovations in education and health. By the time I was diagnosed with cancer in 1993, it was clear we needed to be more proactive because government support of research on all diseases wasn't producing rapid progress.

We launched the organization that became *FasterCures* as a separate public charity. (At first, it was called CaP CURE.) We established 17 strategies and sometimes began collecting data even before it was clear how the data could be used most effectively. These strategies came together and were remixed at our annual Scientific Retreats. New therapies began to emerge—successful therapies that saved lives. However, it would take a greater national commitment to accelerate this progress.

Between 1993 and 1998, we worked to build a public consensus for more government support. The 1995 National Cancer Summit, the 1996 expansion of the Defense Department's cancer research programs, and the 1997 FDA Modernization Act were important steps toward that goal. Then, in 1998, hundreds of patient organizations and half a million people came to the National Mall and medical centers around the country in a massive demonstration to demand greater government support of medical research. This March on Washington was a turning point. Within a month, President Clinton signed the first of several bills that eventually doubled the National Institutes of Health budget.

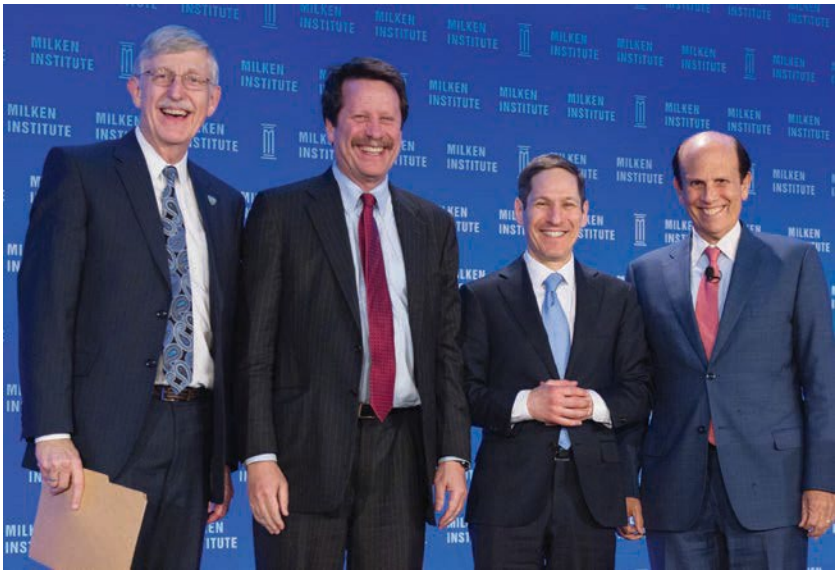
FasterCures

Several years later, we planned another expansion of our healthcare efforts and needed headquarters operations on both coasts. With offices in Washington, DC, we could more effectively contribute to the national discussion of health issues than one operating only from our California base. We renamed the part of CaP CURE focused on prostate cancer as the Prostate Cancer

Vice President Al Gore addressed the 1998 March on Washington.

Foundation and assigned people working on all diseases to a new organization—*FasterCures*.

We had always shared our work with other research and advocacy organizations. This process was formalized under the TRAIN program—The Research Acceleration and Innovation Network—in 2005. TRAIN is an affinity network of disease-specific foundations that share best practices and take an entrepreneurial approach. They reject the old "spray-and-pray" method of funding medical science. As disruptive philanthropists who insist on results and accountability, they're actively involved at every stage.



NIH Director Francis Collins, FDA Commissioner Robert Califf and CDC Director Tom Frieden joined me at a FasterCures Future of Health Summit.

A three-part strategy

Meanwhile, technology was advancing rapidly. Francis Collins, who announced completion of the human genome's first draft, was one of many medical and scientific leaders who helped us develop a three-part strategy designed to bring the benefits of technology's advance to more patients:

I. Accelerate medical solutions, especially through greater data access.
II. Address the challenge of resources diverted to treat lifestyle diseases.
III. Generate more funding for research.

Our more-focused strategy was based on defining the nation's health challenges, demonstrating what could work, creating a plan of action; convening the right people to implement it, and seeing it through to legislative success. In recent years, we've also expanded our work on the other major component of the national health infrastructure—public health.

Many people don't realize what the term "public health" means. Perhaps that's why it gets so little funding. It doesn't seem to have occurred to most people that spending a little more on public health could greatly reduce the costs of treating diseases. Public health programs—including basic sanitation, vaccination campaigns, seat belt laws, occupational safety, air quality improvement, tobacco control, and nutrition education—have saved far more lives than all medical/surgical interventions combined.

Despite the fact that about seventy percent of healthcare costs relate to lifestyle-linked diseases, America's schools of public health are underfunded and underappreciated. Dr. Leana Wen, a professor at George Washington University's Milken Institute School of Public Health, likes to quote an old saying: "Public health saved your life today; you just don't know it." Or as Dr. William Foege, who devised the strategy that eliminated smallpox puts it, "Nobody ever thanks you for saving them from the disease they didn't know they were going to get."

The Covid pandemic showed the world why public health is so important. There were solutions to

Covid-19 by the end of 2020 that we failed to implement fully. Moving forward, we should double down on what worked well. Just as America created NASA and DARPA in response to Sputnik in the 1950s, the nation needs a permanent force to confront emerging health threats. Covid-19 was our new Sputnik moment. Let's use it to recommit to bioscience progress and preparedness.

Only the beginning

Looking to the future, several new technologies show enormous promise. One of these is CRISPR, a way to edit specific letters in a genome. That could make plants more nutritious and drought-resistant, take the allergens out of peanuts, cure AIDS, wipe out malaria-transmitting mosquitoes, or inactivate the Covid-19 virus. The possibilities are endless.

Jennifer Doudna, Ph.D.

Despite obvious risks, CRISPR is so significant that it earned the 2020 Nobel Prize in Chemistry for Dr. Jennifer Doudna at Berkeley, and her colleague, Emmanuelle Charpentier, a French scientist. They showed that a characteristic of bacterial immune systems could be used to make precise cuts in any sequence of DNA letters. It is, says Doudna, "literally a way that bacteria fight viral infection."

A few weeks before the Nobel Prize announcement, Dr. Doudna joined me on one of my podcasts and explained that the process of editing a single gene is relatively straightforward. It gets far more complex when it comes to treating most human diseases. While cautious about speculating on cures, she was sure that further development of the technique will eventually allow it to be applied to "anything that has a unique sequence of DNA or RNA."

It may be years before this technology is widely available to patients. In its current stage of development, it brings to mind Winston Churchill's comment following an early British victory in World War II: "This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning." CRISPR is an exciting beginning in the search for faster cures.

Technology and our health

The driving force behind all new technologies like CRISPR is the astounding advance of our ability to produce, manipulate, store, retrieve and transmit data. If the biological sciences are to our time what physics was to the last century, it is largely because the code of life—the four base components of DNA—can be processed in the same way the binary code of zeroes and ones underlies everything we do in our electronic devices. This data revolution is producing tremendously exciting advances in medical science:

- Physicians can target cancers more precisely with the right drugs in the right amounts at the right time with fewer side effects because they can now sequence the tumor itself.
- Scientific understanding of the immune system, blood components and the microbiome has grown by orders of magnitude over 20 years.

- Natural language processing now allows doctors to interrogate databases without entering complex formulas. For example, they can ask, "What percentage of patients with condition X also have condition Y?"
- Two decades ago, minimally invasive surgery began to replace many types of traditional operations. Now we're starting to see new types of non-invasive surgery, such as focused ultrasound.
- The lead time for vaccine development is getting shorter. What used to take years can be completed in days. The rapid development of Covid-19 vaccines showed that as soon as a data set is complete, it can be uploaded to the internet, where it's available to the world's scientific community.
- The precision of medical imaging now shows anatomical features thousands of times smaller than just a decade ago.
- By harnessing artificial intelligence, machine learning and massive computational power, scientists can now design and synthesize drugs from scratch inside a laboratory computer rather than testing thousands of molecules against biological targets in mice.
- In the future, doctors may be able to implant "neural prosthetics" that allow a paralyzed person to create documents on a computer screen simply by thinking about letters or words. But the future is already here for wearable devices with a wide range of applications. These devices could be particularly helpful in dealing with high blood pressure, which causes more deaths and disability than any underlying condition.

We are truly living through a life science revolution. Hundreds of technological advances are accelerating progress in every corner of medicine. Many breakthroughs have been developed by immigrants who came to the United States in pursuit of the American dream. We're building the Milken Center for Advancing the American Dream to recognize their contributions as well as the contributions of others in the fields of education, access to financial capital and entrepreneurship. The new center, located in Washington, DC on historic Pennsylvania Avenue, will be partially open to the public in 2024 and fully operational in 2025.

To the frontier

To carry the revolution forward, we need greater concentration on ten areas at the frontiers of medical science:

1. Personalized mRNA vaccines to prevent most cancers and infections;
2. Non-invasive surgery;
3. Advanced nutrition to adjust the microbiome for optimal health;
4. CRISPR gene editing;
5. Multi-cancer screening;
6. Cell rejuvenation;
7. Advanced imaging for diagnosis and treatment of neurodegenerative diseases;
8. Immune system activation based on individualized genome sequencing;
9. Replacement organs grown from patients' own cells;
10. Implanted devices that provide 24-hour measurement and responsive treatment.

We have the means to accelerate the future of health. If our society commits itself to that goal, its legacy can be a healthier world for future generations. LM

Michael Milken is chairman of the Milken Institute and author of Faster Cures: Accelerating the Future of Health*, from which this was adapted.*