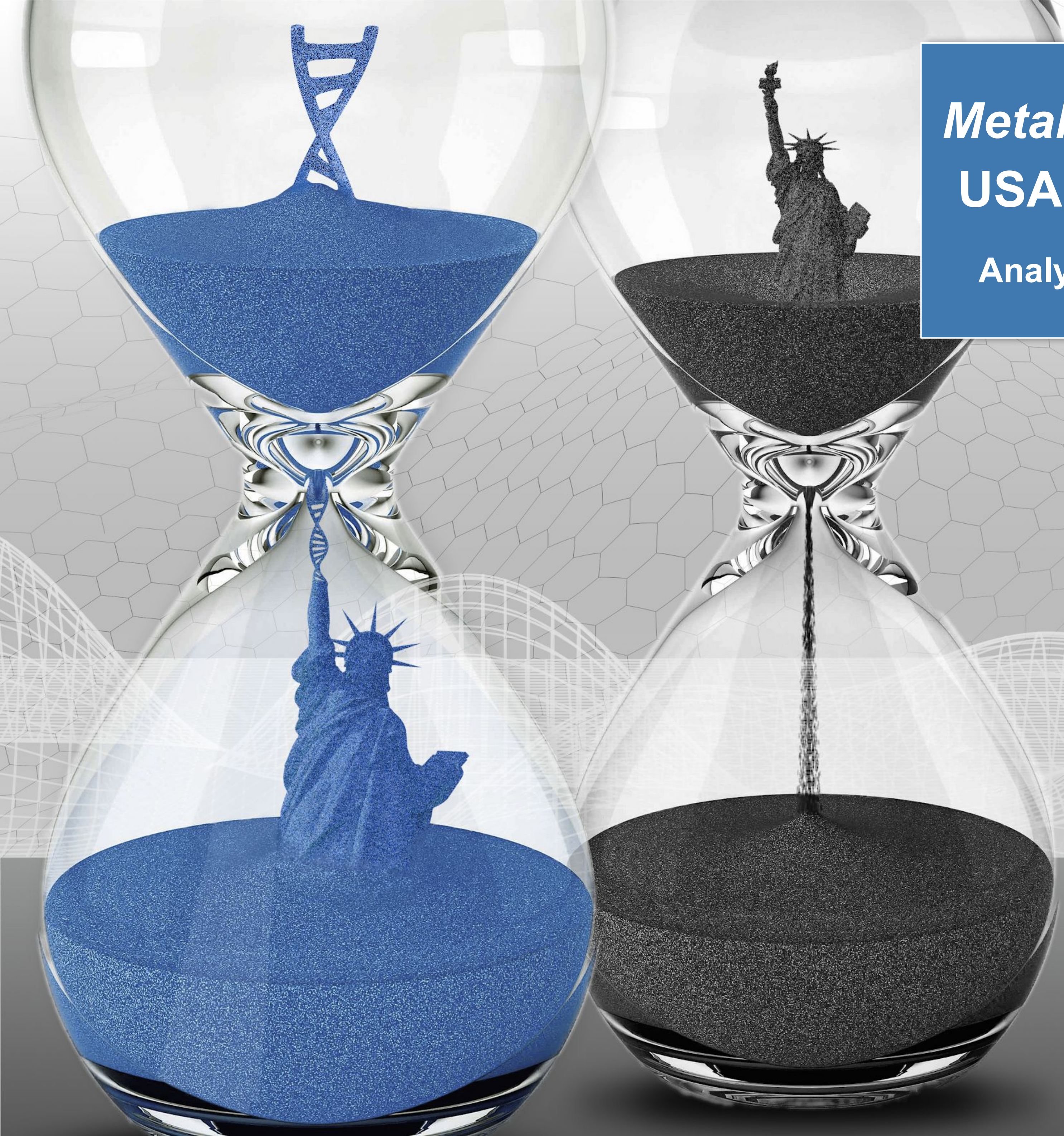

Metabesity and Longevity
USA Special Case Study
Analysis and Policy Implications

TARGETING METABESITY 2019
15-16 October 2019 | Washington, DC, USA
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United States: Metabesity and Longevity

Analysis and Policy Implications

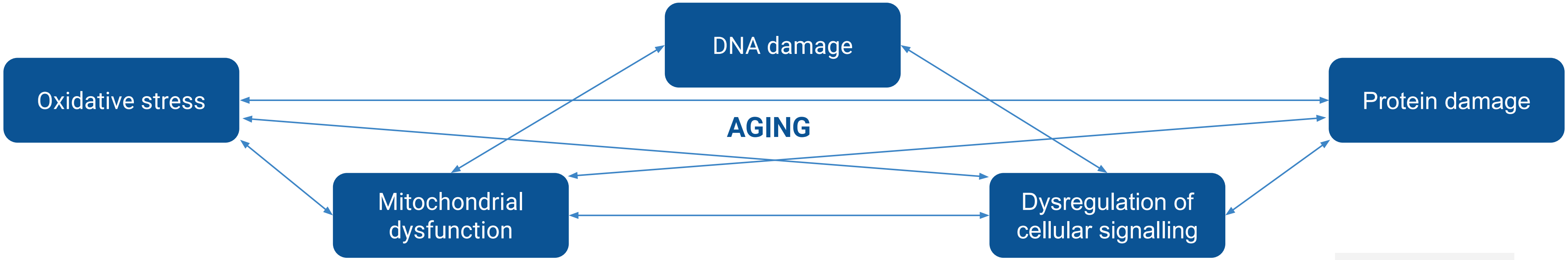
Executive Summary

What is Metabesity?

Our metabolism comprises all of the chemical reactions that help keep our bodies alive. Factors such as resting metabolic rate ("RMR"), thermic effect of food ("TEF"), exercise and non-exercise activity thermogenesis ("NEAT") all work together in a coordinated manner in order to maintain good health. Most of the major diseases of our time (including diabetes, cardiovascular and neurodegenerative diseases, and cancer) have common metabolic roots, and thus may be susceptible to common solutions. This constellation of interconnected diseases can be called **"metabesity."**

Metabolic syndrome has long been recognized as an important risk factor for cardiovascular disease, and its prevalence has been increasing. More recently, metabolic syndrome and other forms of metabolic dysfunction have been linked to other conditions including dementia, cancer, and the aging process. The term "metabesity" was coined by Dr. Alexander Fleming.to reflect the broader impact of metabolic dysfunction on these major diseases.

> *"Scientific evidence has been accumulating over recent decades that major non-communicable diseases of aging, such as diabetes, cardiovascular diseases, neurodegenerative disease and cancer, have common metabolic roots, and thus may be susceptible to common solutions."*
>
> Dr. Alexander Fleming, Founder and Executive Chairman of Kinexum, and Chief Medical Officer of Tolerion, a biotechnology company developing disease-modifying treatments for type 1 diabetes and other autoimmune diseases.



Links Between Longevity, Metabesity and Disease

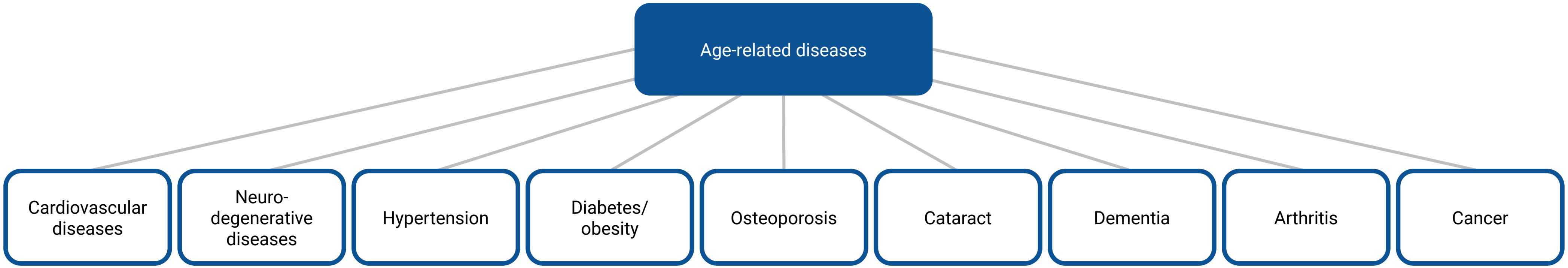
Aging itself is largely a metabolic condition. As we get older, the day-to-day operations of metabolism inflict damage on human cells and organs. Moreover, as this damage accumulates, metabolism itself is thrown into disarray, and these things are no longer coordinated with each other, causing metabolism to malfunction further and inflict more damage.

Among the many signs of metabolic discoordination is a buildup of visceral fat, which may be partly a symptom and partly a cause of aging.

It is well known that carrying excess visceral fat tissue increases risk of age-related diseases, shortens life expectancy, and raises lifetime medical expenditure. For example, excess visceral fat tissue adds to the presence of senescent cells, causing chronic inflammation via several age-associated changes. The more fat tissue, the worse the outcome – even being moderately overweight rather than obese still produces a negative impact on long-term health.

Aging, therefore, along with diabetes, cardiovascular and neurodegenerative diseases, and cancer, is itself an additional component of metabesity. It is also well known that the Western diet and lifestyle similarly contribute to the same metabolic dysfunction and to signs of premature aging.

Given how intimately connected aging, metabesity and disease are, seeking to address the metabolic roots of various diseases might also lead us to discover methods for improving the aging process itself, with positive ramifications for everything from obesity to arthritis.



Source: ResearchGate

America's Large Gap Between Wealth and Health: High Health Care Expenditures and Low Health-Adjusted Life Expectancy

The US currently has a significant gap between its healthy-adjusted life expectancy (HALE) of 70 years and life expectancy at birth of 77 years, compared to a gap of 4 years in Singapore (78 years and 82 years, respectively). Its life expectancy at birth ranks 25th globally, yet its health care expenditures are the highest among all developed countries.

The situation in the US does not stem from the developed state of its science, technology or medicine. Rather, it is rooted in policy. This report seeks to analyze specific policy initiatives that can enable the US to turn its health deficit around.

The United States exhibits the following conditions that warrant establishing policy solutions for metabesity:

- High health care spending relative to HALE (the desired end product of health care). The US spends about twice of what other high-income nations do on health care and exhibits the lowest life expectancy and one of the largest gaps between its unadjusted and health-adjusted life expectancies at birth.
- The large gap between HALE and life expectancy at birth generally within the United States. HALE is a measure of population health that takes into account mortality and morbidity – it adjusts overall life expectancy by the amount of time lived in less than good health.
- The high prevalence in the US of many diseases rooted in metabesity. A study found that 34% of US adults in government health surveys conducted between 1999 and 2006 had some form of metabolic syndrome, up from 29% in similar surveys done between 1988 and 1994. The researchers estimate that about 50 million US adults had metabolic syndrome in 1990 compared to 64 million in 2000. According to researchers, the number of Americans with metabolic syndrome between 1999 and 2006 was about 68 million. In general, it was established that the rise in metabolic syndrome was primarily due to growing rates of abdominal obesity and high blood pressure.

Source: Reuters: Business & Financial News, US & International Breaking News

The Shift from Sick Care to Preventive Medicine

The biotechnological tools and funding necessary to directly intervene in metabesity already exist. The question that remains is the degree of personalization, precision, prevention, and patient participation involved in their application. The current state of medicine and health care is currently being disrupted by a shift away from "one-treatment-fits-all" blockbuster drugs and towards P4 (Personalized, Precision, Preventive and Participatory) medicine: optimized disease prevention and applying drugs long before the underlying pathology develops into actual chronic disease. This increasing precision would allow for a series of increasingly smaller micro-doses as technology advances.

This medicine consists of the leading edge of advanced biomedicine already at the level of practical, real-world implementation and use. The “preventive” focuses on maintaining a state of good health, and implicitly decreasing the probability of disease development through periodic health monitoring, and the application of treatments. The “personalized” and “precision” refer to the drugs and treatments that will be designed and applied using precise, individually-tailored methods of dosing, cocktail compositions of micro-dosages, and efficient methods of delivery. The “participatory” refers to the increasingly active role that patients are taking in managing their own health. Its high degree of complexity necessitates not only innovative frameworks for general benchmarking and forecasting, but also the general assessment of its technologies’ and therapies’ basic safety and efficacy. This starts with development of biomarker panels for aging as a means of evolving effective P4 strategies.Vast amounts of data aggregation and analysis are required to identify predictive markers. Data aggregating for biomarkers of aging (rather than biomarkers of disease) is particularly difficult, as by definition it has to be gathered from healthy disease-free populations (e.g., data that distinguished the young from the even younger) rather than from among the health data of hospital populations. Furthermore, as the scope of P4 medicine broadens in the coming years, the number of biomarkers and technologies involved will increase rapidly to the thousands.

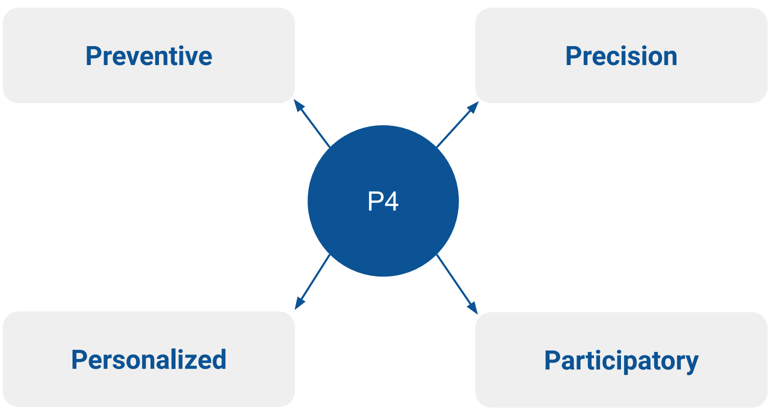
Identifying a vast number of biomarkers will eventually require the aggregation of incomprehensibly large volumes of data, making the implementation of P4 medicine infeasible with conventional computation. AI is the indispensable tool for overcoming this limitation, and is already in use in longevity-progressive states such as the UK, Switzerland and Singapore.

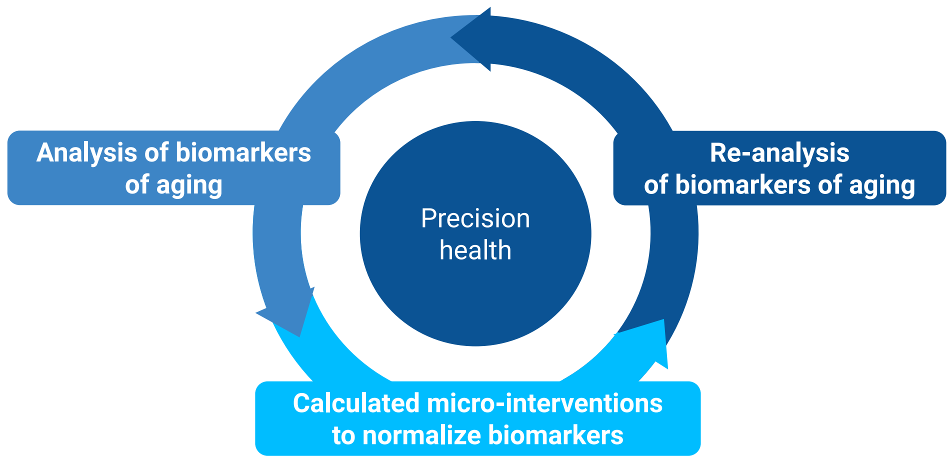
The Shift from Preventive Medicine to Precision Health

This shift from treatment to prevention is ultimately leading to a coming age of precision health, where patients are empowered with the tools necessary to become the CEOs of their own health, through the application of P4 medicine in response to continuous monitoring of fluctuations in biomarkers of aging for the maintenance of the optimal state of health until the very end of life. “Precision health” denotes the continuous stabilization of health and the maximum obtainable maintenance of a young biological age via the routine application of micro-interventions in response to ongoing fluctuations in biomarkers of aging and health.

The high degree of complexity associated with precision medicine, the development of biomarker panels for aging to determine what P4 technologies are effective, and the role of AI in achieving this means that progress in creating a comprehensive system of precision health is less of a biotechnology problem (which requires us to wait on biotech breakthroughs), and more of a data mining, analysis and management issue.

This, in turn, makes it a government problem to some extent, as only government-led initiatives would be capable of providing the necessary infrastructure for such a project on a national level. In other words, the future rate of progress in solving the metabesity crisis (which plays a pivotal role in the future of HALE), relies on a certain amount of government coordination.





Utilizing Strength of United States in Artificial Intelligence (AI) Industry for Rapid Progress in AI for Precision Health and Longevity

The United States already possesses a large share of the global longevity economy's basic resources. Not only is it home to a huge scientific base, it is also a world leader in AI in health care, with America's top 5 hospitals all possessing machine learning capabilities. However, these resources are not optimally assembled to provide a framework for the P4 ecosystem, which would be necessary to make inroads into tacking metabesity.

The United States is the birthplace of biotechnology and AI, encompassing Silicon Valley and several AI hospitals within its borders, but this offers it little competitive advantage for precision health as long as there is no national strategy for integrating these resources together. America also has a very strong AI in the health care industry and has heavily prioritized the development of its AI industry more generally on a national level, but its efforts in the specific realm of AI for preventive medicine is comparatively lacking.

Other nations are already seizing this initiative. British parliamentarians are discussing the establishment of AI centers for longevity across the country. We are seeing initiatives for a preventive medicine approaches to aging across the globe, from the UK's **Genomic Medicine Service**, and **Swiss Personalised Health Network**.

If a nation many times larger than Switzerland or the UK, such as the United States, were to do the same, and direct its resources toward solutions for metabesity and aging, for which there is ample incentive in the USA to address, and which is linked to innumerable medical issues negatively influencing the USA's HALE, even despite its high standard of living, it could revolutionize global health care, greatly accelerate biomedicine, and ignite the emerging global longevity industry.

In the next few years, several technologically advanced small technocratic states will emerge as global competitors in the development of integrated longevity industry ecosystems, some of which will focus on specific sectors tuned to their unique strengths, while others will seek to create fully integrated hubs encompassing the entire multifaceted scope of the longevity industry. Whether the US will embrace this wave of change remains to be seen – what is clear, however, is that the nation's future health and wealth depend upon it. With its strong domestic longevity industry and strengths in AI, the US could quickly become a global leader in the application of AI for longevity, preventive medicine and precision health.

Policy Implications: National Government Strategy to Narrow the Gap Between Life Expectancy and HALE at Birth

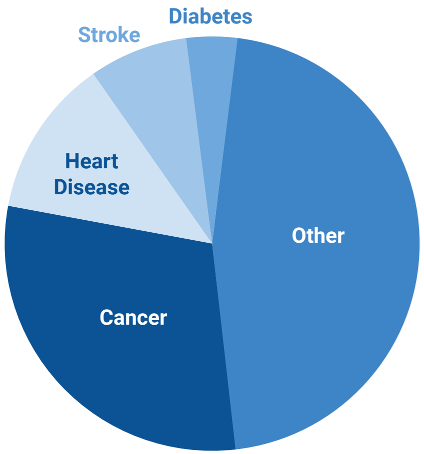
A degree of government initiative can always be found behind any ecosystem for cross-sector collaboration between industry, academia and non-profits focused on longevity. For instance, in Switzerland it is the job of the Swiss Federal Administration to maintain and develop as good a framework as possible for biomedical research and technology, and at the same time to enable its citizens to benefit physically from the achievements of biomedicine and offer them affordable access to the latest biomedical products. It is responsible for the legal framework (for example, in relation to human research, therapeutic products, cancer registers and e-patient dossiers) and is charged with ensuring that the health care system remains high-quality, effective and affordable.

Despite its *laissez faire* political tradition, it is not unprecedented for the United States to rapidly develop government programs for building synergies that combine old sciences into revolutionary new technologies. On the cusp of the "moon shot," for example, the prerequisite sciences for interplanetary travel – rocketry, Newtonian physics, mathematics and basic astronomy were already centuries-old. It was the added enhancements of precision and predictiveness, brought about by digitization, with substantial government initiative, commitment and funding thrown in, which opened the doors to another world. Likewise, from this point on, advancing the longevity industry (including tackling metabesity) is less a matter of improving its constituent sciences and technologies, and more a matter of enhancing its precision through data aggregation. This is a far cry from the alternative priority of investing in basic research into "frontier technologies" in the hope of remote future breakthroughs which, though potentially revolutionary, are still decades away from fruition.

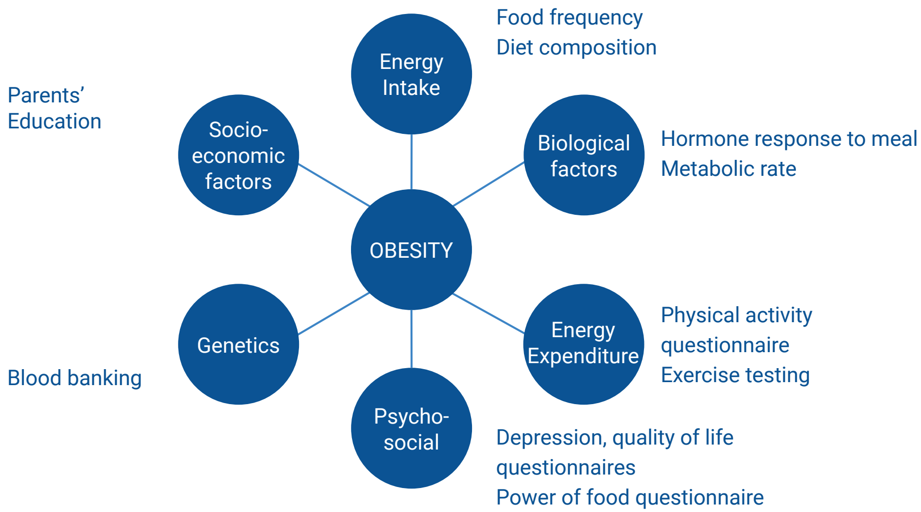
The USA holds the greatest share of the multi-trillion dollar global longevity economy and the majority share of global longevity industry companies and players. It also has one of the highest rates of health care expenditure. The nation therefore has all the resources necessary to become a global leader in longevity, preventive medicine and precision health, and national healthy longevity. Yet it lacks prioritization of these objectives by the federal government, and a strategy to unite the activities of its longevity industry, AI, and preventive medicine to work in synergy, rather than in discoordination. America's low HALE and high gap between HALE and life expectancy at birth is not a scientific problem, but a policy issue.

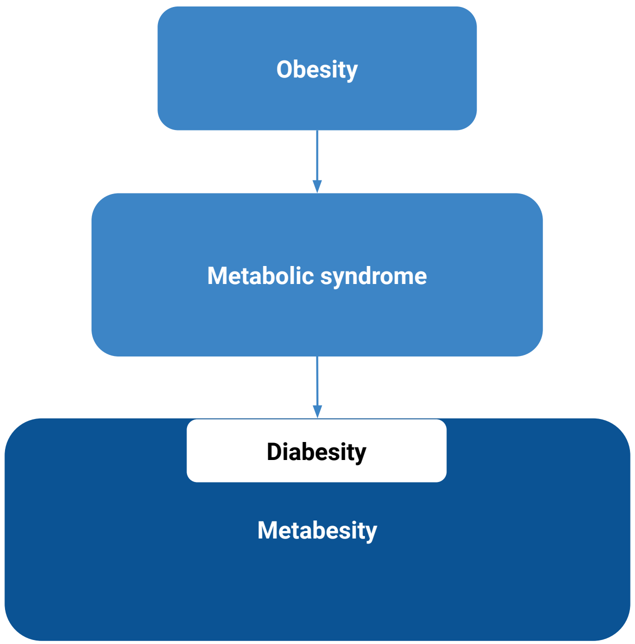
Infographics Summary

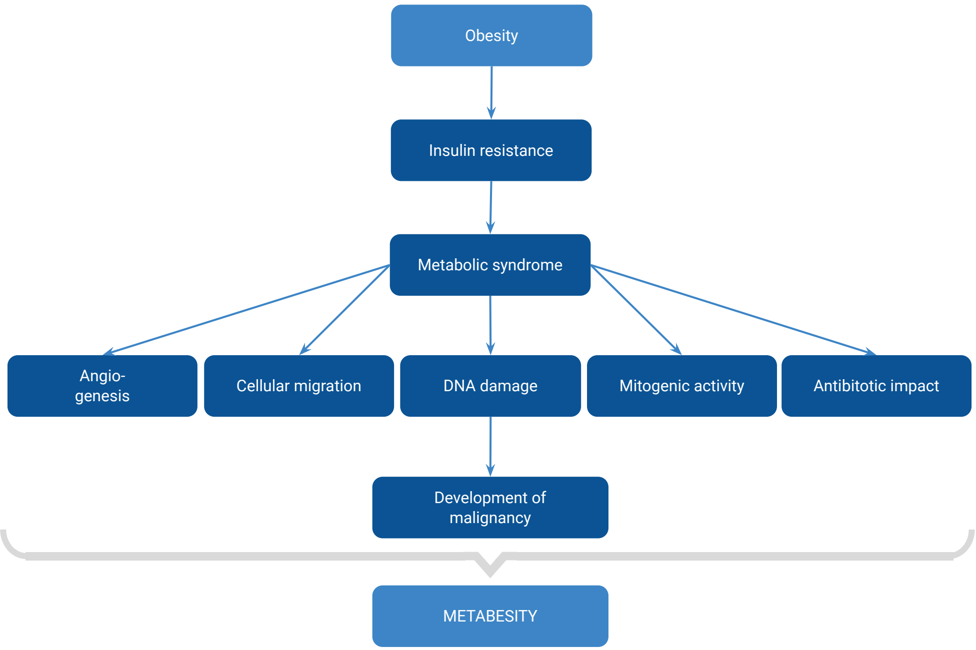
Causes of Death



Over 50% of deaths are from obesity-related chronic diseases







Source: Institute for Health Metrics and Evaluation

United States: Top Risk Factors (I)

Metabolic risks
Environmental/occupational risks
Behavioral risks

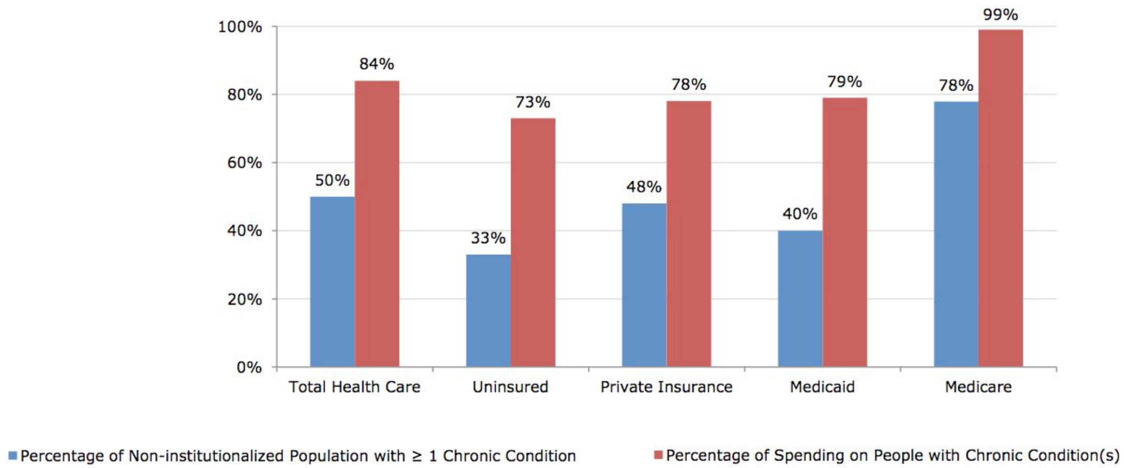
2007 ranking		2017 ranking		% change 2007-2017
Tobacco	1	1	High body-mass index	22.4%
Dietary risks	2	2	Tobacco	-3.1%
High body-mass index	3	3	Dietary risks	9.8%
High fasting plasma glucose	4	4	High fasting plasma glucose	26.5%
High blood pressure	5	5	High blood pressure	11.9%
High LDL	6	6	Drug use	67.0%
Drug use	7	7	Alcohol use	15.9%
Alcohol use	8	8	High LDL	-1.4%
Air pollution	9	9	Impaired kidney function	23.2%
Impaired kidney function	10	10	Occupational risks	7.4%
Occupational risks	11	11	Air pollution	-5.0%

United States: Top Risk Factors (II)

2007 ranking		2017 ranking		% change 2007-2017
Ischemic heart disease	1	1	Ischemic heart disease	4.3%
Alzheimer's disease	2	2	Alzheimer's disease	30.8%
Lung cancer	3	3	Lung cancer	9.6%
Stroke	4	4	Stroke	11.0%
COPD	5	5	COPD	22.4%
Lower respiratory infect	6	6	Lower respiratory infect	17.1%
Colorectal cancer	7	7	Chronic kidney disease	37.4%
Diabetes	8	8	Colorectal cancer	13.9%
Chronic kidney disease	9	9	Diabetes	2.5%
Cirrhosis	10	10	Drug use disorders	163.1%
Drug use disorders	11	11	Cirrhosis	29.6%

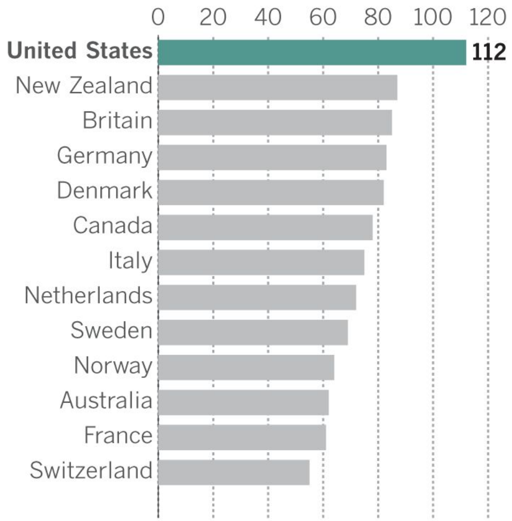
Source: IHME

People with Chronic Conditions Account for 84% of National Health Care Dollars and 99% of Medicare Spending



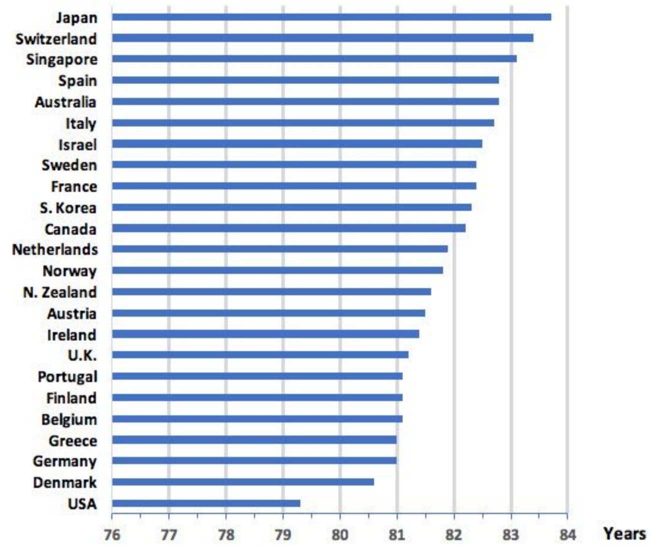
Sources: Medical Expenditure Panel Survey, 2006 and Robert Wood Johnson Foundation, Chronic. Care: Making the Case for Ongoing Care, February 2010

Number of deaths per 100,000 from preventable diseases or complications had adequate health care been available (2013)



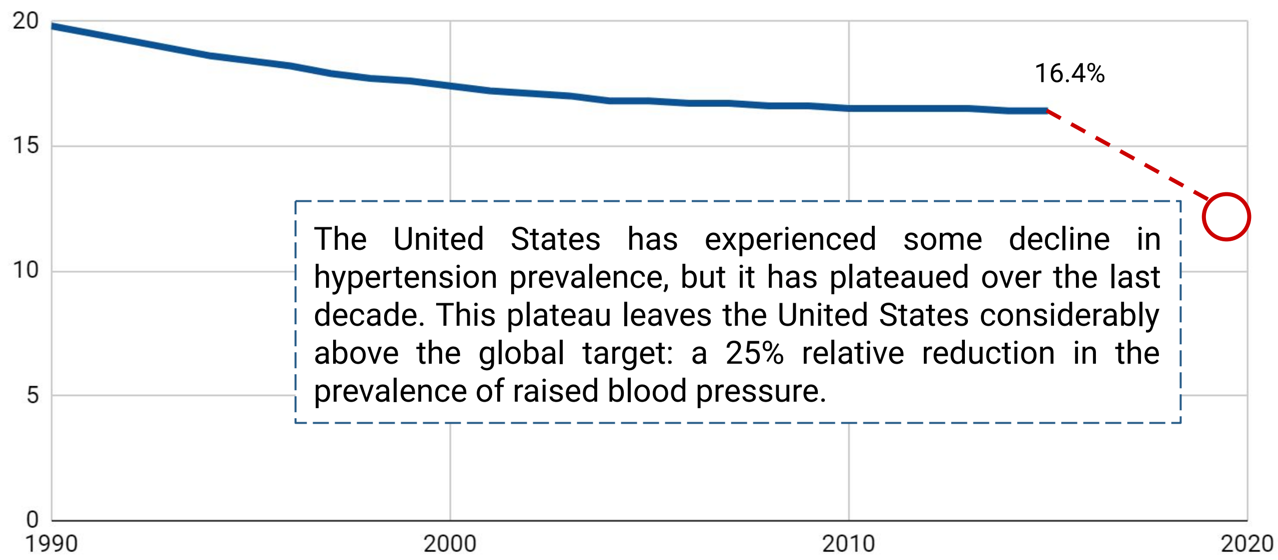
Source: America's Health Rankings | AHR

Life expectancy at birth (2016)

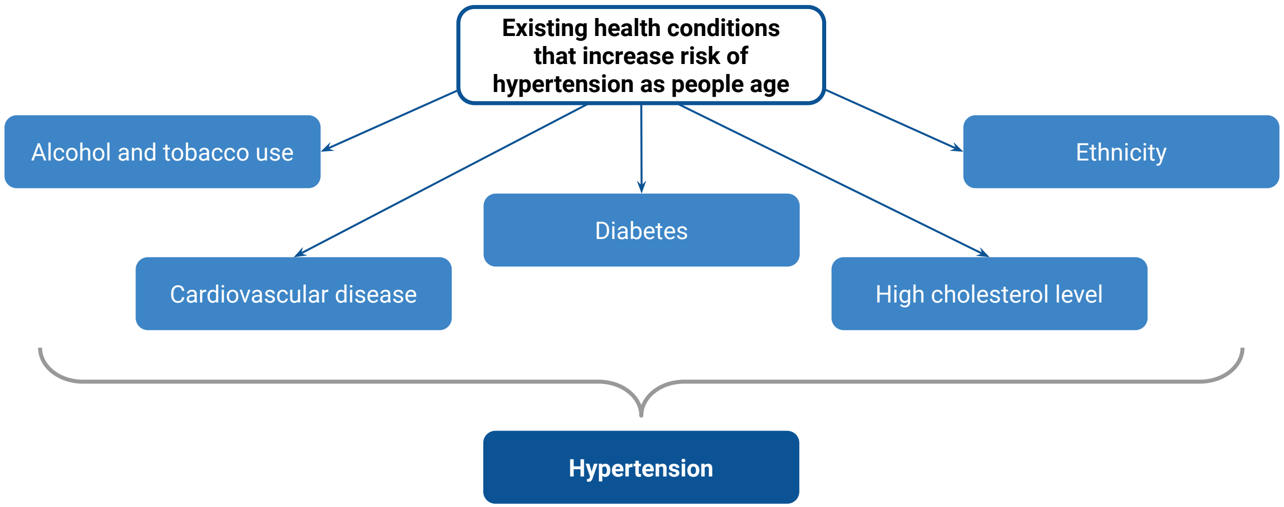


Source: Los Angeles Times

In the United States 16.4% of adults have high hypertension (SBP≥140 or DBP≥90). Men are 1.2 times more likely than women to have high hypertension.



Raised blood pressure, % of adult population

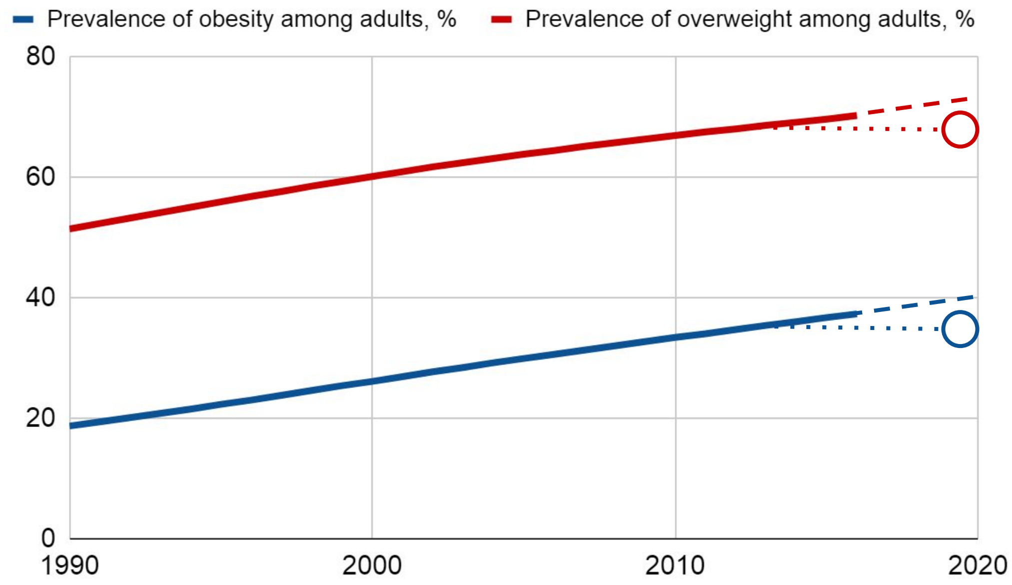


Source: World Health Organization | Risk Factors

The WHO and OECD indicate that the US has the greatest prevalence of obesity among high-income countries. Over a third of the US is obese, compared to just over a fifth on average in comparable countries.

OECD Rank (Global Rank)	Country	% of Adult Population that is Obese
1 (12)	**United States**	**36.2**
2 (17)	Turkey	32.1
3 (22)	New Zealand	30.8
4 (26)	Canada	29.4
5 (27)	Australia	29.0
6 (28)	Mexico	28.9
7 (32)	Chile	28.0
8 (33)	United Kingdom	27.8
9 (41)	Hungary	26.4
10 (44)	Israel	26.1

Current trends of increase in obesity across the United States deviates from the global target of the noncommunicable diseases action plan 2015-2020 to halt the rise in obesity



Multiple studies demonstrate that obesity reduces lifespan, with a loss of 9-13 years of life for individuals with BMI >35. It is possible that health and life expectancy gains could be even greater if it was not for the increasing prevalence of extreme obesity.

Prevalence of More Extreme Obesity

- The most robust estimates of the association between BMI and mortality suggest that the mortality risk from excess body weight increases from a BMI of 25 but is not substantial until BMI exceeds 32–35. The Global BMI Mortality Collaboration demonstrates evidence of a 31% increase in risk of premature death for every 5 BMI unit increase over 25, with an overall increased mortality risk of 45% for stage 1 obesity and 94% for stage 2 obesity.

Reversal of Relationship in Old Age

- In old age, those of low body weight are at a higher risk of disability (limitations to activities of daily living) and mortality. The relationship between obesity and health appears to reverse in old age.

Source: World Health Organization | Risk Factors | Journal of Obesity | The Global BMI Mortality Collaboration

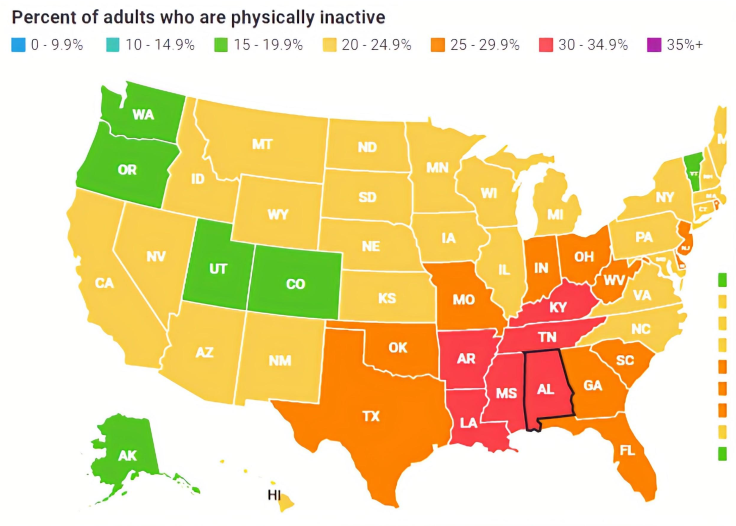
In the United States, prevalence of insufficient physical activity among adults equals 40% of the age group 18+ years. The share of American women who are physically inactive is more than 1.51 times that of men.

Insufficient physical activity is one of the 10 leading risk factors for global mortality.

People who are insufficiently physically active have a 20–30% increased risk of all-cause mortality.

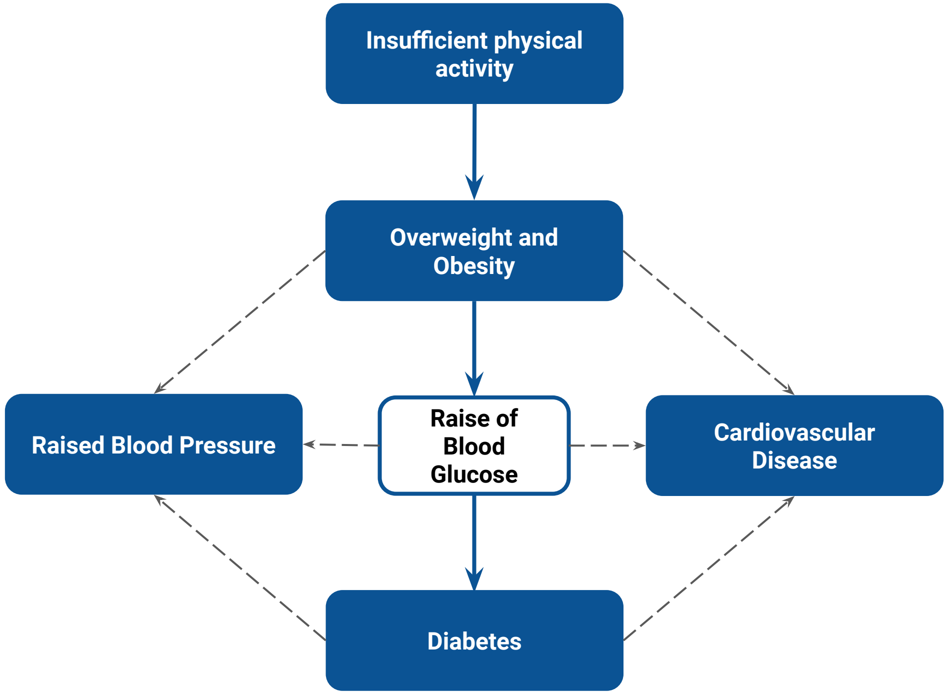
Insufficient physical activity is a key risk factor for noncommunicable diseases (NCDs), such as cardiovascular diseases, cancer and diabetes.

Adults aged 65 and over reported the highest prevalence of physical inactivity (32.1%) followed by adults aged 45 to 64 and younger adults aged 18 to 44.



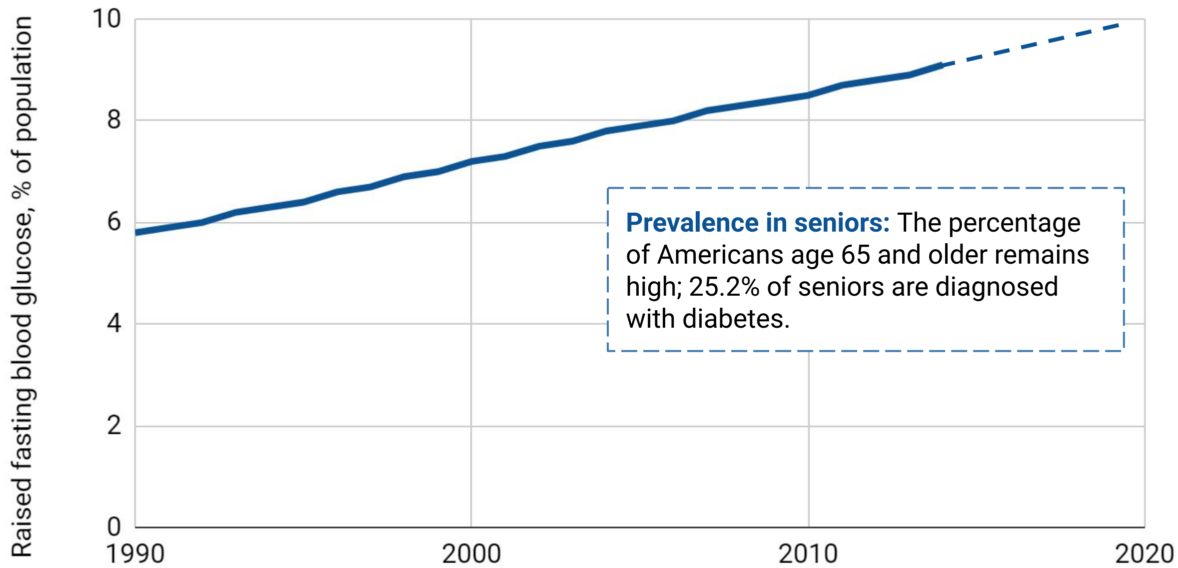
Sources: Behavioral Risk Factor Surveillance System and The State of Obesity

The United States, as a WHO Member State, has agreed to reduce insufficient physical activity by 10% by 2025.



Source: World Health Organization | Risk Factors | The State of Obesity

In the United States, adults with raised fasting blood glucose (≥7.0 mmol/L or on medication) account for 9.4% of respective age group. Men are 1.18 times more at risk for raised fasting blood glucose than women.



Diabetes remains the 7th leading cause of death in the United States

Risk factors of diabetes

Excess body fat

85.2% of people in the United States with type 2 diabetes are overweight or obese.

High blood pressure

Adults with diabetes are significantly more likely to die from a heart attack or stroke.

Higher age

A person with diagnosed diabetes at age 50 dies 6 years earlier than a counterpart without diabetes.

Metabesity

Source: World Health Organization | Risk Factors | ADA

The Burden of Cancer in the United States

In 2018, an estimated 1,735,350 new cases of cancer will be diagnosed in the United States, and 609,640 people will die from the disease.

Approximately 38.4% of men and women will be diagnosed with cancer at some point during their lifetimes (based on 2013–2015 data).

The number of cancer survivors is expected to increase to 20.3 million by 2026.

The most common cancer (listed in descending order according to estimated new cases in 2018) is breast cancer.

Cancer mortality is higher among men than women (196.8 per 100,000 men and 139.6 per 100,000 women).

Estimated national expenditures for cancer care in the United States in 2017 were $147.3 billion.

Source: National Cancer Institute

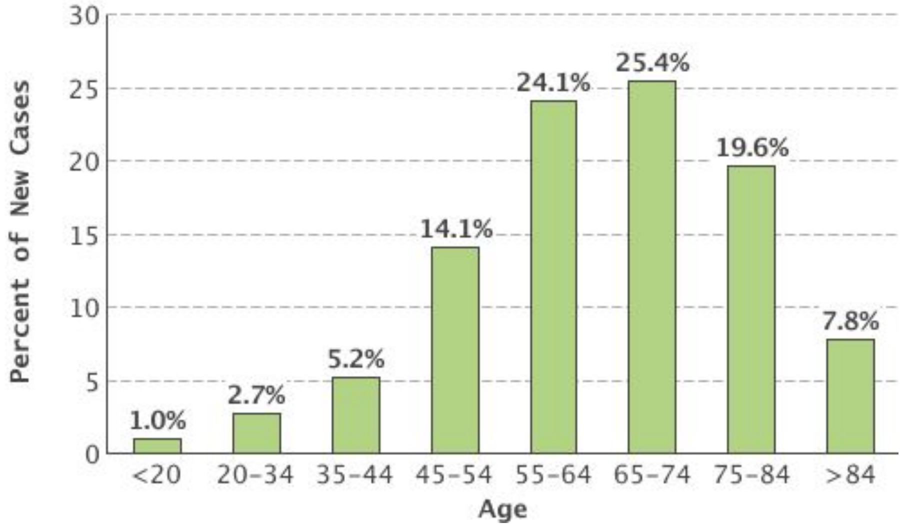
In the United States, the overall cancer death rate has declined since the early 1990s.

1991 – – – – → 2015

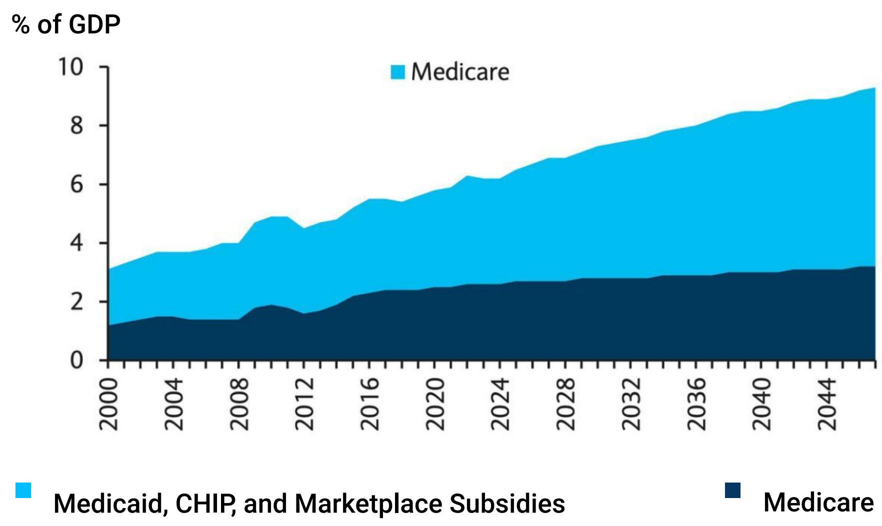
The overall cancer death rate in the United States fell by

↓ 26%.

Advancing age is the most important risk factor for cancer overall, and for many individual cancer types.



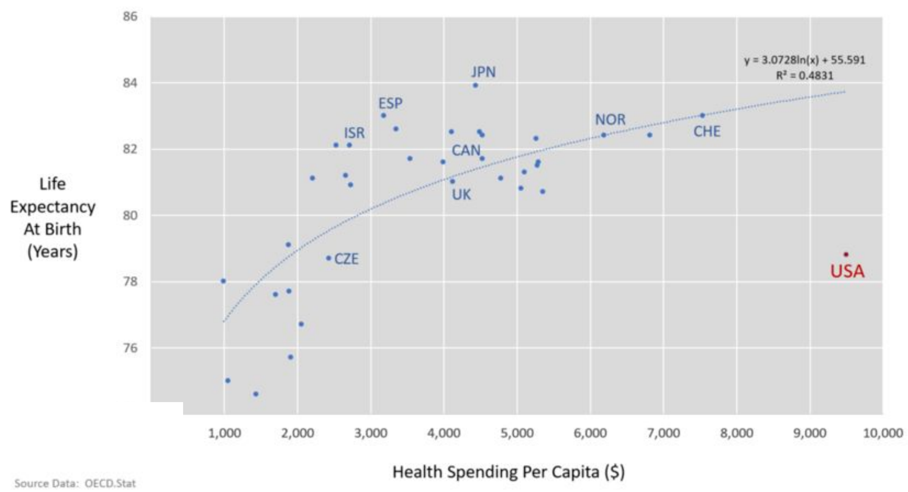
Federal spending on health care has increased substantially over the past several decades. Health spending growth has outpaced growth of the United States economy.



Life expectancy increases with increase in GDP per capita. The wide variation in the life expectancies for countries with high GDP per capita would be due to health care policy and health status of the population.

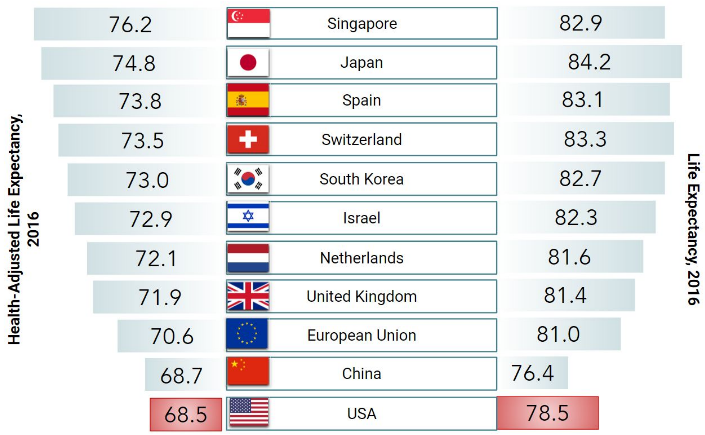
Sources: World Economic Outlook | Geoba.se - Life Expectancy

Relation between life expectancy at birth and health spending per capita shows that life expectancy at birth increases at a decreasing rate with respect to health care spending per capita.



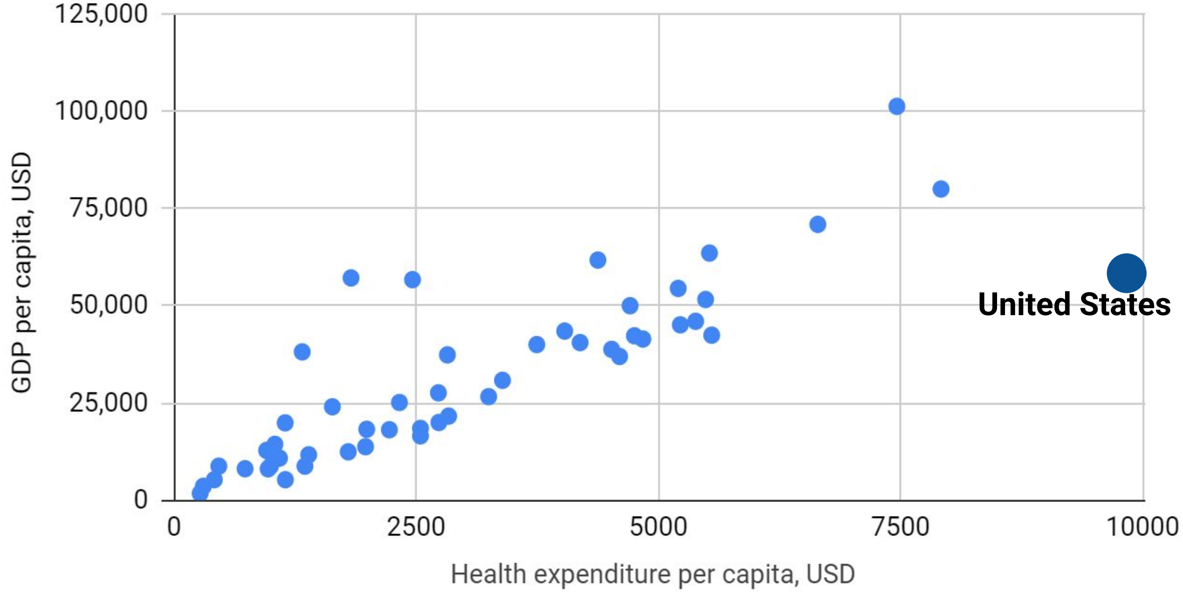
Source: OECD Statistics

Health-Adjusted Life Expectancy (HALE), used here as a measure of healthy longevity, is the average number of years an individual can expect to live free of chronic age-related disease.

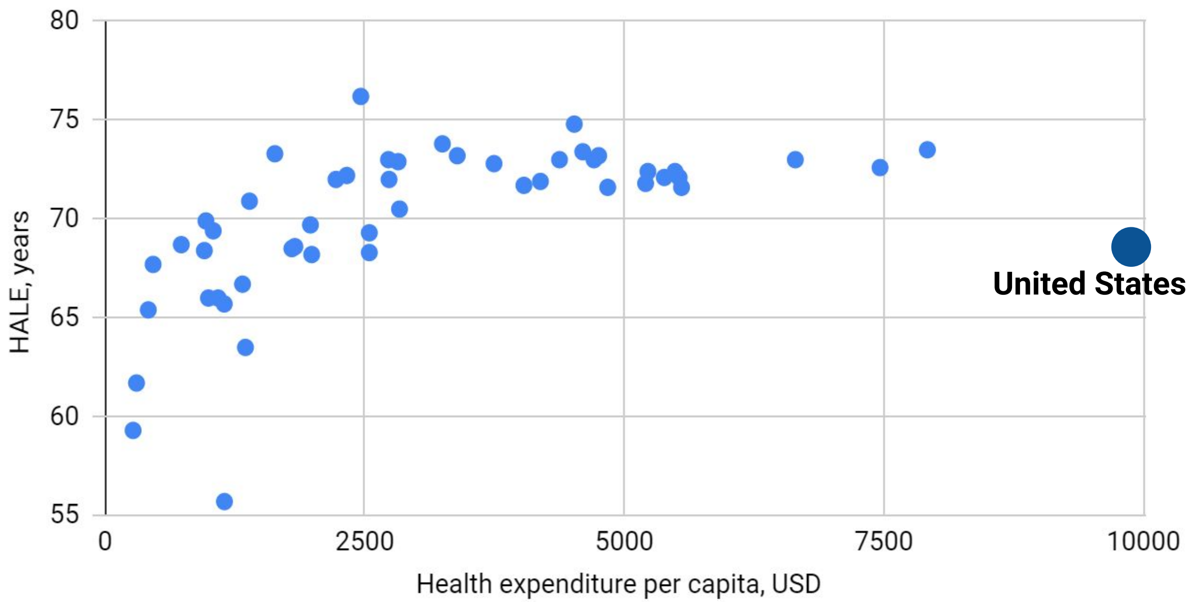


Source: GHO Life expectancy and HALE

Wealthy countries like Norway, Switzerland, Luxemburg, and Sweden tend to spend more per person on health care and related expenses than lower income countries such as India, Brazil, South Africa and Indonesia. However, even as a high-income country, the US spends more per person on health than comparable countries.

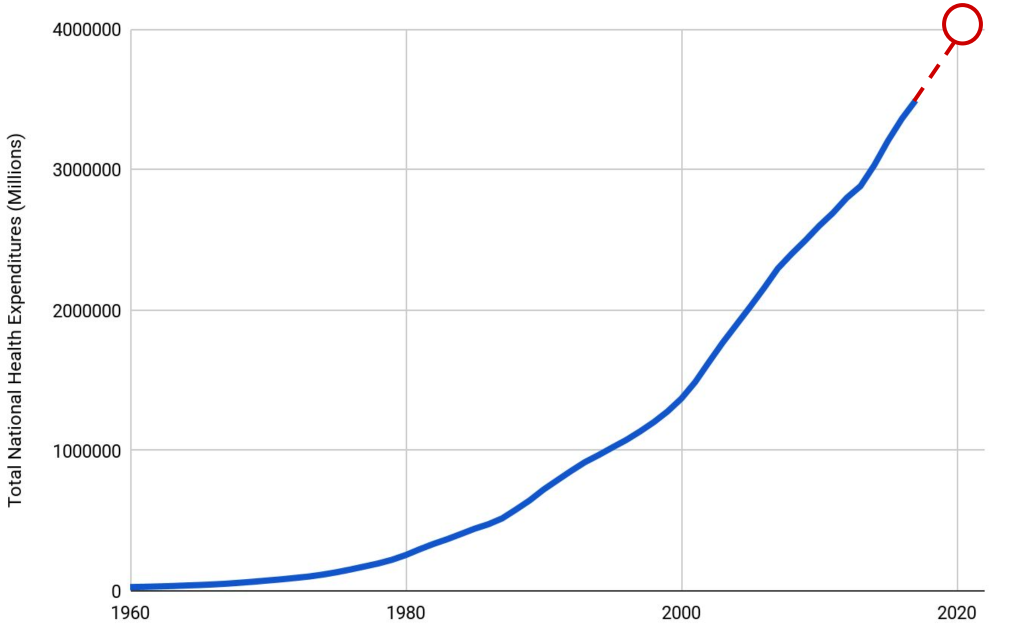


The most evident difference in effectiveness of government expenditures on health care is between the United States and Singapore. These countries are approximately of the same level of wealth, but lower health care spending per capita in Singapore contributes to higher Health Adjusted Life Expectancy (HALE) compared to the United States.

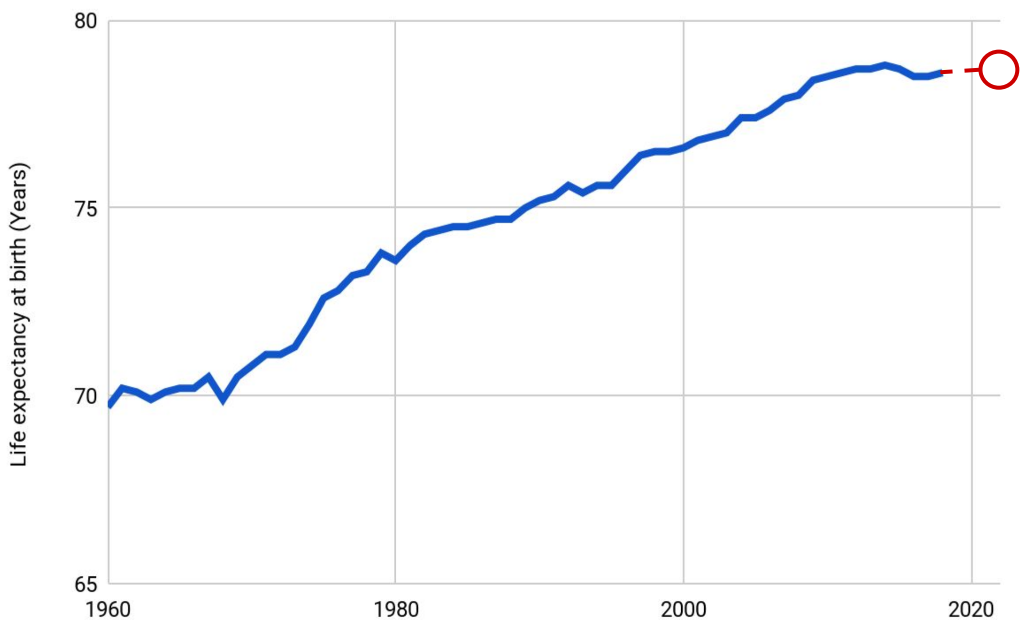


Source: OECD WHO

In the United States, there has been a rapid increase of total national health expenditure (millions $) over time. In 2017, this figure reached an enormous value of almost 3.5 trillion dollars. There is a trend of further expenditure increase in this field.

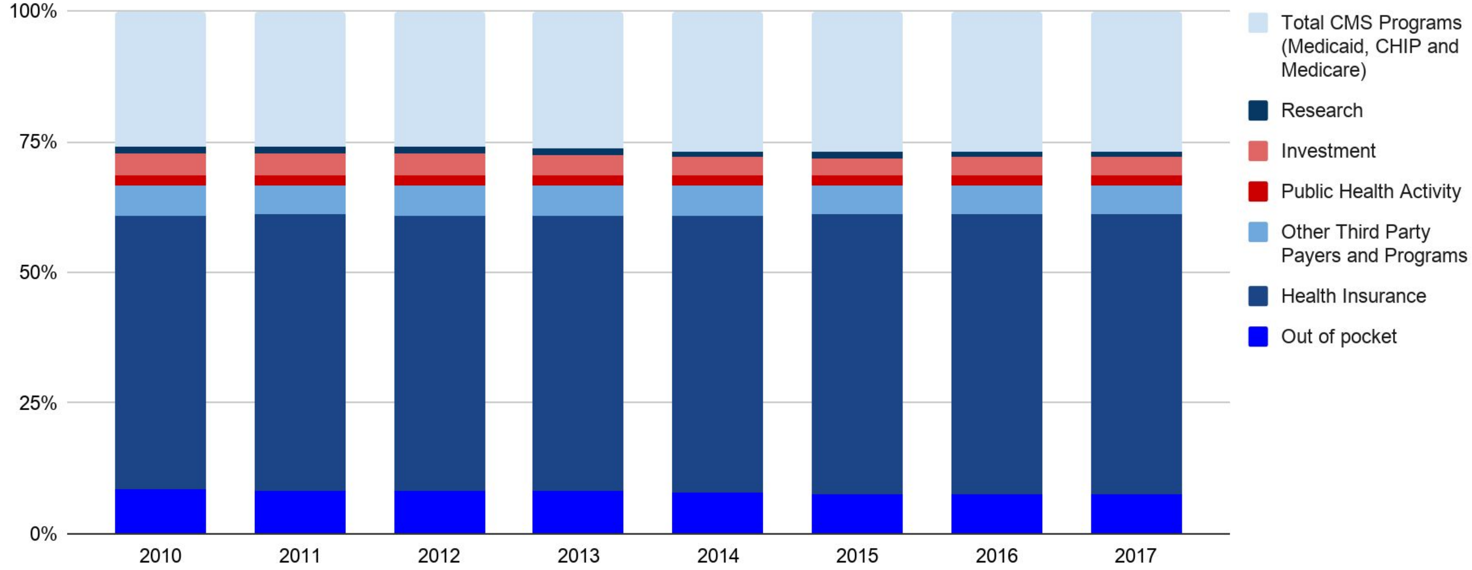


Despite the increasing total national health expenditure, there is an opposite trend in life expectancy at birth (years). The amount of decrease in life expectancy is less alarming than the fact that addiction and a decline in the emotional wellbeing of Americans have contributed significantly to decrease of the average length of life in the United States.

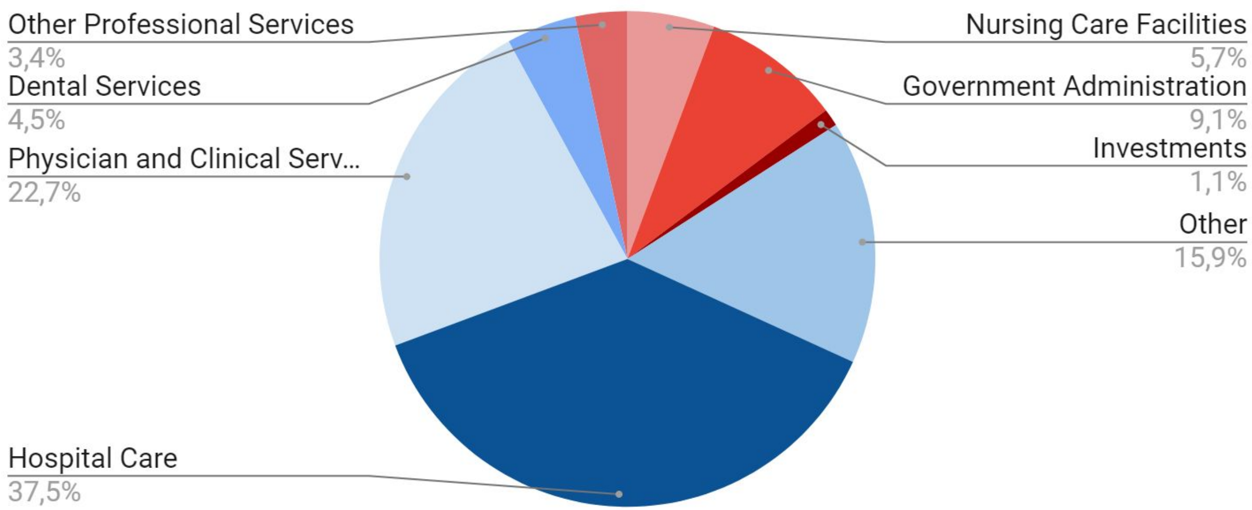


Source: The World Bank | CMS.gov

In the United States, the structure of health care expenditures by sources of funding is stable during previous years. The growth of total health care expenditures is proportional to growth of all types of financing. Health insurance contributes the most (53.7%) toward total health care expenditures in 2017.



Where the United States Health Dollar ($3.5 trillion in 2017) Went

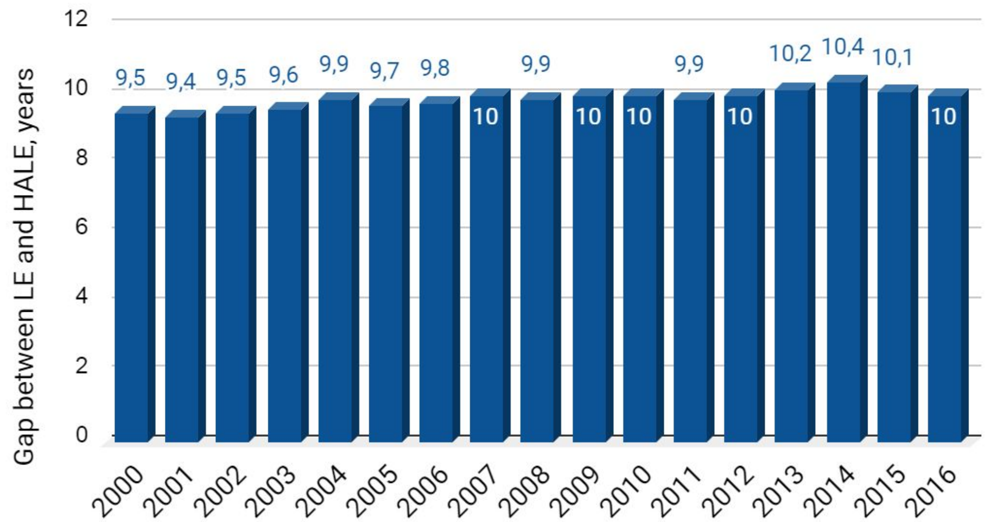


Source: CMS.gov

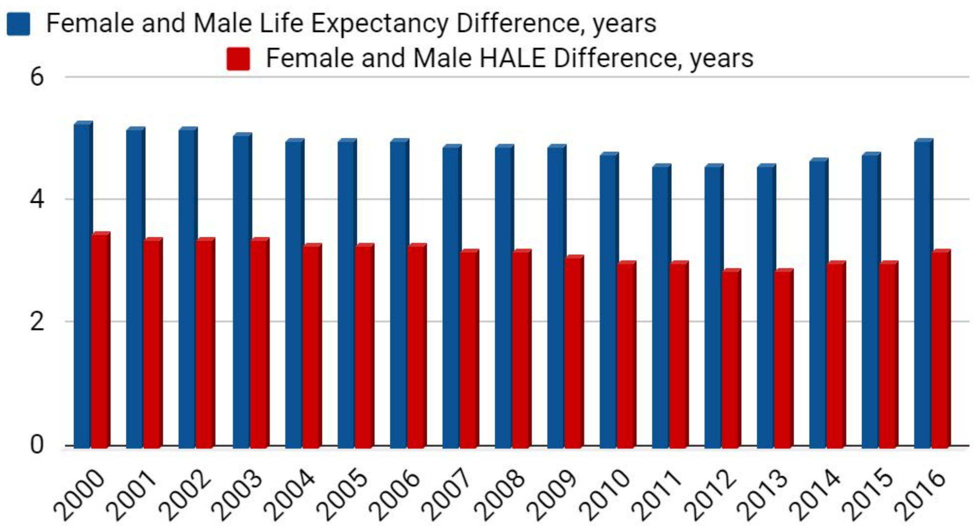
Healthy Life Expectancy – Compared of US States

US States with Longest *Healthy* Life Expectancy	US States with Shortest *Healthy* Life Expectancy
1. Minnesota - 70.3 healthy years	50. West Virginia - 63.8 healthy years
2. Hawaii - 70.1 healthy years	49. Kentucky - 64.3 healthy years
3. California - 69.9 healthy years	48. Oklahoma - 64.5 healthy years
4. Washington - 69.1 healthy years	47. Alabama - 64.6 healthy years
5. Vermont - 69 healthy years	46. Mississippi - 64.9 healthy years

Trends in Gap Between Life Expectancy and Health-Adjusted Life Expectancy



The difference in life expectancy at birth between white men and women declined from 5.3 years longer lives for women in 2000 to 4.7 years in 2013. Since 2014, the difference has begun to rise.

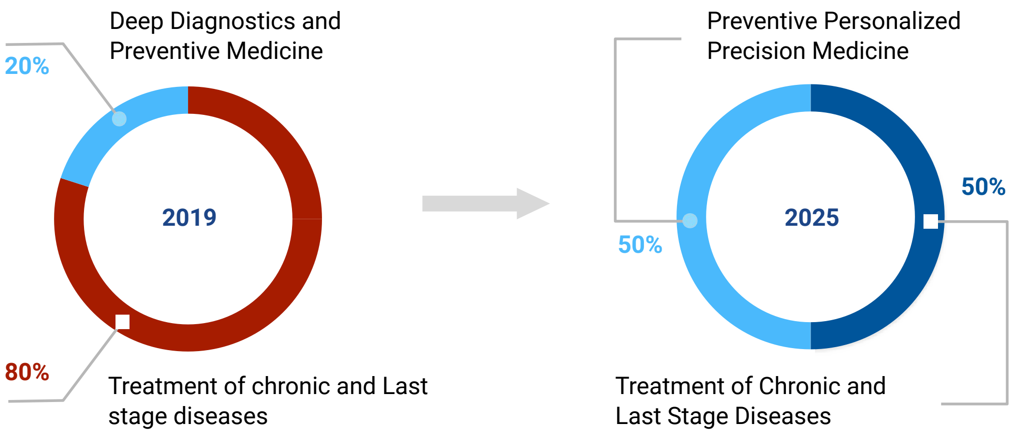


The average life expectancy in the US has been on the decline for three consecutive years since 2014.

Indicators	Absolute change (years)		
	2000-2005	2005-2010	2011-2016
Life Expectancy at birth	0.7	1.1	-0.3
Healthy life expectancy at birth	0.5	0.8	-0.4
Life Expectancy at age 60 years	0.7	0.9	0
Healthy life expectancy at age 60 years	1	0.6	0.1

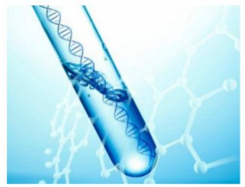
Source: World Health Organization | Risk Factors | Business Insider

Paradigm Shift from Treatment to Prevention



Preventive Treatment

- Gene therapies
- Cell therapies
- Tissue engineering
- Small molecules & biologics
- Natural mimetics of validated geroprotectors (e.g. metformin, rapamycin)
- Genetically engineered cell therapies
- 3D bioprinting
- Microbiome engineering



This eclectic range of biotechnologies owe their "preventive medicine" status to the fact that each can be applied (and micro-adjusted) in response to continuous monitoring of biomarkers.

Precision Diagnostics (I)

Digital avatar visualizes a combination of biomarkers and other diagnostic results

Collect your data today:

- Blood samples
- Biomarker analysis
- Database of personal biomedical data stored on blockchain

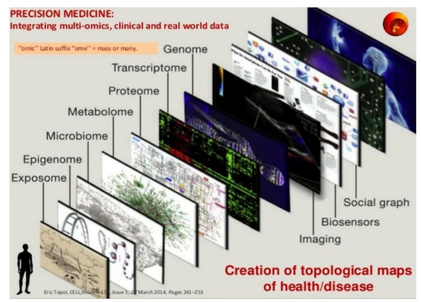
Future benefits:

- Data driven analysis of biomarkers dynamics over time
- Analyse the changes in your digital avatar
- Personalized interventions

In order to achieve an optimal panel of aging biomarkers for precision diagnosis data must be taken using multiple health variables from people who are not currently patients. This is an almost entirely impractical task to do manually.

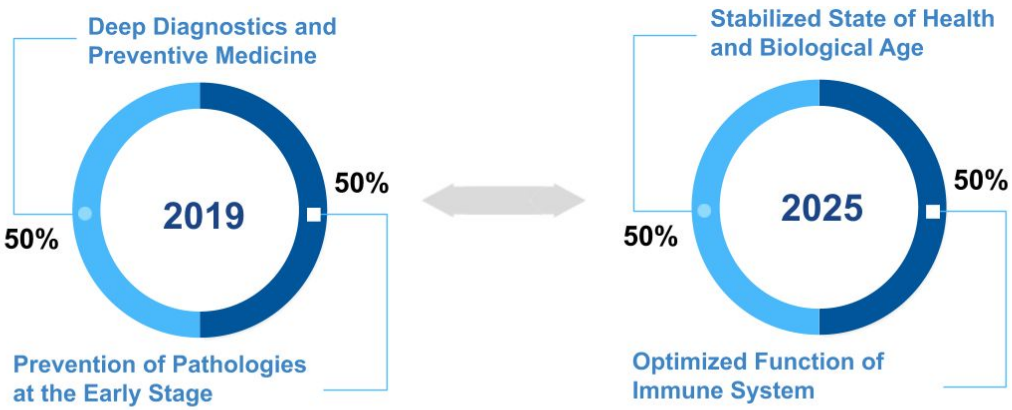
Precision Diagnostics (II)

- Multi-Omics Sequencing
- Non-invasive continuous monitoring of biomarkers
- Multi-modal total-body imaging
- Qualitative functional tests
- Whole-body and organ specific biological age calculation based on biomarkers
- 3D integration of cross-sectional tissue and organ imaging

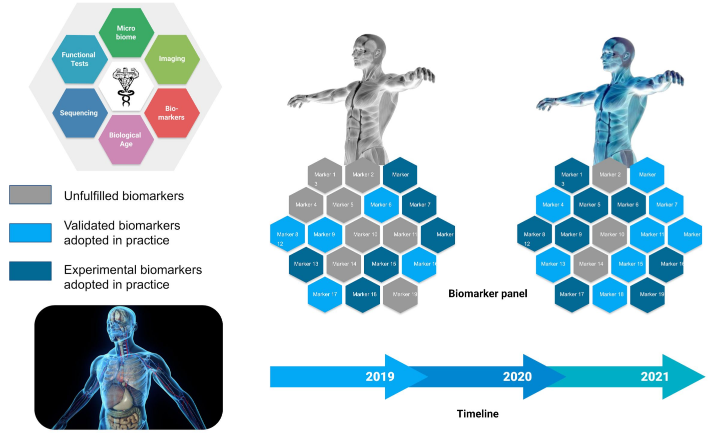



The diagnostic technologies of the future will be grounded in bodies of data which are incomprehensibly vast, spanning every determining stage in the development of pathology, from the exposome to the genome.

The New Frontier - from Precision Medicine to Precision Health

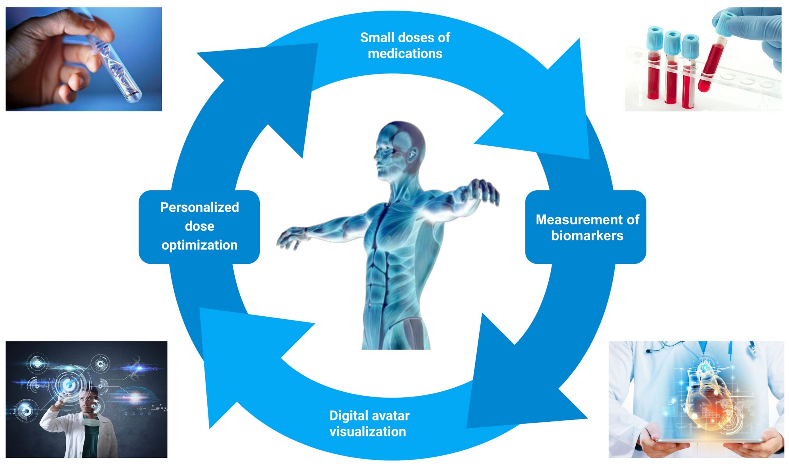


Development of "Minimum Viable" and "Most Comprehensive" Panels of Biomarkers of Aging



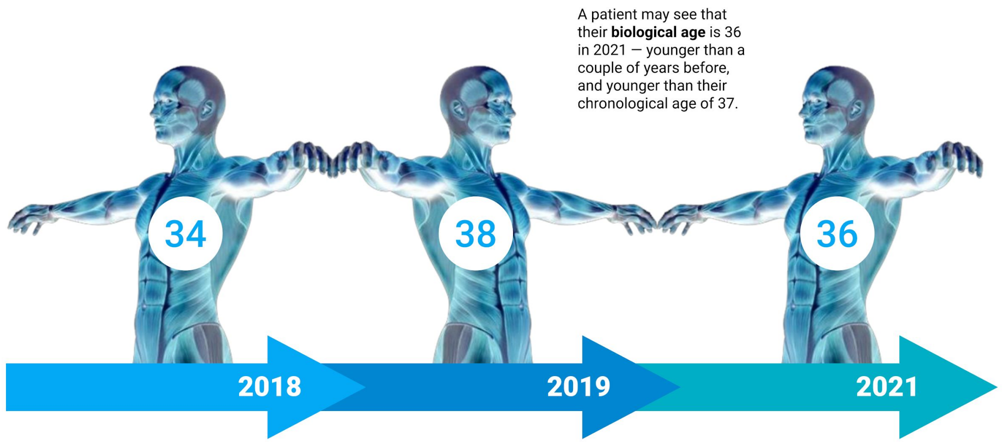
As the precision health industry is grown and developed to scale, we will see an increasing emphasis on the creation and validation of a wide diversity of biomarkers of aging come into use, which will enable the extension of healthspan and the maintenance of optimal health for the majority of citizens' lifespans via continuous, AI-empowered monitoring of fluctuations in personalized biomarkers of aging.

Precision Diagnostics: New Intervention



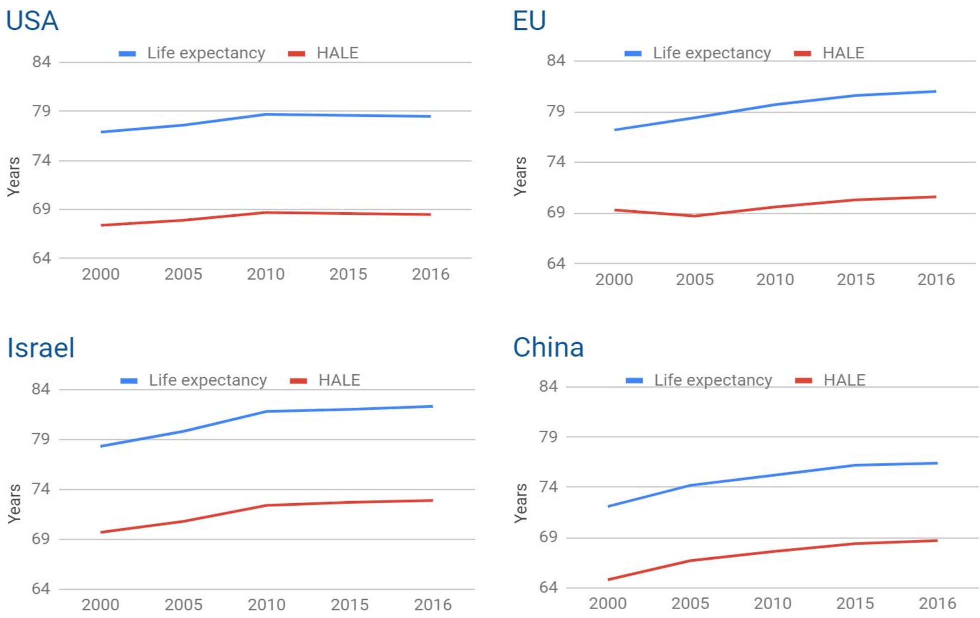
Not only do new methods of standard industry benchmarking and forecasting need to be developed to combat the issues of overcomplexity and multidimensionality in the longevity industry, but new methods of testing the basic safety and efficacy of longevity and precision health diagnostics, prognostics and therapeutics need to be adapted as well, moving away from the use of model organisms, towards a more human-centric approach.

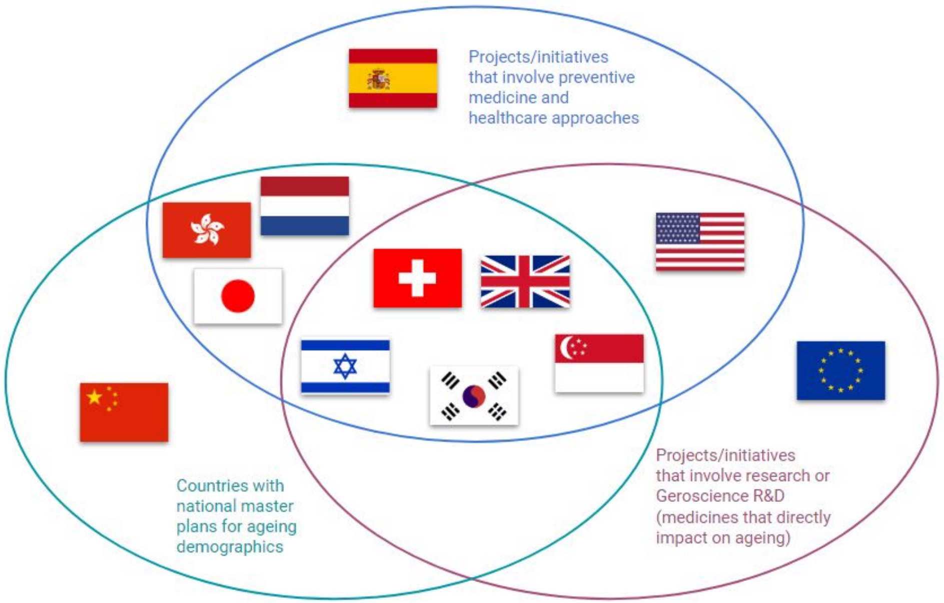
Precision Diagnostics



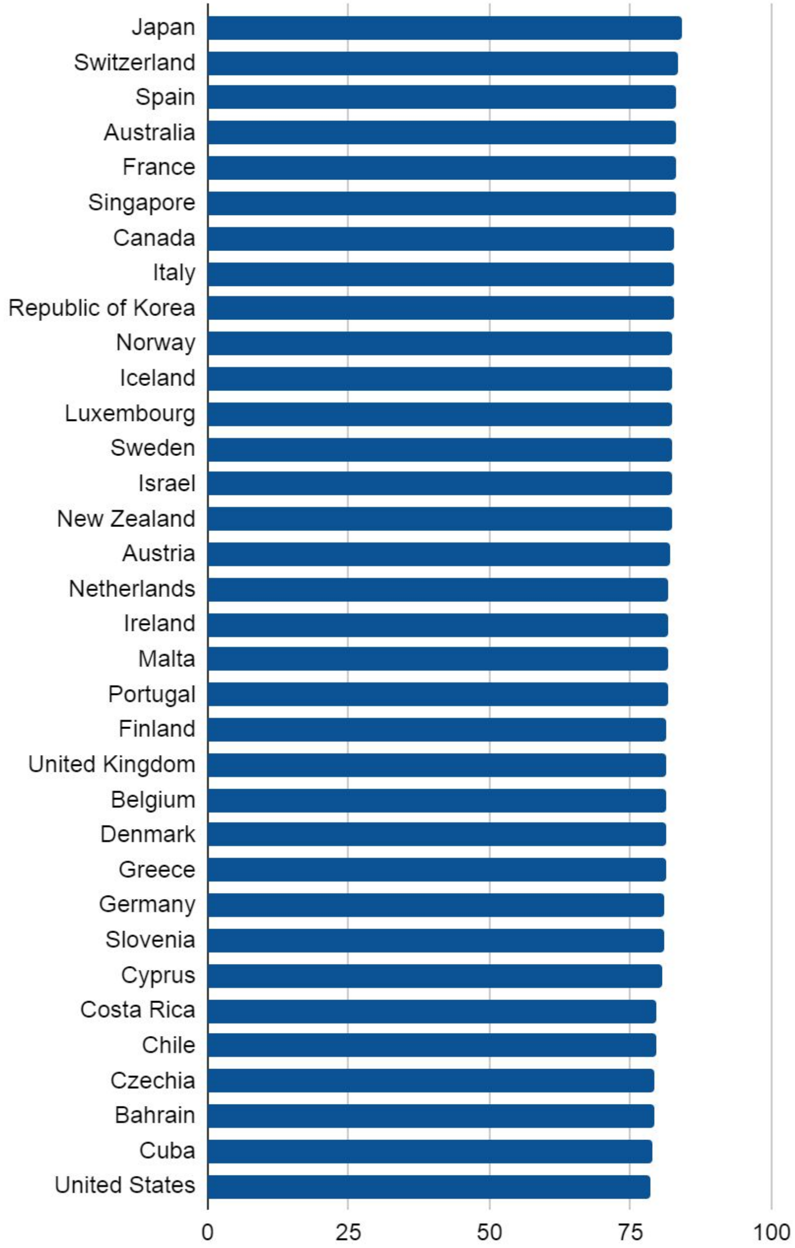
Gathering aging biomarkers means collecting data which marks the difference between healthy people only (e.g., between the young and even younger), with no traces of any officially recognized diseases. The continuous monitoring of small changes in such biomarkers, and the continuous and commensurate micro-adjustment of treatments in response, allow for some de facto reversal of biological age.

Health-Adjusted Life Expectancy vs. Life Expectancy (2000-2016)





Countries with longest life expectancy (2016)



Source: WHO

USA Government-led Longevity Initiatives Level of Comprehensiveness

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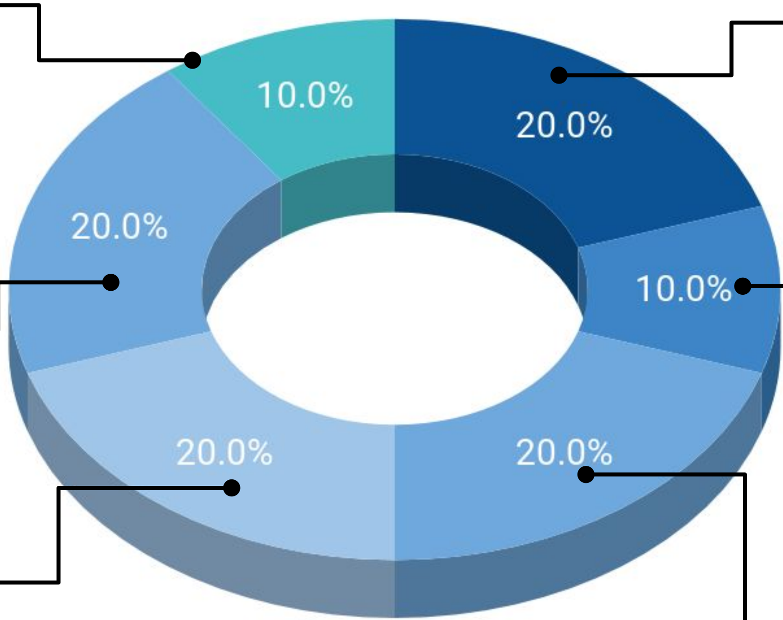


Financial Reform

ACL Strategic Plan

National Master Plan on Aging

State Plan on Aging

CIAIP

Elderly Health Care Vouchers

Medicaid

Affordable Care Act

Healthy Aging: Lifestyle and Fitness Programs

Healthy Aging Program

GO4Life

Non-medical Initiatives

Feeding America

Geroscience R&D

Building Our Largest Dementia (BOLD) Infrastructure for Alzheimer's Act

NIH National Institute on Aging: Aging Well in the 21st Century

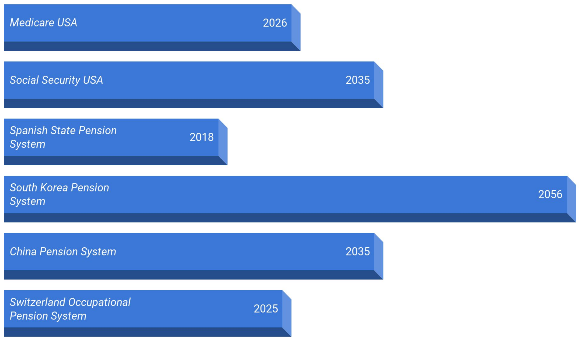
Underrepresented Initiatives

Preventive Medicine	AgeTech	Longevity Industrial Strategy	Continuing Education

The United States spends a disproportionate amount on health care, comparing to Singapore, but HALE is relatively low

Singapore	United States
HALE: 76.2	HALE: 68.5
HALE GAP: 6.7	HALE GAP: 10.0
Life Expectancy: 82.9	Life Expectancy: 78.5
Healthcare Efficiency Rank: #2	Healthcare Efficiency Rank: #25
Healthcare Spending: 4.5% GDP	Healthcare Spending: 18% GDP

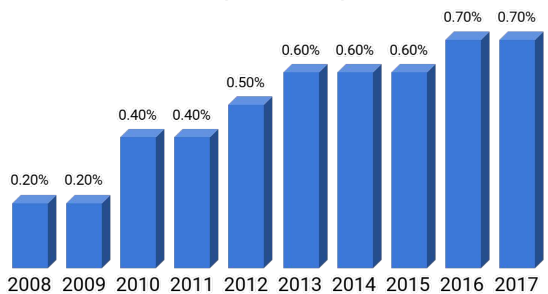
Insolvency Predictions for Government-Funded Schemes



Sources:

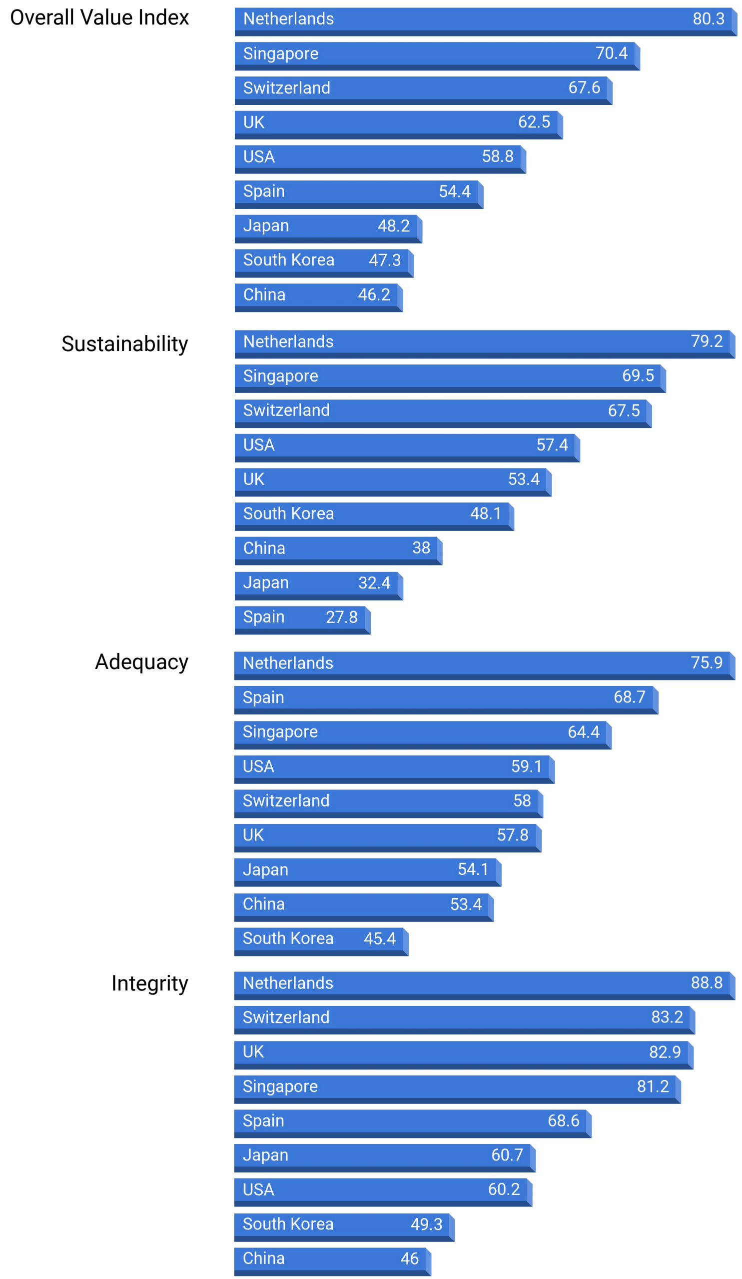
- Bloomberg
- MishTalk
- TheDiplomat
- Reuters
- Financial Times

USA Age Dependency Annual Dynamic



Source: World Bank Data

Countries with longest life expectancy, 2015

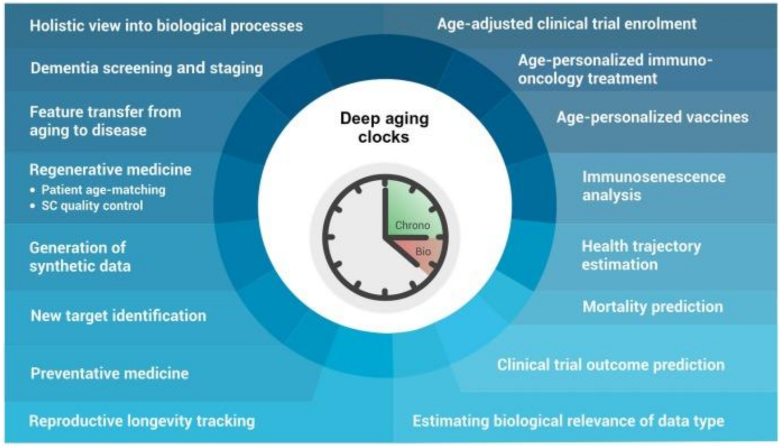


Source: Mercer Global Pension Index

Accelerating the Development of Precision Health through AI

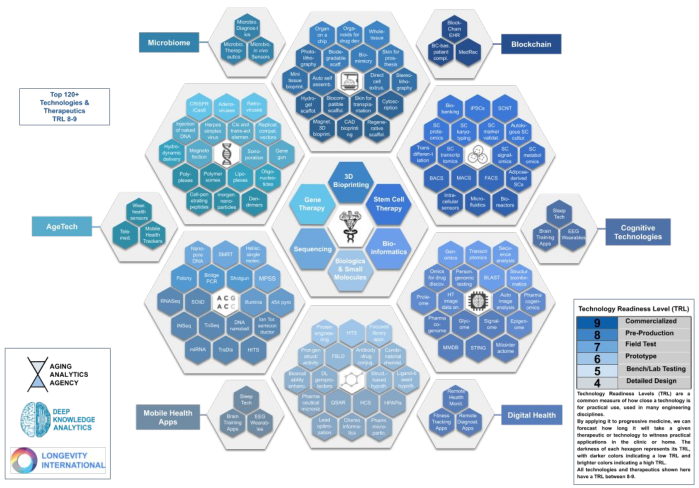
The intensive application of AI to all stages of longevity and preventive medicine R&D has the potential to rapidly accelerate the clinical translation of both validated and experimental diagnostics, prognostics and therapeutics, to empower patients to become the CEOs of their own health through continuous AI-driven monitoring of minor fluctuations in biomarkers, and to accelerate the rapid development of the global longevity industry to scale.

Trends in Pharmacological Sciences



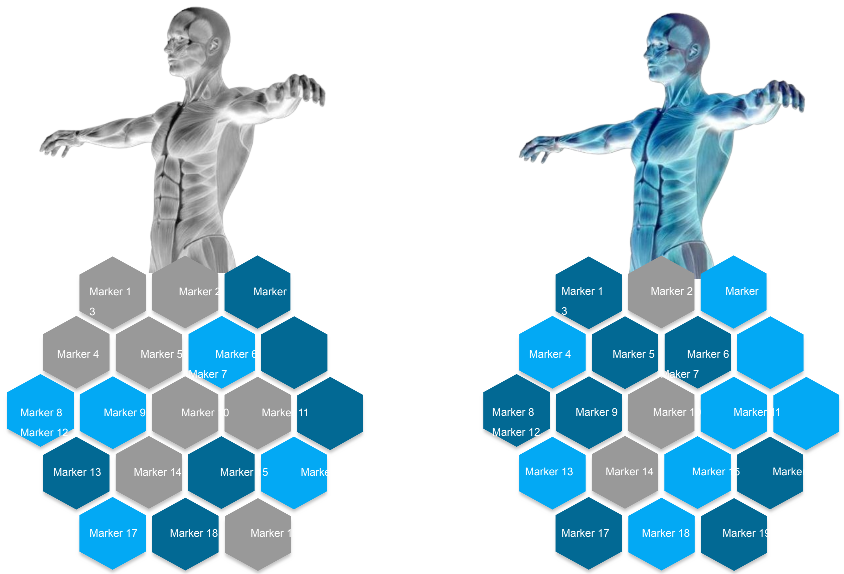
The ongoing shift toward diverse and actionable biomarkers of aging is described at length in [a recent scientific article] by Alex Zhavoronkov, CEO of Insilico Medicine.

The Business of Progressive Medicine 2019: Practical Applications



The quantitative and tangible assessment of technologies, methods, therapies and companies within the longevity space necessitates the use of novel approaches to technological, scientific and industry benchmarking, utilizing methodologies like Technology Readiness Levels (TRLs), which use the expertise of science and technology professionals to assess the market-readiness of products and services, and forecast when their clinical translation will become a reality.

Biomarker Panel



40 Research Hubs

Aging Intervention Foundation	Albert Einstein College of Medicine	Beckman Institute for Cancer and Aging	Berkeley Center on the Economics and Demography of Aging	BioHub
Buck Institute for Research on Aging	Calibr	Center for Digital Innovation	Center for Research & Education on Aging (CREA)	Center On Aging & Health
Cooper Institute	Gladstone Institutes	Glenn Center for Research on Aging	J. Craig Venter Institute	Learning & Longevity Research Network
Life Span Institute	Maximum Life Foundation	Milken Institute Center for the Future of Aging	National Foundation for Cancer Research	National Institute on Aging

40 Research Hubs

NHLBI	QB3	Rand Center for Study of Aging	Salk Institute in San Diego	Sanford Burnham Prebys Medical Discovery Institute
Scripps Research	SENS Research Foundation	SRI International Center for Health Sciences	Stanford / VA / NIA Aging Clinical Research Center	Stanford / VA Alzheimer's Research Center
Stanford Center on Longevity	The Longevity Research Institute	UC San Diego Health Sciences Center for Healthy Aging	UCLA Division of Geriatrics	UCLA Longevity Center
UCLA-Easton Center - Mary S. Easton Center	UCSF Memory and Aging Center	USC Leonard Davis School of Gerontology	USC Longevity Institute	West Health Institute

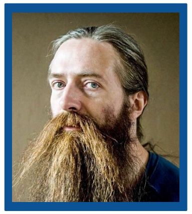
70 Longevity Influencers


Alan Trounson


Alexander Fleming


Ana Maria Cuervo

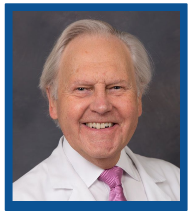

Arielle Burstein

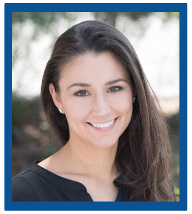

Aubrey de Grey


Bill Andrews

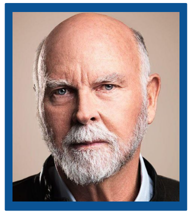

Bill Maris


Bimal Shah


Brian Leyland-Jones


Caitlin Lewis

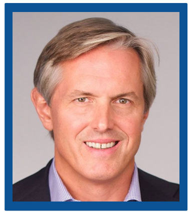

Charles Stacey


Craig Venter


Cynthia Kenyon


David Kekich

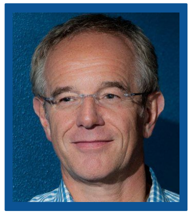

David Sinclair


Dennis Purcell


Diana Dooley


Elizabeth Blackburn


Eric Topol


Eric Verdin

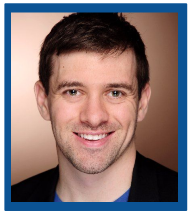

Gary Gibbons


George Martin


Gordon Lithgow


Hal Sternberg


James Kirkland


James Peyer

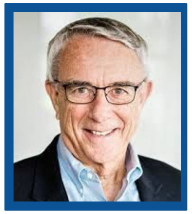

James Williamson

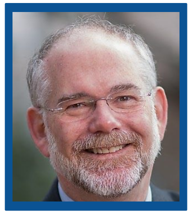

Janet Woodcock


Jeffrey Berkowitz

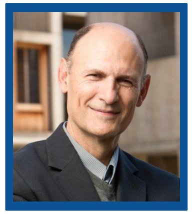

Jennifer Ligibel


Joan Mannick


Joe Cook


John Buse

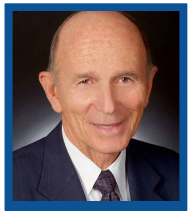

Joseph Rodrigues


Juan Carlos Belmonte

70 Longevity Influencers


Judith Campisi


Karen Tracy


Kenneth Cooper


Kris Verburgh

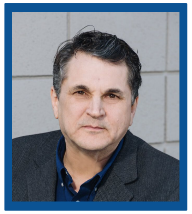

Laura Carstensen


Laura Deming

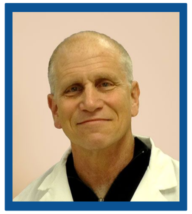

Leonard Guarente


Lucy Rose


Matt Kaeberlein


Michael Kope


Michael West


Michael Zemel


Nir Barzilai

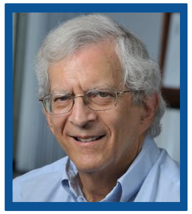

Patricia Olson


Paul Knoepfler


Peter Diamandis


Pinchas Cohen


Remy Gross III


Richard Hodes


Ronald Demos Lee


Sal Cumella


Sarah Constantin


Sree Kant


Stephanie Lederman

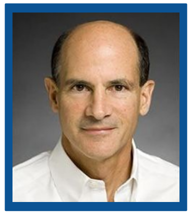

Steve Horvath


Susan Mayne


Suzana Petanceska


Terdema Ussery II

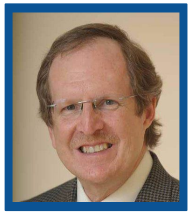

Thomas Okarma


Thomas Rando


Thomas Seoh


Vadim Gladyshev


Vittorio Sebastiano


W. Keith Hoots


William Cefalu

AGING ANALYTICS AGENCY

TARGETING METABESITY 2019

15-16 October 2019 | Washington, DC, USA

Link to the Report: https://aginganalytics.com/longevity-and-metabesity-usa

E-mail:	Website:	E-mail:	Website:
info@aginganalytics.com	www.aginganalytics.com	cmg@custommanagement.com	www.metabesity2019.com

AGING ANALYTICS AGENCY is the world's premier provider of industry analytics on the topics of longevity, precision preventive medicine and economics of aging, and the convergence of technologies such as AI and digital health and their impact on health care. The company provides strategic consulting services in fields related to longevity, and currently serves as the primary source of analytics for the specialized hybrid hedge fund Longevity.Capital, as well as the UK All-Party Parliamentary Group for Longevity.

TARGETING METABESITY 2019 focuses on shifting the emphasis from treatment to prevention, and going beyond managing individual diseases to extending healthy lifespan. Gathering will be stellar speakers and participants from science and medicine, government regulation and policy, health care organizations, industry (drugs, devices, nutritional, and digital products), capital markets, patient advocacy, and other fields, held this year at the Carnegie Institution for Science in Washington, DC, 15-16 October 2019.