



Trouble Ahead

The Impending U.S. Budget Showdown: Defense vs. Healthcare

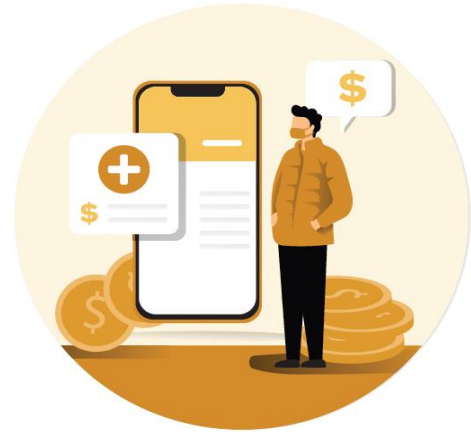
| WHITE PAPER

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There is a battle ahead, and it is going to be ugly. The United States finds itself in a remarkably challenging situation - a confluence of factors we have never experienced in the entire 248-year history of our young country:

- **Ten cold or hot wars** around the world.
- **National debt of \$34.5 trillion**¹ (~120% of GDP, higher than it has ever been, including during World War II).
- **\$4.5 trillion per year is spent on healthcare**² (~20% of GDP). This number is expected to reach \$7 trillion by 2030.
- **An aging population.** By 2030, all 70 million Baby Boomers alive will be 65 or older.



Specifically, our healthcare system continues to struggle in nearly every way. Despite having the best system in the world as it relates to advanced care, R&D, and new treatment methods for certain diseases, our performance against other first world countries in basic public health measures is abysmal. A large portion of the population remains uninsured. Data shows U.S. life expectancy, general mortality, maternal mortality and infant mortality are all substantially worse than other western democracies and, in many cases, third world countries³.

In the meantime, the U.S. spends twice the money as a percentage of GDP on healthcare than any other western democracy⁴. Yet less than half of Americans view their healthcare experiences as positive.

With only about one million physicians in the country and a growing general population, the shortage of caregivers is increasingly severe. The average age of physicians in the United States is 53 while the median age of every other U.S. worker is 41.8. And most of these physicians are suffering from burnout

¹ U.S. Department of the Treasury. "National Debt." America's Finance Guide, FiscalData.Treasury.gov, <https://fiscaldata.treasury.gov/americas-finance-guide/national-debt/>.

² Centers for Medicare & Medicaid Services. "National Health Expenditure Data." CMS.gov, www.cms.gov/data-research/statistics-trends-and-reports/national-health-expenditure-data/historical.

³ Peterson-KFF Health System Tracker. "How Does the Quality of the U.S. Healthcare System Compare to Other Countries?" Peterson-KFF Health System Tracker, 2023, www.healthsystemtracker.org/chart-collection/quality-u-s-healthcare-system-compare-countries/.

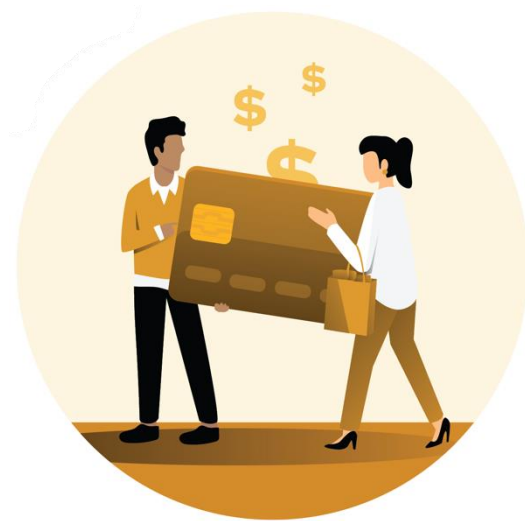
⁴ AK;, Papanicolas I;Woskie LR;Jha. "Health Care Spending in the United States and Other High-Income Countries." JAMA, U.S. National Library of Medicine, pubmed.ncbi.nlm.nih.gov/29536101/#:~:text=The%20United%20States%20spent%20approximately%20twice%20as%20much%20as%20other%20high%20income%20countries%20on%20medical%20care.

and dissatisfaction. Most estimates suggest the U.S. will need at least 150,000 more physicians by 2034, yet fewer and fewer people are choosing to go into medicine⁵.

A Crisis is Coming

So here we are - it is awful, and it is going to get worse. Our country has experienced inflation for the first time in a generation, and the Federal Reserve has tried to tame it by raising interest rates to the highest they have been in 30 years.

According to a recent article in the New York Times, the U.S. faces a mounting debt crisis exacerbated by ongoing military engagements and domestic spending challenges. The article highlights how the national debt, now at \$34.5 trillion, is straining the economy and forcing difficult decisions regarding budget allocations⁶. At present, **\$1 trillion is added to the national debt every 100 days**.



Additionally, a HealthCare Innovation Group article highlights how the U.S. healthcare system is on a "\$7 trillion burning platform." The piece emphasizes that **without reform or industry disruption, the financial burden of the healthcare sector will increase dramatically**.

It is entirely possible that one or two of the cold/hot wars happening right now will pull the U.S. into a regional conflict or worse, a third world war. Many experts in geopolitics suggest that this scenario is already in motion. Such entanglements often take 10-20 years to resolve and cost trillions of dollars⁷.

In this case, the U.S. government would need to dramatically increase spending on military and defense. The 13.3% of the federal budget spent on defense in 2023 may need to increase to something close to 30%. With high interest rates, a spiraling deficit and low tax revenues, government would look for ways to make substantial cuts, and it would very likely be Medicare/Medicaid spending.

⁵American Medical Association. "The Physician Shortage Crisis Is Here—And So Are Bipartisan Fixes." American Medical Association, <https://www.ama-assn.org/practice-management/sustainability/doctor-shortages-are-here-and-they-ll-get-worse-if-we-don-t-act>

⁶ Qiu, Linda. "The U.S. Faces Mounting Debt Crisis as Economic Challenges Persist." The New York Times, 18 June 2024, <https://www.nytimes.com/2024/06/18/us/politics/us-debt-economy.html>.

⁷ U.S. Department of Defense. "Supplemental Bill Becomes Law, Provides Billions in Aid for Ukraine, Israel, Taiwan." Department of Defense (.gov), 15 Dec. 2022, <https://www.federaltimes.com/congress/2024/02/13/senate-passes-ukraine-israel-taiwan-aid-amid-trump-fueled-opposition/>.

Cuts in Medicare/Medicaid spending would force the closure of 1,500-2,000 of our nation's 6,000 hospitals in a very short period. This would push healthcare spending back on individuals and families who are already at a breaking point.

The Current Healthcare System is a Disaster

The current state of the U.S. healthcare system is dire, as highlighted by Robert Glatter and Peter Papadakos in their *Time* article⁸. They describe a post-pandemic reality where hospitals are closing and staff shortages are rampant, leading to critical delays in care. For instance, patients experiencing cardiac events are often transported to distant hospitals due to local closures, only to face overcrowded facilities with insufficient ICU beds. **This situation underscores the urgent need for systemic reform to ensure timely and effective care for all patients.**

The consequences of these systemic issues are particularly devastating for underserved communities, which already face substantial barriers to accessing healthcare. **The reduction in available services and the increase in travel times for critical care disproportionately affect low-income and rural populations.** These communities often have limited access to primary care, exacerbating chronic health conditions and leading to higher rates of preventable illnesses.

Addressing these disparities requires targeted interventions and innovative solutions to rebuild a healthcare system that is equitable, accessible, and capable of meeting the diverse needs of all Americans. The proactive approaches taken over the past hundred years have not worked in part because they were constructed via government programs created out of political compromise among lots of interested (vs. disinterested) parties.

⁸ Schwartz, Ariel. "The Collapse of the U.S. Health Care System and How We Can Fix It." *Time*, 7 Feb. 2023, <https://time.com/6246045/collapse-us-health-care-system/>.

These compromises have fallen short in the eyes of the American people, as evidenced by the chart, which highlights the astronomical cost of healthcare for the American taxpayer⁹.

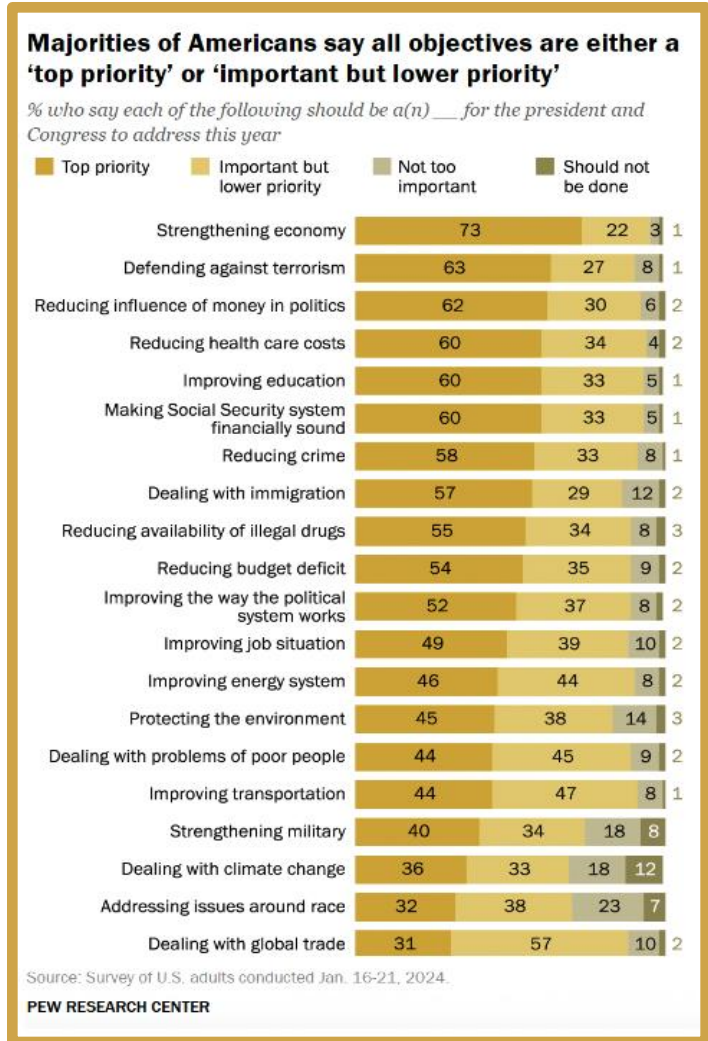
The “Smartest People in the World” Have Tried: Lessons from the “Big Six” Tech Titans

As the title suggests, the “Big Six” we are talking about here are: Amazon, Apple, Google, Meta, Microsoft, and Walmart. These firms have arguably impacted every aspect of our lives over the past 40 years or so. All are outgrowths of the invention of the microprocessor in 1971. (By the way, if you feel that the last one on the list does not belong in a list of technology companies, take a closer look at Walmart. The ability to deliver goods Americans need and want at the low prices they do, is largely because of a remarkable technology stack.)

The entry of these titans into healthcare should not surprise anyone. Having disrupted nearly every other sector of our global economy, one might imagine that getting their mitts on the last ~20% just makes sense. If we take a closer look at it, with almost no exceptions, their encroachment into the healthcare sector has been met with mixed results.

Despite vast resources and technological prowess, these companies have faced significant challenges in their attempts to disrupt the healthcare industry.

Amazon's "Amazon Care" faced difficulty expanding beyond its employee base, as well as regulatory challenges when attempting to integrate this healthcare arm into its existing operations. Haven, the venture formed by Amazon, Berkshire Hathaway and JPMorgan Chase in 2018 with the lofty goal to “provide U.S. employees and their families with simplified, high-quality, and transparent health care at a reasonable cost,” was disbanded less than three years later¹⁰.



⁹ Pew Research Center. "Americans' Top Policy Priority for 2024: Strengthening the Economy." Pew Research Center, 29 Feb. 2024, <https://www.pewresearch.org/politics/2024/02/29/americans-top-policy-priority-for-2024-strengthening-the-economy/>.

¹⁰ Becker's Hospital Review. "Amazon deepens its healthcare presence: A timeline of the past year." Becker's Hospital Review, 15 Oct. 2019, www.beckershospitalreview.com.



While "Walmart Health" promised to bring low-cost healthcare to its customers, the company just recently closed all 51 centers and their telehealth business, citing unexpectedly high operational costs and low reimbursement. These failures are seen in many other companies, including Apple, Microsoft, and Google.

Why have these enormous and talented companies failed to impact the healthcare industry? Because they really have not tried to innovate. Instead, they took the, "We are big and can command lower costs; and we are smarter than those healthcare people so we'll figure out the stuff they haven't" approach - but alas they, respectively, could not and

did not.

Despite these challenges, the entry of these major corporations into healthcare highlights the **immense opportunity for innovation and investment**. While their attempts are not always successful, **they have cleared a path for a new generation of startups and investors** to leverage technology to drive meaningful change in healthcare delivery.

Current and former healthcare industry professionals hold a unique position in today's market. **Those with experience in healthcare understand the nuances of the sector and are better equipped to develop solutions that address its unique challenges**. By combining industry expertise with technological innovation, investors can ensure that the benefits of AI and other emerging technologies are applied in ways that truly transform healthcare delivery.

The Way Out

So, you are halfway into this paper, and everything may appear to be pretty bleak. Well fear not, dear reader. There is a way out of this. **There is a future healthcare delivery system in the U.S. that will allow us to deliver better healthcare at more reasonable prices** and in ways that our citizenry will appreciate and find to be positive and functional.

The coming crisis will leave us with challenges that the government will not be able to address (because our government will be broke and focused on the war machine). **The market will inevitably step in to address the demand**. This means technology and a totally different way of doing things¹¹. As we have seen time and time again over the past several hundred years, technological advances tend not to make

¹¹ Spatharou, Angela, et al. "Transforming healthcare with AI: The impact on the workforce and organizations." McKinsey & Company, 10 Mar. 2020, <https://www.mckinsey.com/industries/healthcare/our-insights/transforming-healthcare-with-ai>

the “old way” more efficient and less expensive. But rather, **technology tends to wipe out the old system and replace it with a much better overall one.**

Examples are plentiful over time (and notably all of these major advancements were invented by Americans):

- Electricity
- The Internal Combustion Engine
- Microprocessors and Personal Computers
- The Internet
- The Smartphone

Role of Technology and Innovation in Healthcare

To effectively address the looming crisis in U.S. healthcare, **it is imperative to embrace technological innovation and private market-driven solutions.** These advancements offer the potential to transform the healthcare system, making it more efficient, accessible, and cost-effective.

Let’s take Telemedicine as an example. Telemedicine has emerged as a “disruptor” and presented an incalculable amount of opportunities for private investment in recent years. In the wake of COVID-19, we saw a 4,000% increase in telehealth visits¹². This increase showed a jump from a \$3 billion spend to \$250 billion¹³.

Measuring the value of virtual care by quantifying clinical outcomes post-COVID brought about lucrative long-term investment opportunities. Telemedicine exemplifies the potential of technological innovation to transform the healthcare industry. Its rapid adoption and integration with other advanced technologies have created opportunities driven by the promise of improved patient outcomes and cost efficiencies. Today we see the emergence of other “disruptors,” promising similar transformative effects on the healthcare landscape.

The Evolution of Healthcare Digitization

The digitization of healthcare in the early 2010s laid the groundwork for current technological advancements. The transition from paper-based records to electronic health records was a significant step forward, improving access to patient information, increasing productivity, and reducing errors.

Today we see the emergence of other disruptors, promising similar transformative effects on the healthcare landscape.

¹² How Has U.S. Spending on Healthcare Changed over Time?" **Peterson-KFF Health System Tracker**, 2 Mar. 2023, www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time/.

¹³ Albert Henry, Tanya. "After COVID-19, \$250 Billion in Care Could Shift to Telehealth." **American Medical Association**, 18 June 2020, www.ama-assn.org/practice-management/digital/after-covid-19-250-billion-care-could-shift-telehealth.

This initial phase of digitization paved the way for more sophisticated technologies, including AI and Telemedicine, which continue to build on these foundational improvements. The ongoing evolution of healthcare technology reflects a broader trend toward deeper integration of digital tools in healthcare delivery. It is important to remember that the U.S. healthcare system, unlike almost every other industry in the world, only reached a tipping point of automation in the last decade or so.

Now that this tipping point has been reached, **the industry is able to take advantage of all of that data being in databases rather than on paper**. Moreover, it is also critically important to recognize that part of the reason healthcare is so expensive in our country is because of the enormous number of care settings in the system, as well as demographics¹⁴.

Furthermore, while the U.S. has fewer hospital beds per capita than other similar countries, we serve as the healthcare R&D “lab” for the planet. All these things tend to add cost to the system. In short, healthcare is expensive in part because it requires lots of people. A strange characteristic of healthcare in the U.S. (again - unlike every other industry throughout history) is that technology advancements HAVE NOT typically resulted in reductions in cost¹⁵.

This is about to change dramatically.

Today’s Disruptor: Artificial Intelligence

The integration of AI into healthcare presents a paradigm shift with profound financial implications for industry stakeholders. The potential of AI lies in its ability to:

- **Replace labor with robots** (initially administrative/back-office functions, much sooner - clinical care).
- **Automate processes** (some very much dated).
- **Enable personalized medicine**.

AI lies as a key driver of innovation and the new financial disruptor of the sector.

Using advanced data analytics and machine learning algorithms, this tailored approach stands to revolutionize treatment and cost efficacy. AI lies as a key driver of innovation and the new financial disruptor of the sector.

¹⁴ American Medical Association. "Improving Care: Priorities to Improve Electronic Health Record Usability." AMA, 2021, <https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/member/about-ama/ehr-priorities.pdf>.

¹⁵ Johns Hopkins Bloomberg School of Public Health. "U.S. Health Care Spending Highest Among Developed Countries." Johns Hopkins, 7 Jan. 2019, publichealth.jhu.edu. Accessed 22 July 2024.

By analyzing vast amounts of patient data, AI can identify patterns and predict outcomes, allowing for more efficient utilization of resources and reduction of unnecessary procedures. This not only improves patient outcomes but also reduces costs, a key concern in an industry facing escalating expenditures¹⁶.

Additionally, in the context of technological innovation, the integration of AI-driven solutions like ElliQ, (a robot companion designed to assist and accompany the senior population), represents a major advancement. According to a recent article in Fierce Healthcare, ElliQ is designed to provide companionship and support to seniors, helping them manage their daily routines and health needs through friendly, engaging interactions¹⁷.

This technology not only addresses the emotional well-being of seniors but also offers practical assistance in medication management and appointment reminders, showcasing the potential of AI to enhance the quality of life for elderly patients.

¹⁶ "Artificial intelligence in health care." Deloitte Insights, Deloitte, www2.deloitte.com.

¹⁷ Fierce Healthcare. "CES 2024: Older Seniors Are Happily Living with AI in the Form of Chatty Robot ElliQ." Fierce Healthcare, 12 Jan. 2024, www.fiercehealthcare.com/ai-and-machine-learning/ces-2024-older-seniors-are-happily-living-ai-form-chatty-robot-elliq.

AI's wide range of use cases presents a multitude of opportunities for startups and investors alike. The chart below, based on information provided by McKinsey, provides a more detailed categorization of these opportunities.

Areas of Impact for AI in Healthcare



Improving population health management

Improving operations

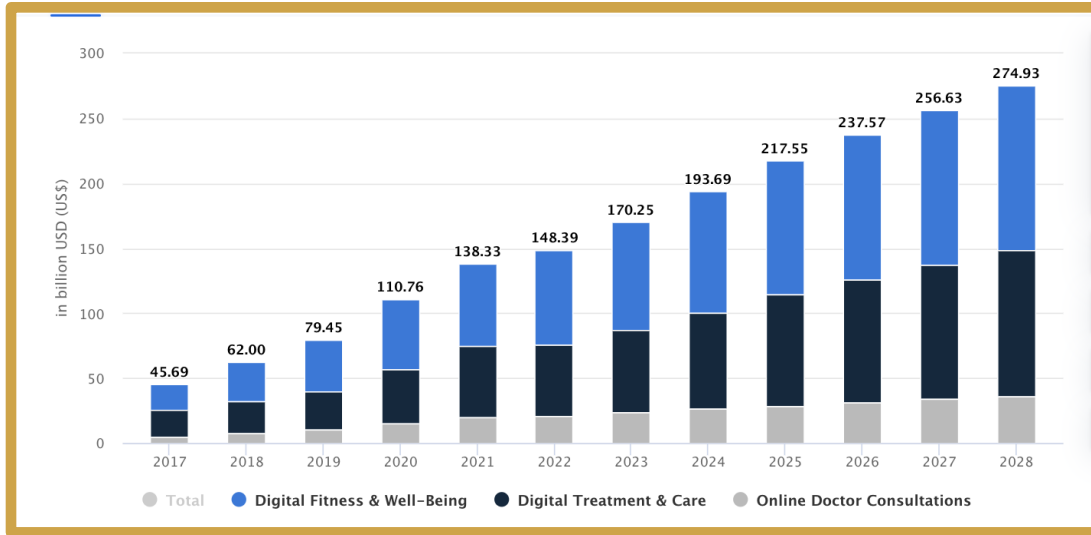
Strengthening innovation

McKinsey & Company

Where We are Headed

Winston Churchill once famously said that “you can depend upon the Americans to do the right thing. But only after they have exhausted every other possibility.” There is much behind this remark - it not only implies the criticality of crises in the U.S. changing course, but also the necessity to wait as long as possible to change. If this is consistent with the nature of Americans, the impending budget crisis between Defense and Healthcare will need to get to a crisis level before change occurs.

That said, there is evidence that change is coming. The chart below shows digital health revenue over the past 7 years (and projected to 2028). As one can see, we are projected to spend north of a quarter of a \$1 trillion on digital health technologies.



Digital Health Revenue Past Seven Years & Projected through 2028

The global strategy on digital health outlined by the World Health Organization (WHO)¹⁸ for the period 2020-2025 represents a significant step towards advancing healthcare through digital innovation. Published in 2021, this strategy highlights the increasing recognition of the revolutionary potential of digital health on a global scale. The WHO's four strategic objectives for digital health highlight a concerted effort to promote collaboration, knowledge transfer, and the implementation of national digital health strategies.

1. **The first objective focuses on promoting global collaboration and advancing the transfer of knowledge on digital health.** This emphasizes the importance of sharing best practices and leveraging collective expertise to drive innovation and improve healthcare outcomes worldwide.
2. **The second objective aims to advance the implementation of national digital health strategies.** By supporting countries in developing and implementing their own digital health strategies, the WHO seeks to ensure that all nations can benefit from the opportunities presented by digital health technologies.
3. **Strengthening governance for digital health at global, regional, and national levels is the third strategic objective.** This recognizes the need for robust governance frameworks to address challenges such as data privacy, security, and interoperability, ensuring that digital health initiatives are implemented effectively and ethically.
4. **The fourth objective advocates for people-centered health systems that are enabled by digital health.** This highlights the importance of placing individuals at the center of healthcare delivery, empowering them to actively participate in their own care through digital tools and technologies.

¹⁸ World Health Organization. *Global Strategy on Digital Health 2020-2025*. World Health Organization, 2021, <https://www.who.int/docs/default-source/documents/qs4dhdaa2a9f352b0445bafbc79ca799dce4d.pdf>.

Overall, the WHO's global strategy on digital health reflects a coordinated effort to harness the power of digital innovation to transform healthcare delivery and improve health outcomes for people around the world.

Conclusion

The clash between Defense and Healthcare spending in the U.S. is an impending crisis that requires immediate attention. As the nation faces cost challenges in both budgetary categories, the efficient use of resources is critical. Our current trajectory is unsustainable without intervention.

We are about to see enormous changes enabled by advances in technology. These shifts will start on the administrative and back-office sides of healthcare. Over a period of time, many of the non-clinical jobs in our industry will be replaced by artificial intelligence. In the second half of this ballgame, we will begin to see clinical functions enhanced by AI.

As these technologies mature, more and more healthcare (and end of life care) will be delivered to patients in their homes. At a point in time, we will see hospitals begin to go the way of shopping malls.

In the not-too-distant future, the confluence of advanced technologies such as AI, quantum computing, and wireless electricity, will enable an era of robotics we can only imagine today. In a few decades, empathetic robots could play a major role in both healthcare and domestic life in the home. These technologies will not only ensure that older folks are eating well, taking their medications, and getting exercise, but also will provide a salve for loneliness - an ever-increasing issue in our society.

These technologies will impact drug development in a substantial way as well. While clinical trials will never totally disappear, it is believed that AI will enable research scientists to model the impact of certain molecules on the human body - dramatically accelerating the time to get medications to market.

We will see more change in the next two decades than we have seen in the last hundred years.

Just in the last couple of years we have seen the GLP-1 medications impact Diabetes and Obesity in a substantial and meaningful way. As prices drop and these drugs become even more effective, it is not out of the realm of reason that we will largely eliminate these disease states. These two are considered to be responsible for a quarter of healthcare costs.

Alzheimer's Disease, Heart Disease/Stroke and Cancer will likely be targeted next. Each of these costs between \$200-350 billion per year in the U.S. Curing any one of them would go a long way toward addressing our cost challenges. AI will positively impact all three¹⁹.

¹⁹ University of Southern California. "Most Expensive Disease to Treat: Infographic." USC Price School of Public Policy, 2024, <https://healthadministrationdegree.usc.edu/blog/most-expensive-disease-to-treat-infographic>.

We will see more change in the next two decades than we have seen in the last hundred years. We predict that, in that time, our national healthcare spending will moderate toward the 9-11%²⁰ of GDP, similar to what most major western democracies spend on healthcare. Advanced technologies will be the secret weapon that makes this a reality, creating a very different and overall better healthcare system in the U.S.

About Dave Vreeland, Senior Managing Partner, Caduceus Capital Partners

With more than 30 years of experience in the healthcare industry, Dave is a well-known expert on digital health, healthcare IT and the future of the healthcare industry. Currently, he is senior managing partner at Caduceus Capital Partners, a venture capital firm dedicated to investing in and accelerating the growth of digital health startups. With a deep understanding of the intricacies of the healthcare industry, Caduceus' leadership team executes a refined and proven methodology to successfully source, grow and exit companies.

²⁰ University of Southern California. "Most Expensive Disease to Treat: Infographic." USC Price School of Public Policy, 2024, <https://healthadministrationdegree.usc.edu/blog/most-expensive-disease-to-treat-infographic>.