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ANALYTICS
AGENCY

Investment Digest

Longevity Industry 2021/Q2

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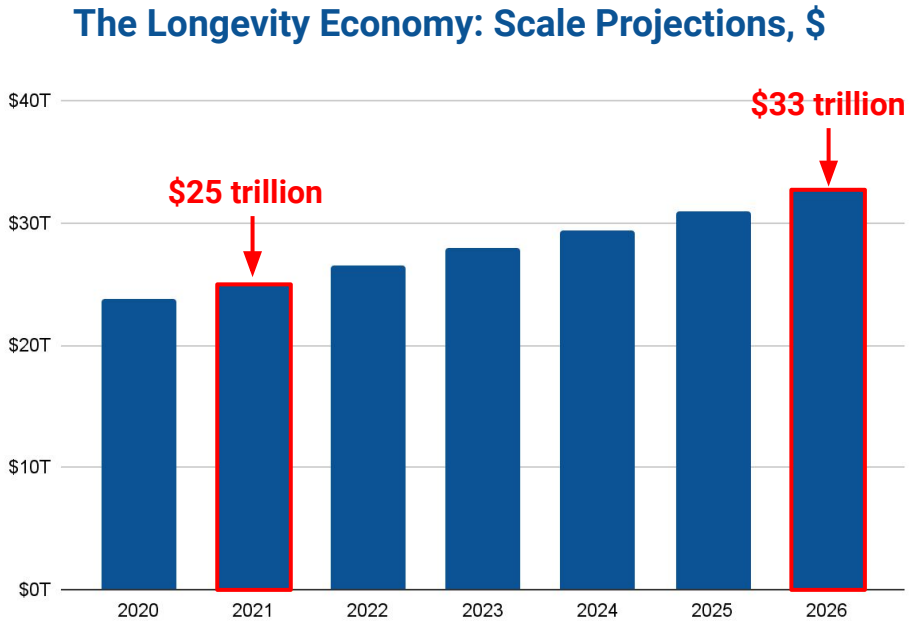
Longevity Investment Digest at a Glance

This Investment Digest summarizes key observations in the private equity and venture capital ecosystem of the rapidly evolving and exponentially growing Longevity Industry. In it, we have assembled information about key industry trends, more than 23,000 longevity companies, 50 leading investors, and more than 600 longevity-focused publicly traded corporations. We have also outlined major investment rounds and relevant R&D trends, illustrating the industry's traction and readiness of institutional investors (including top-tier financial institutions) to potentially acquire the most successful startups, such as AgeTech, Longevity Fintech, and Longevity Biomedicine.

The COVID-19 pandemic has given a boost not only to the growth of the biotech capital market, but also to the development of the longevity biomedicine sector, resulting in an increase of more than 30% (compared to the previous year). Though the growth in the longevity market exceeds that of in the biotech and financial services markets, it still remains pretty volatile. 15 longevity-focused companies launched their IPOs in 2021, whereas more than a thousand of them received private equity investments. Currently, the growth rate of the longevity market is comparable to that of the IT sector. Longevity is regularly picked as a major topic of interest for panel discussions and entire conference series by top-tier finance and business media brands, including The Economist, Financial Times, and Bloomberg.

To sum up, the Longevity industry is poised to witness a quantum leap in the near future, particularly because of the impact of Artificial Intelligence on biomedicine R&D and in light of the upcoming paradigm shift from treatment to prevention.

The Longevity Economy on a Global Scale



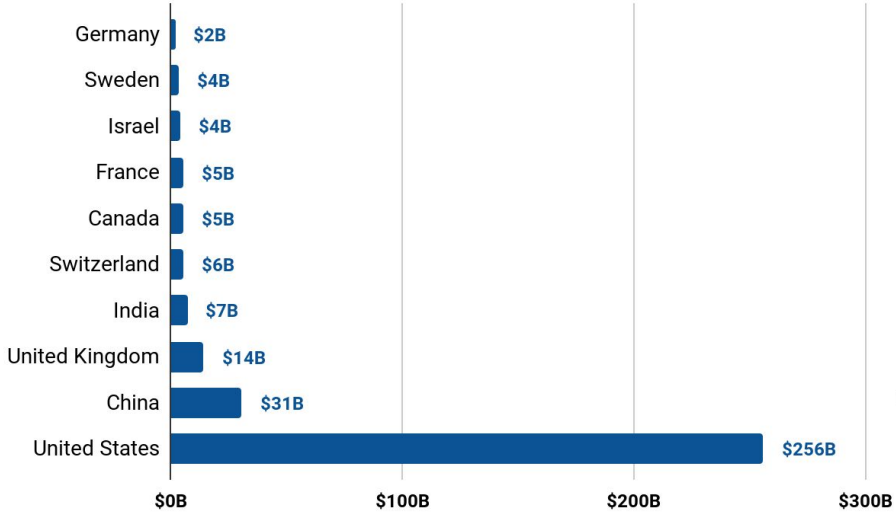
The Longevity Economy's Scale Projections contains global healthcare spending affecting Longevity, the combined capitalisation of publicly listed Longevity companies, the capitalisation of Longevity-related insurance and reinsurance companies, banks and pension funds and privately held Longevity companies.

Not only does aging pose one of the most acute problems of our time - it also presents one of the most promising opportunities. Financial institutions, such as investment banks, pension funds, and insurance companies can either sink or swim when hit by the oncoming Silver Tsunami. Whether they will succeed in riding the wave or end up drowning under it will depend not only on their willingness to deploy new business models adapted to population aging and emerging industries of AgeTech, WealthTech, and Longevity Finance, but also on the quality of longevity analytics that they use to develop such business models.

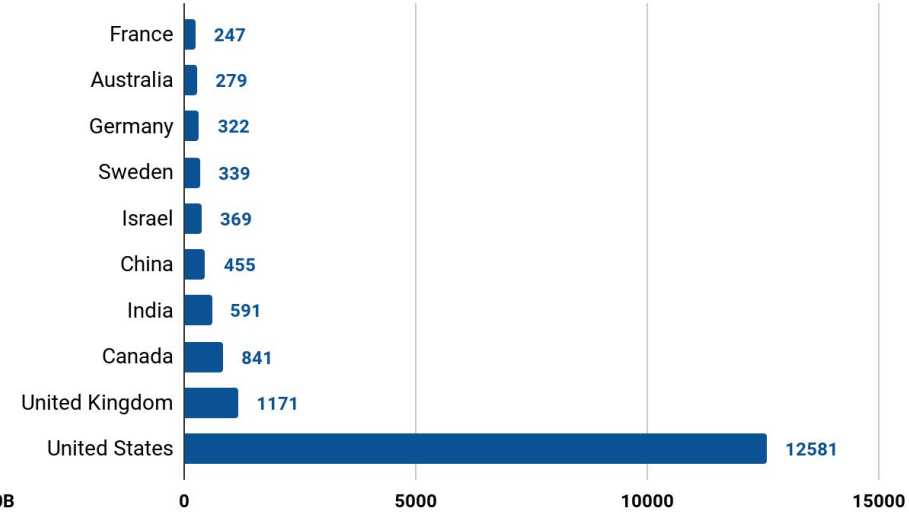
We define the Longevity Industry as a combination of aging, advanced preventive precision biomedicine, AgeTech, relevant parts of national healthcare budgets, and the global financial industry related to such sub-industries.

Top 10 Countries in the Longevity Sector in 2021

Total Investment



Number of Companies



The chart on the left represents the top 10 countries with the largest investment in the Longevity Industry (as of August 2021). The chart on the right shows the top 10 countries for the number of longevity-focused companies (as of 2021). The undisputed leader here is the US which has a total of $256 billion invested in 12,581 companies. It is followed by China, the second largest country for longevity investment, which has a total of $31 billion invested in 455 companies. China's closest competitor is the United Kingdom where funds are mostly raised from public sources and IPOs, not from private investors.

Top 20 Longevity Companies

Jiangsu

BeiGene
Changping, Beijing, China

BlueRock Therapeutics
Toronto, Ontario, Canada

Maharashtra

PharmEasy
Mumbai, Maharashtra, India

California

Abcam
Cambridge, Cambridgeshire, UK

Juvenescence
Douglas, NA - Isle of Man, Isle of Man

Samumed
San Diego, California, US

One Medical
San Francisco, California, US

Freenome
South San Francisco, California, US

Human Longevity
San Diego, California, US

UNITY Biotechnology
Brisbane, California, US

Geron
Menlo Park, California, US

Epirium Bio
San Diego, California, US

Massachusetts

Amwell
Boston, Massachusetts, US

Decibel Therapeutics
Cambridge, Massachusetts, US

Navitor Pharmaceuticals
Cambridge, Massachusetts, US

Washington

Sana Biotechnology
Seattle, Washington, US

Colorado

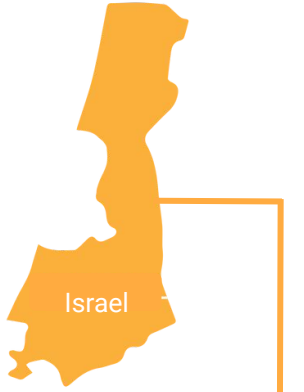
SomaLogic
Boulder, Colorado, US

Maryland

Osiris Therapeutics
Columbia, Maryland, US

New Jersey

Celularity
Warren, New Jersey, US

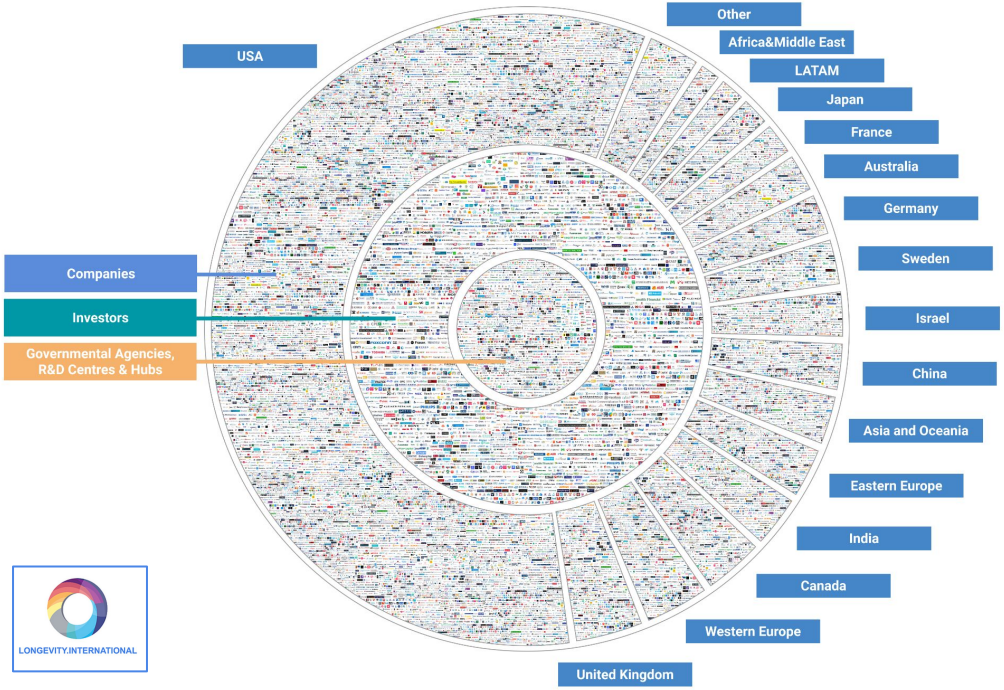


Tel Aviv

EarlySense
Ramat Gan, Tel Aviv, Israel

Global Longevity Ecosystem 2021

23,000 Companies	9,000 Investors	1,000 Hubs	20 Sectors



USA	UK
Canada	India
Japan	China
Sweden	Germany
Switzerland	Spain
CEE*	Singapore
Portugal	France
Brazil	Australia
MENA Region	EU

www.longevity.international

* – Central and Eastern Europe

Global Longevity Ecosystem - 23,000 Companies by 20 Sectors

LONGEVITY.INTERNATIONAL

Geroscience

Longevity WealthTech

Space Medicine

Deep Diagnostics

Regenerative Medicine

Longevity Biomarkers

FinTech

Longevity FemTech

P4 Medicine

AI for Longevity

InsurTech

Advanced Cosmetics

NeuroTech

AgeTech

Clinical Data management

Longevity Gene Therapy

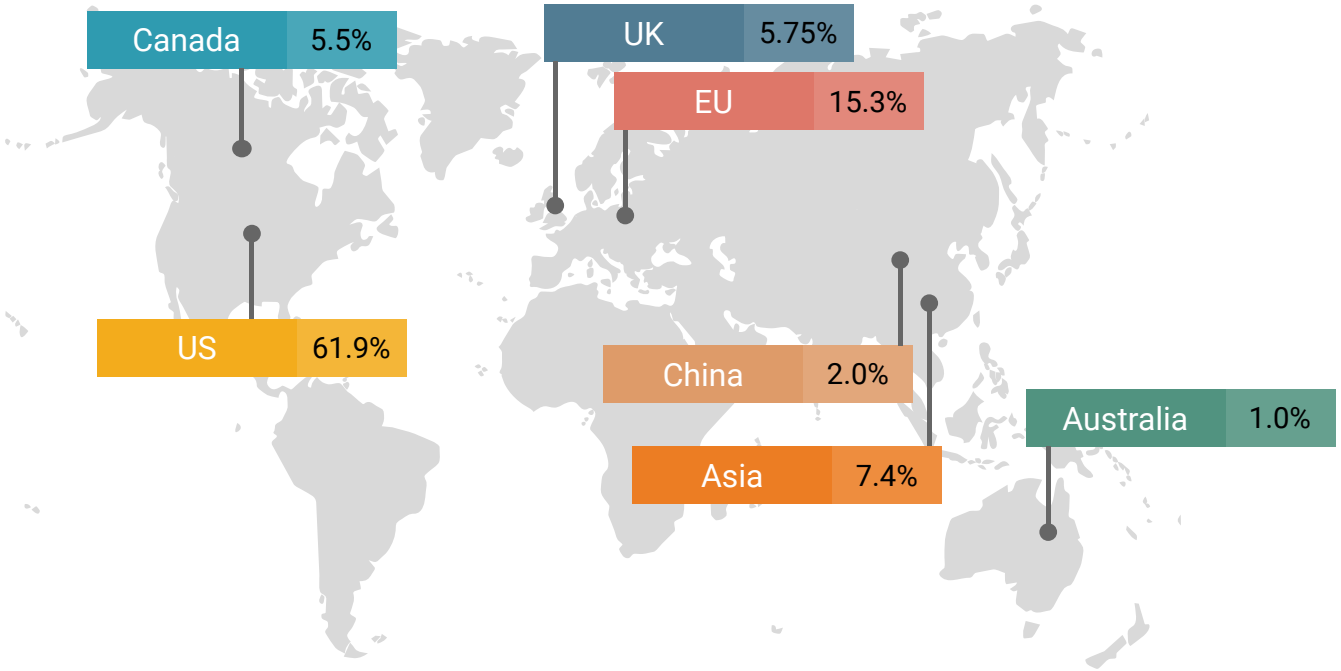
PharmTech

Wellness & Fitness

Telemedicine

Mental Health

23,000 Companies: Regional Proportion



The US is still firmly in the lead in terms of the number of longevity-focused companies, and the EU is the second biggest market in the world. However, Asia increased the market share to 9.4% (represented by 2,162 companies of different sizes and funding structures) and keeps growing today. We expect steady growth of the Asia companies with increasing the number of public offerings among them.

Longevity Industry: Multi-Trillion Dollar Opportunity

Longevity, AgeTech & WealthTech Market

Globally
1 Billion in Retirement

In the UK
10 Million in Retirement

FT FINANCIAL TIMES

"The one billion retired people globally are a multi-trillion dollar opportunity for business "

~ Dmitry Kaminskiy, inverview in the Financial Times

"We expect to add 1 billion older individuals in the next three to four decades, atop the more than 700 million older people we have today "

~ International Monetary Fund

INTERNATIONAL MONETARY FUND

Longevity Industry: Multi-Trillion Dollar Opportunity

The Global Longevity Market is Estimated at $25 trillion in 2021

- 23,000+ companies
- 600+ corporations
- 9,000+ investors
- 1,000+ financial institutions
- 100+ governments
- 114 subsectors

The longevity market is not only limited to anti-aging applications of life sciences. It also includes some new sectors of the financial industry, as well as government projects (national longevity development plans); hence, its overall size potentially exceeds $25 trillion. As the majority of full-blown longevity startups are quickly becoming mature companies, large institutional investors are making increasingly more investments into the industry and a full-fledged longevity infrastructure is emerging.

There are at least 600 publicly traded corporations that can be considered part of the Longevity industry.

Longevity Biomedicine, FinTech, and AgeTech industries include 23,000+ companies, 9,000+ investors, 14 sectors, and 114 subsectors.

The longevity Financial Industry includes 1,000+ corporations, 15 sectors, and 50 subsectors.

The Longevity Governance Landscape includes national healthcare budgets and development plans of at least 100 governments.

Note: Since there is no generally accepted methodology for their estimation, the numbers presented in the scheme are approximate.

The “7th Continent” of 1 Billion People in Retirement

There are more than 1 billion people aged 60 years and older in the world nowadays. In fact, there are so many of them that they can populate an entire ‘7th Continent’.
Not only do they wield immense purchasing power, but they also hold the largest amount of financial assets compared to other age groups.

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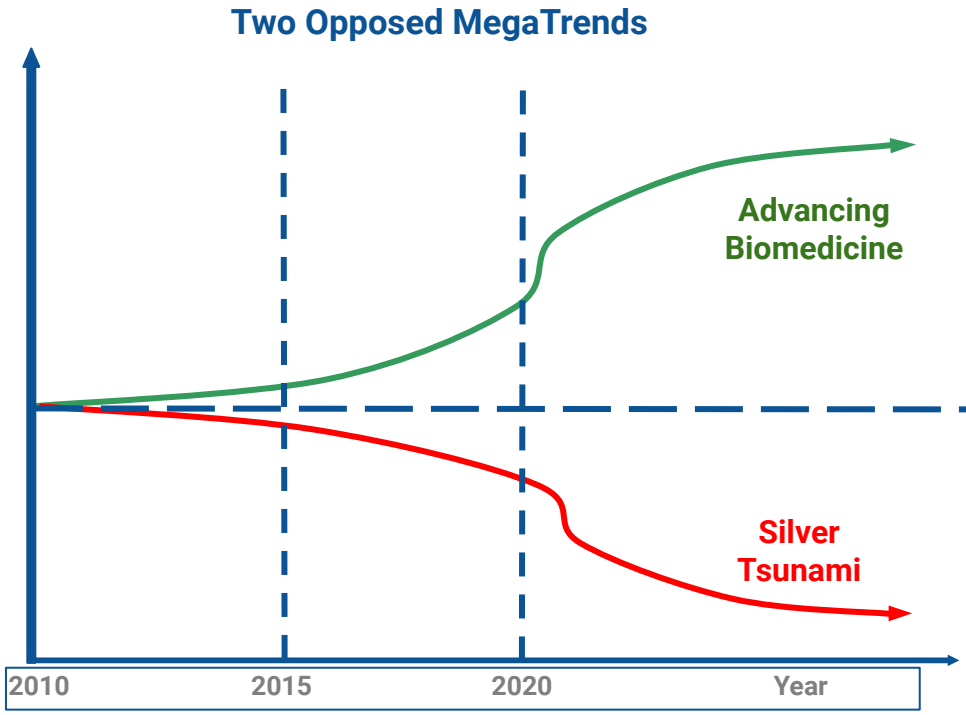
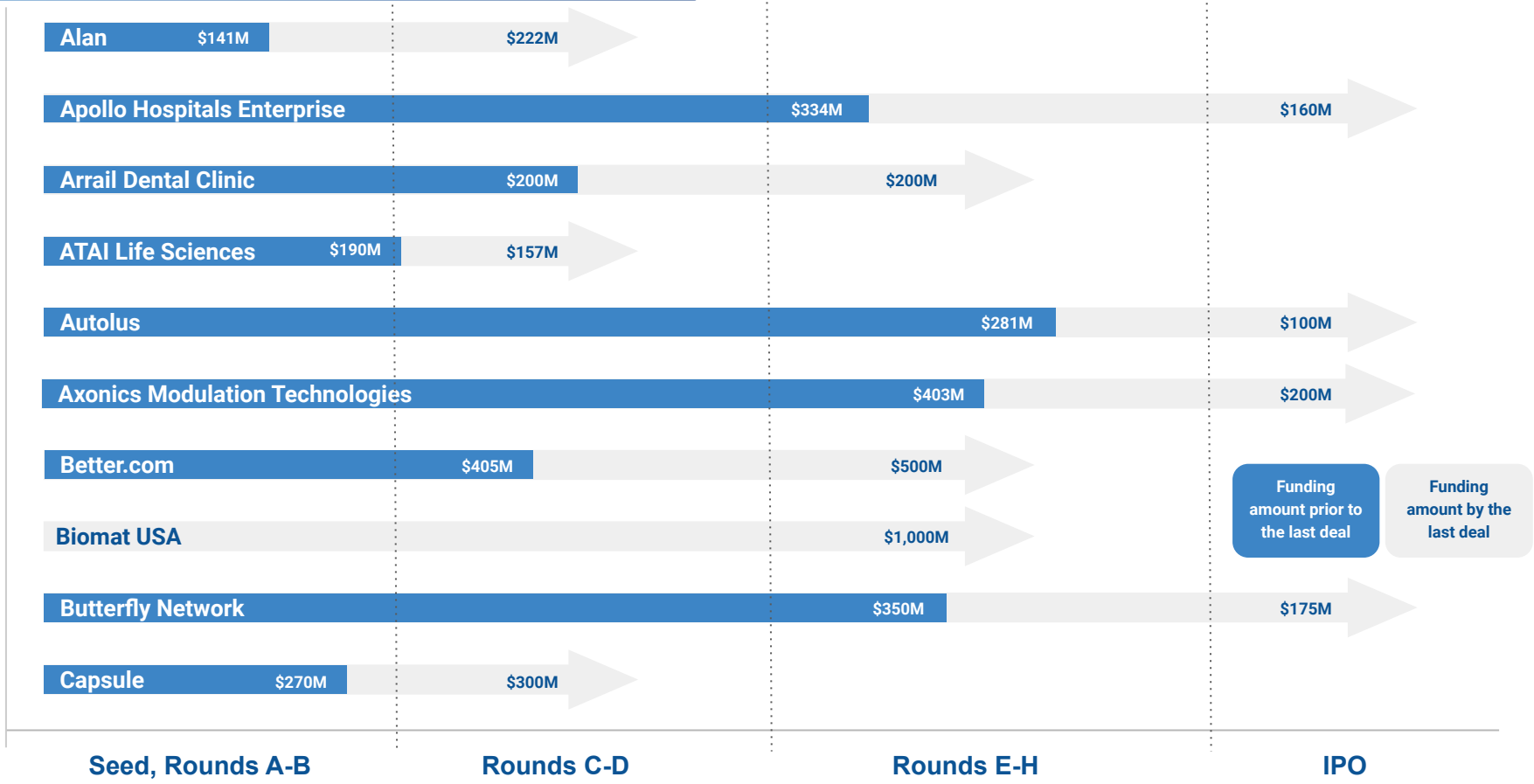
Longevity and Silver Tsunami - Collision of Two Opposing MegaTrends



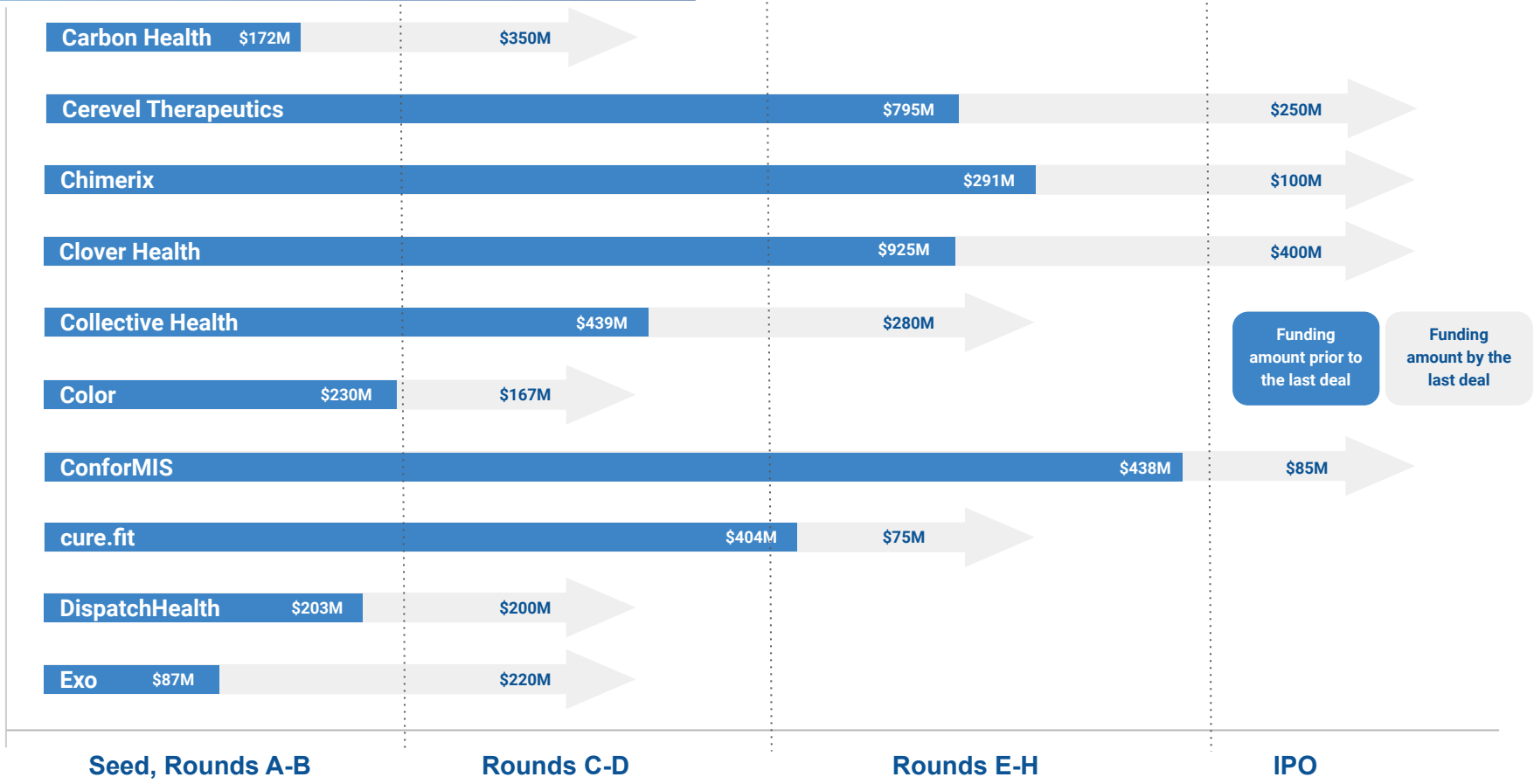
Rapid progress in biomedicine has been mainly due to the advances in collection and analysis of data. The industry is poised to witness a quantum leap in the near future, particularly because of the impact made by Artificial Intelligence on biomedicine R&D and in light of the upcoming paradigm shift from treatment to prevention.

At the same time, the inevitable Silver Tsunami (demographic aging) places a major economic burden not not only on the healthcare systems of developing nations, but also on major financial institutions, including pension funds, insurance companies, asset management firms and retail/private wealth banks. It is also expected to increase costs associated with old age.

Top Companies by Investment and Investment Stage



Top Companies by Investment and Investment Stage



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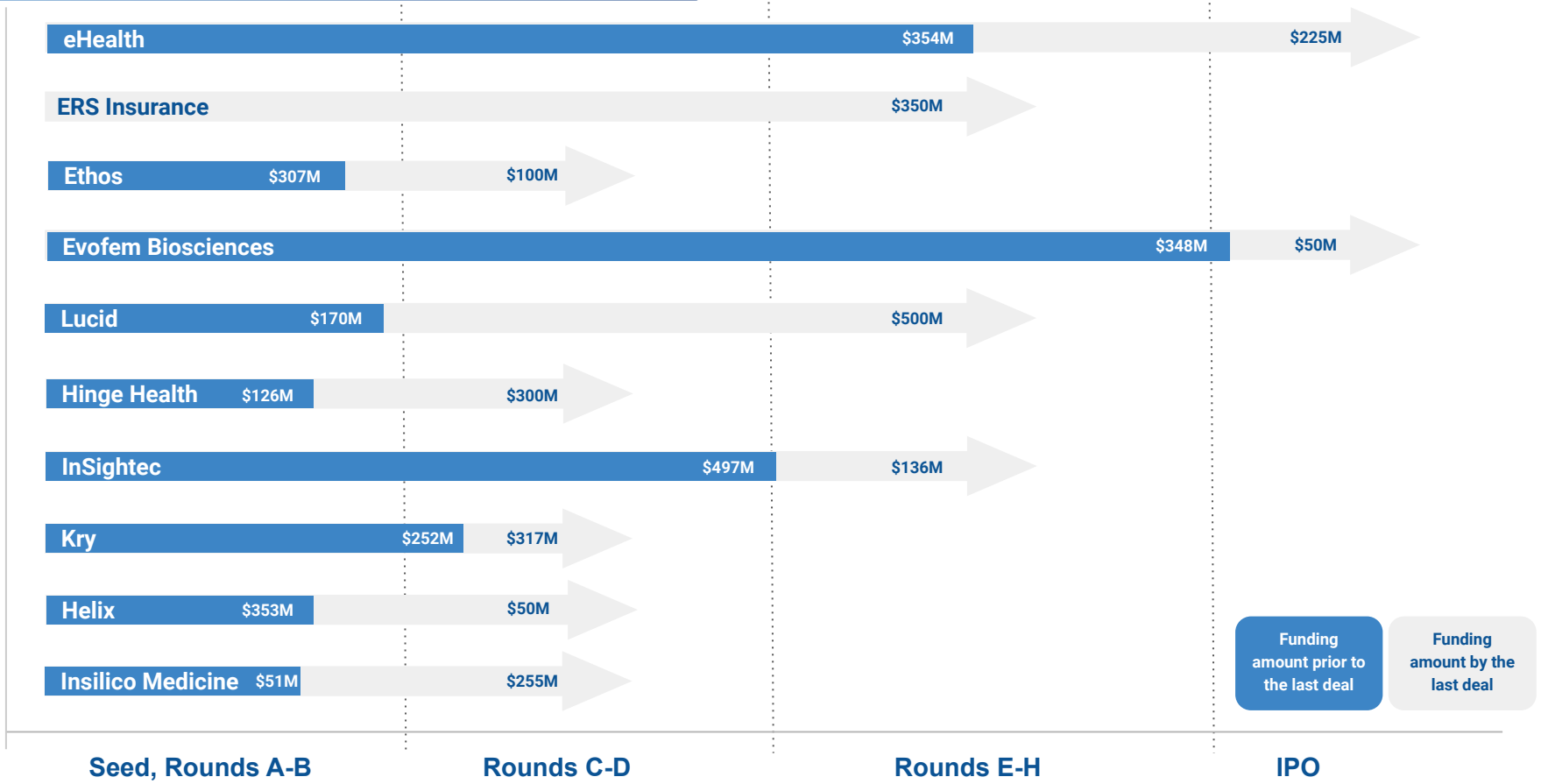
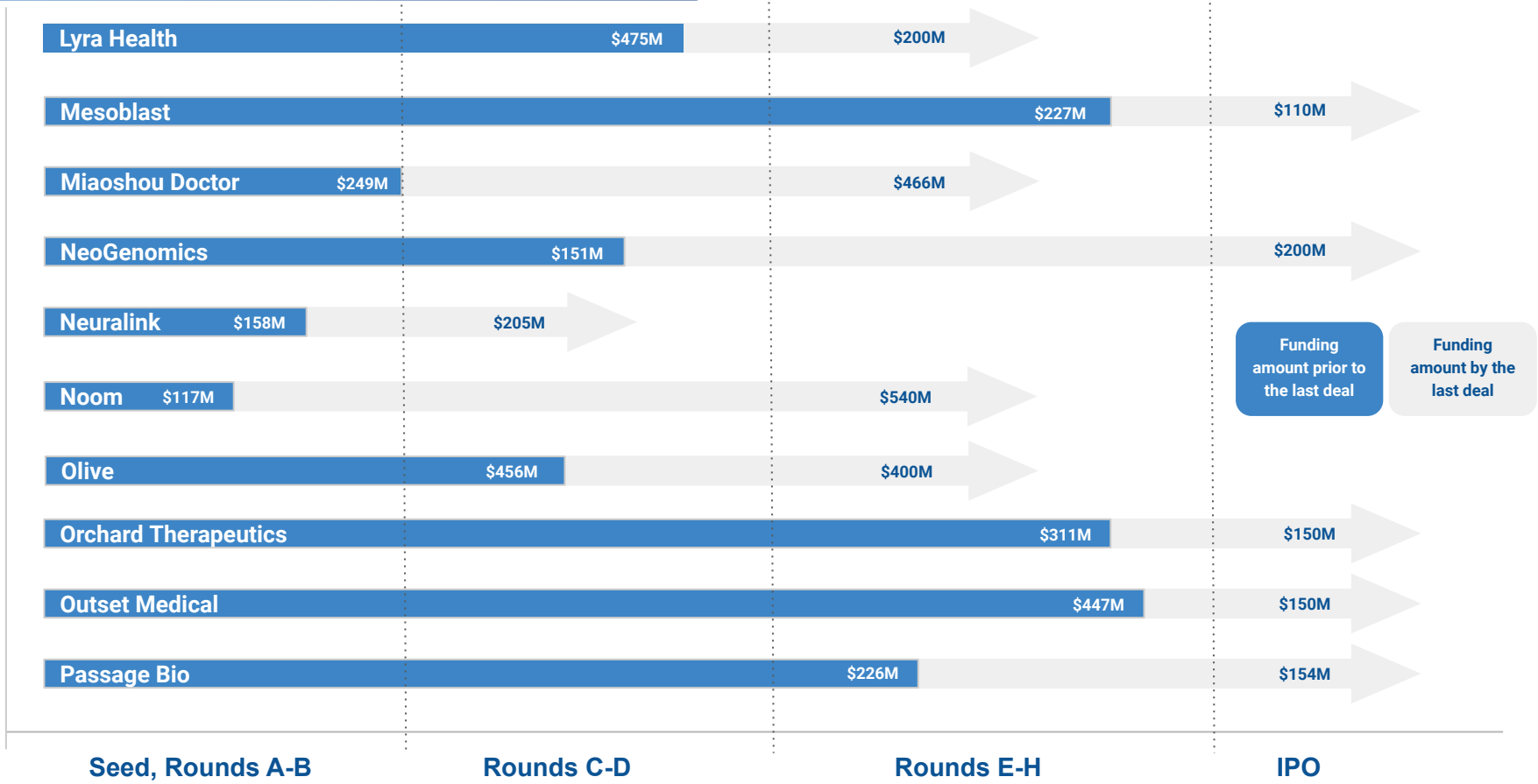
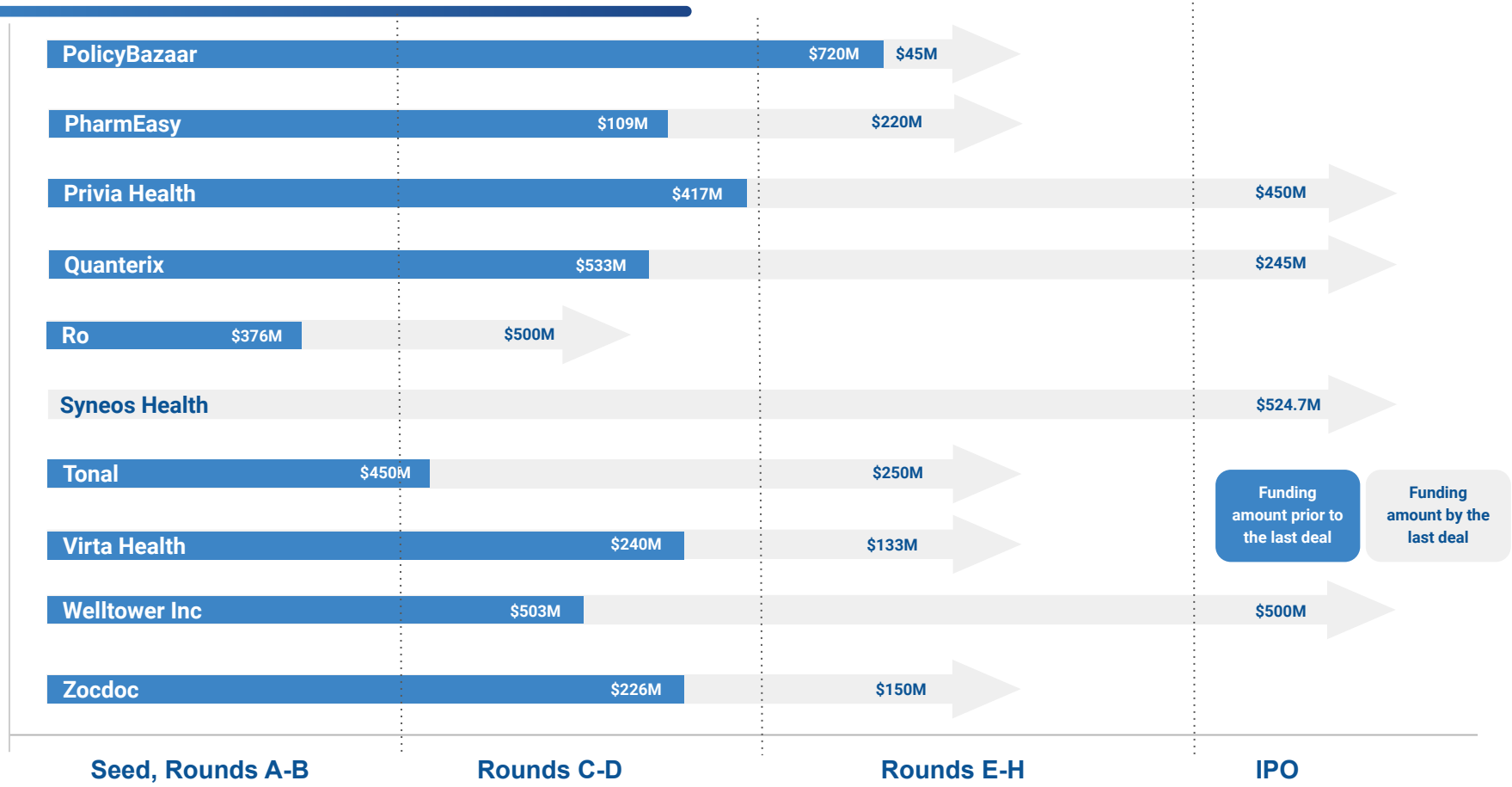


Top Companies by Investment and Investment Stage



Top Companies by Investment and Investment Stage



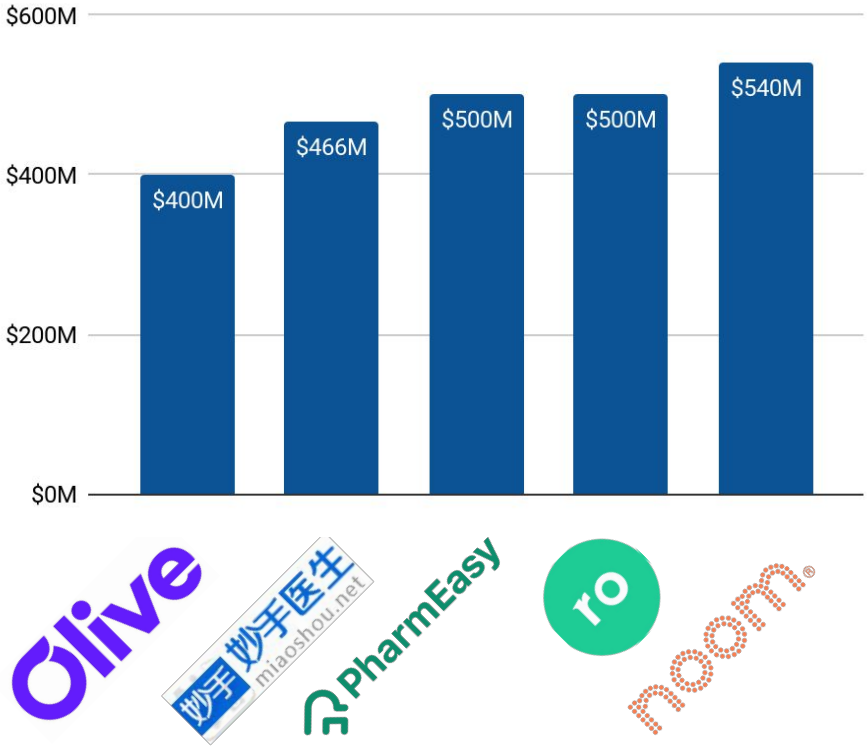
Investment Landscape in 2021 at a Glance

In 2021, the global investments in longevity-focused companies totalled **$39.54B**.

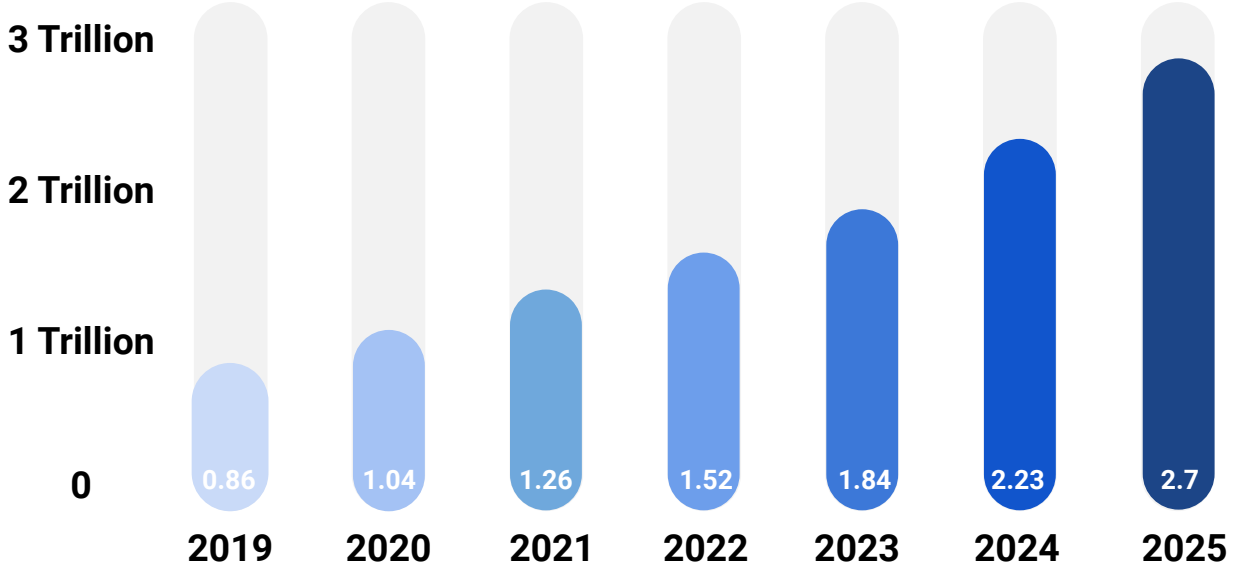
Some of the major deals included:

- **Noom**, a psychology-based digital health platform used to provide intelligent nutrition and exercise coaching, raised $540M in Series F Round;
- **Ro** announced a $500M Series D round in March 2021, which values the 3.5-year-old company at $5 billion;
- **PharmEasy,** health tech startup offering services such as teleconsultation, medicine deliveries, and diagnostic test sample collection, raised $500M Series F in July 2021 at $4B valuation supported by seven private institutional investors;
- **Miaoshou Doctor**, a platform based in China for doctors and patients to communicate, raised $466M (Series E Round);
- **Olive** in July 2021 doubled its valuation after raising a $400M in Series H funding round. The US-based company passed a $4B valuation.

Top 5 Investment Deals



AgeTech Industry Market Capitalisation



World AgeTech Industry Size Projections, current US $

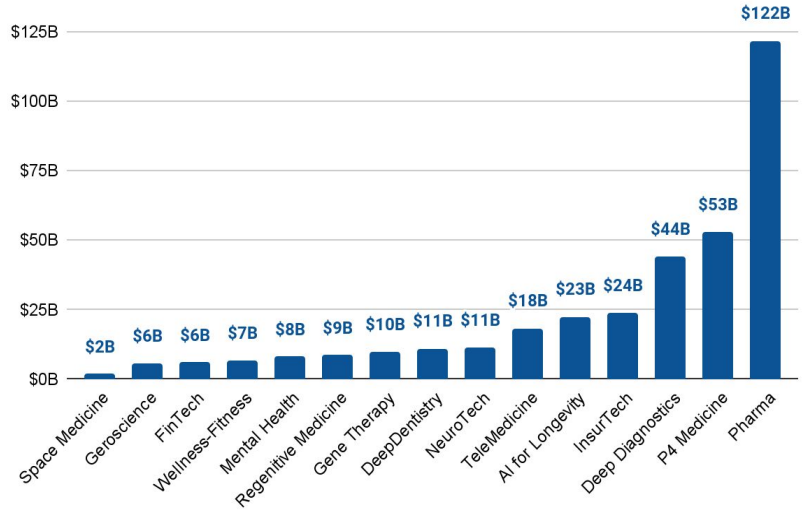
AgeTech Sector:

- Elderly Care
- FinTech
- m-Health
- Senior Living Communities
- Social and Communication Caregiving
- Independence
- Social Protection
- Cognitive Care

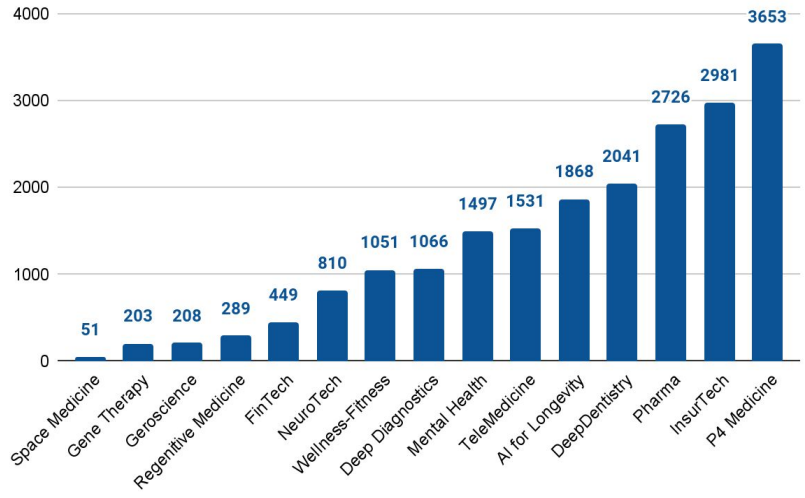
Estimated at $25 trillion in 2021, the global longevity economy is growing steadily and expected to be worth $33 trillion by 2026. By the most conservative estimates, it accounts for 20% of the global GDP. While the global Longevity Economy is projected to reach $33 trillion by 2026, the Age-Tech segment alone is projected to reach $2.7 trillion by 2025. This, in turn, implies an annual growth rate of 21% in the global Age-Tech market, which is attributable to the development of the elderly care sector enhanced by IT, FinTech, and other digital technologies.

Investments in the Longevity Industry

Total Investment



Number of Companies



Pre-IPO Investments in Longevity by 2021: $353 Billion

PharmTech is the largest sector in the Longevity Industry in terms of funds raised and companies involved.
The distribution of investments across different sectors of the Longevity industry demonstrates that investors tend to invest more into drug and gene therapies than into devices (**Agetech**). However, as society's focus is shifting towards keeping older people healthy and active for longer, tech-enabled care and mobility aids, the two key areas of age-tech, are very likely to attract even more investment in the near future.

Longevity Industry Subsectors

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AgeTech

Digital, IT and mechanical technologies aiming at prolonging physical functionality and wellbeing in elderly demographics.

AI for Longevity

Application of Artificial Intelligence for longevity research and development, including AI for drug discovery and biomarker development.

FemTech

FemTech products and services targeting core female-specific hallmarks of aging and/or aspects of aging. Prominent sectors include fertility, ovarian rejuvenation.

PharmTech

PharmTech include application of scientific knowledge or technology to pharmacy, pharmacology, and the pharmaceutical industry.

P4 Medicine

P4 (Precision Preventive Personalized Participatory) diagnostic, prognostic and therapeutic technologies to maintain an optimal state of health for as long as possible. Considered as the leading edge of practical applications of Longevity technologies.

Regenerative Medicine

Cell therapies, bioengineered organs, tissue engineering and xenotransplantation targeting core hallmarks of aging.

Biomarkers for Longevity

Discovery and development of panels of biomarkers of aging, the core infrastructure required for testing the safety and efficacy of Longevity therapies and the effectiveness of interventions.

Longevity Industry Subsectors

AGING ANALYTICS AGENCY

Longevity NeuroTech

NeuroTechnologies to improve and maintain cognitive abilities, neurological plasticity, sleep quality (SleepTech) and psychological well-being into later stages of life.

Deep Diagnostic

Treating or diagnosing a problem you're having by monitoring existing problems, checking out new symptoms or following up on abnormal test results.

FinTech

The integration of technology into offerings by financial services companies in order to improve their use and delivery to consumers.

Space Medicine

The practice of medicine on astronauts in outer space whereas astronautical hygiene is the application of science and technology to the prevention or control of exposure to the hazards that may cause astronaut ill health.

Longevity WealthTech

WealthTech industry comprises any product or service (again, almost invariably IT-based) that either simplifies or enhances the creation and maintenance of Wealth - from savings to investment - for all ages of society.

Advanced Cosmetics

Advanced cosmetic describes the industry that manufactures and distributes advanced cosmetic products. It includes Natural cosmetics, Cosmeceuticals, Beauty devices, Ingredients-as-a-Service and Anti-aging cosmetics markets.

Longevity Gene Therapy

Gene therapy is an experimental technique that uses genes to treat or prevent disease. In the future, this technique may allow doctors to treat a disorder by inserting a gene into a patient's cells instead of using drugs or surgery.

Longevity Industry Subsectors

AGING ANALYTICS AGENCY

Mental Health

Mental Health includes a wide range of psychological or psychiatric disorders and often requires psychiatric intervention. Conditions can be caused by either a biological origin such as genetic, chemical, and anatomical.

Clinical Data Management

Clinical data management is the process of collecting and managing research data in accordance with regulatory standards to obtain quality information that is complete and error-free.

Telemedicine

Telemedicine, or virtual health, refers to one-on-one consultations between patients and health professionals via video chat, phone call, or text message.

InsurTech

Insurtech refers to the use of technology innovations designed to squeeze out savings and efficiency from the current insurance industry model. Insurtech is a combination of the words “insurance” and “technology,” inspired by the term fintech.

Geroscience

Biomedical therapies targeting the root causes of aging, including Cellular Senescence, Stem Cell Exhaustion, Epigenetic Alterations, Altered InterCellular Communication, Loss of Proteostasis, Deregulated Nutrient Sensing, Mitochondrial Dysfunction, Telomere Attrition and Genomic Instability.

Wellness & Fitness

Wellness & Fitness encompasses all activities which promote physical and mental wellbeing: from yoga to healthy eating, personal care and beauty, nutrition and weight-loss, meditation, spa retreats, workplace wellness and wellness tourism.

Longevity Landscape Framework

AGING ANALYTICS AGENCY

Geroscience R&D

- Rejuvenation Biotechnology
- Basic Research on Biology of Ageing
- Geroprotectors
- Regenerative Medicine
- Nutraceuticals
- Gene Therapy

P4 Medicine

- Personalized Diagnostics
- Personalized HALE and QALE Estimation
- Personalized Prognostics
- Personalized in vivo and in silico Drug Testing
- Preventive Therapies
- Participatory Medicine

AgeTech

- NeuroTech
- Cognitive Enhancement
- Smart Homes
- NextGen Mobile Apps for the Elderly
- Continuing Education
- Entertainment for the Elderly

Longevity WealthTech

- Financial Planning
- Asset Management
- Micro-Investments
- Digital Brokers
- AI-Driven Assistants
- Long-Term Securities

Longevity Finance

- Longevity Index Fund
- Longevity Hedge Fund
- Longevity Stock Exchange
- AgeTech Bank
- Longevity Derivatives
- Longevity Investment Bank

Longevity Governance

- Pension Plans
- National Healthcare Budgets
- Longevity Development Strategies
- Elderly Care Programs
- National Insurance
- Elderly Education

Longevity Financial Industry Framework

AGING ANALYTICS AGENCY

InsurTech

- HALE/QALE-Based Insurance
- AI-Driven Insurance Premium Calculation
- NextGen Mobile Apps
- Healthy Lifestyle Bonuses
- Big Data Actuarial Models
- Biological Age Estimation

WealthTech

- Robo-Retirement
- Digital Brokers
- Micro-Investments
- Annuities
- Long-Term Securities
- AI-Driven Advisors

Longevity Asset Management

- Novel Retirement Plans
- Portfolio Management
- FinTech for the Elderly
- NextGen Mobile Apps for the Elderly
- Financial Planning
- De-Risking

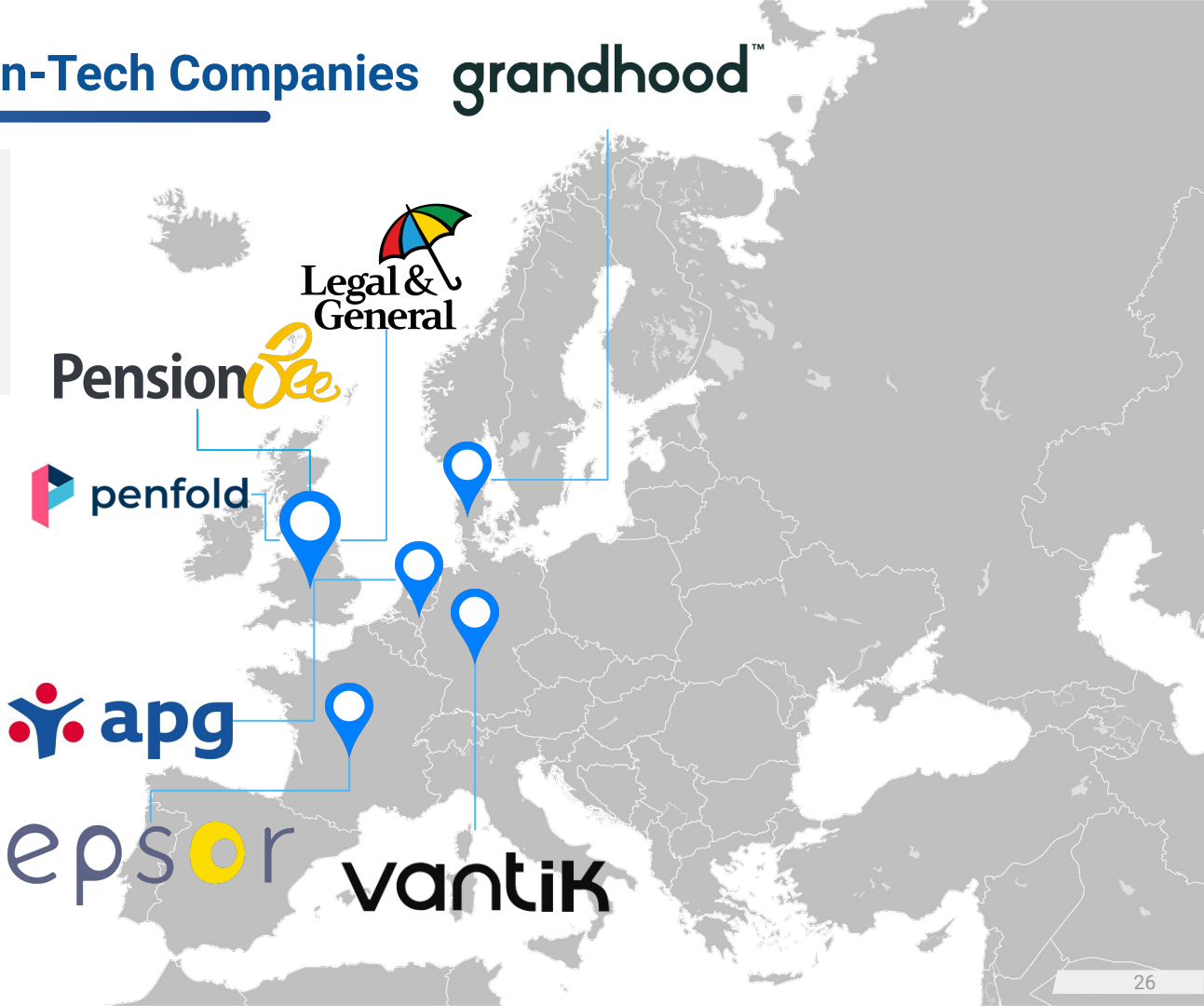
Novel Financial System

- Longevity Index Fund
- Longevity Hedge Fund
- Strategies Diversification
- AgeTech Bank
- Longevity Derivatives
- Pension Planning

Most Advanced Pension-Tech Companies

grandhood™

Aging Analytics Agency has analyzed the most advanced pension-tech companies and concluded that the majority of them are based in the UK and EU.



Top Longevity Companies

Regenerative Medicine

P4 Medicine

Biomarkers for Longevity

Geroscience

Top Longevity Companies

AgeTech

AI for Longevity

FemTech

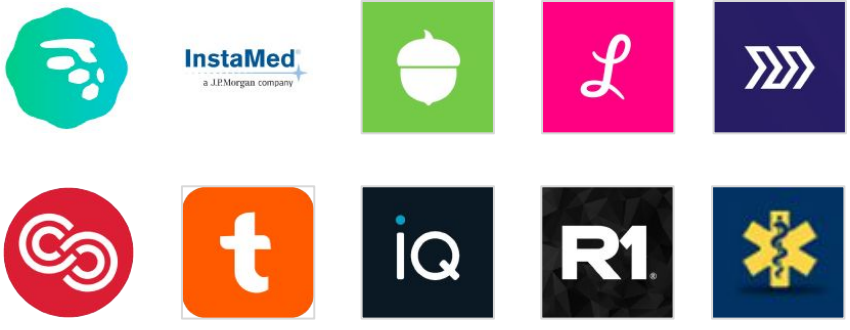
PharmTech

Top Longevity Companies

Longevity Neurotech

Deep Diagnostic

FinTech



Space Medicine

Top Longevity Companies

Longevity WealthTech

Advanced Cosmetics

Longevity Gene Therapy

Mental Health

Top Longevity Companies

Clinical Data Management

SEQSTER
SOPRIS HEALTH
CATO SMS
HeptaQuest
ZoomMD
Vitalbeat
aura
DEDO
Atos
OptiMantra

Telemedicine

COMPASS GROUP
Take it easy PharmEasy
Salix PHARMACEUTICALS, INC.
妙手医生 miaoshou.net
丁香园 WWW.DXY.CN
kry
Stemcentrx
PEAR THERAPEUTICS

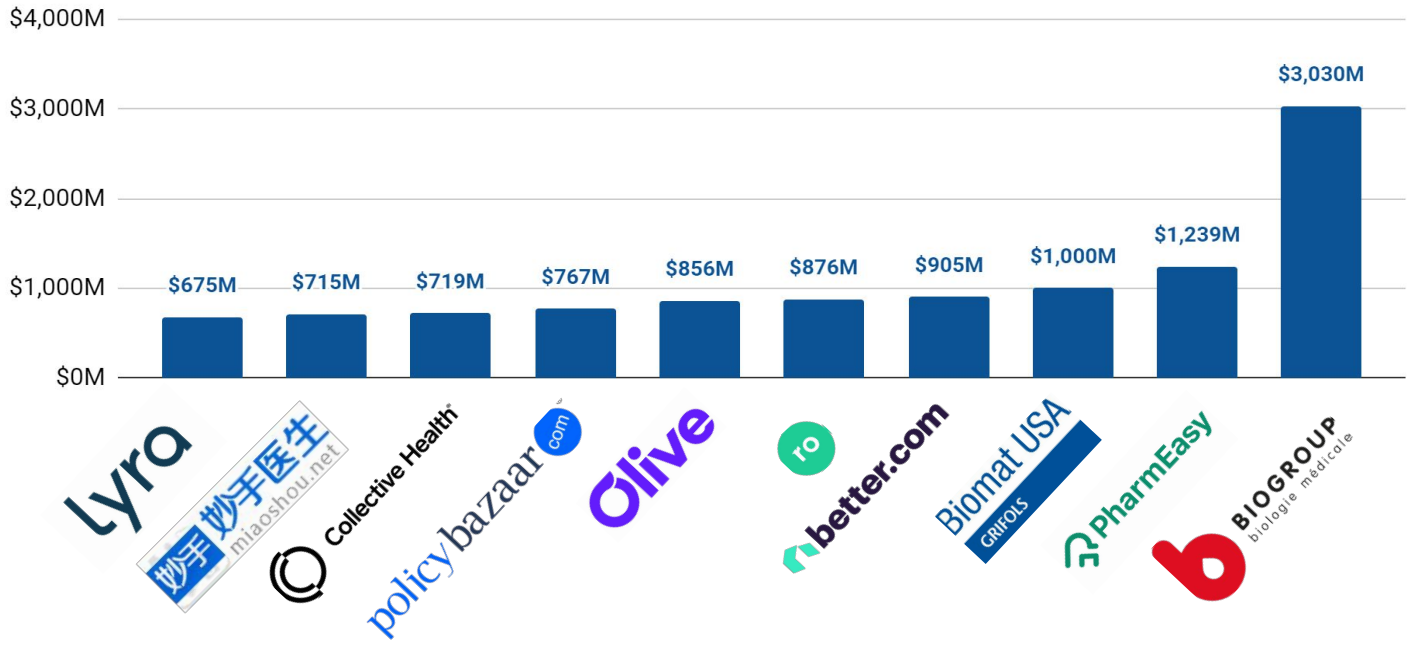
InsurTech

oscar
PING AN
WeDoctor
EXCHANGE We go where you go!
Better
policybazaar.com
IRONSHORE
Hippo
Collective Health
SBI Life INSURANCE With Us. You're Sure

Wellness & Fitness

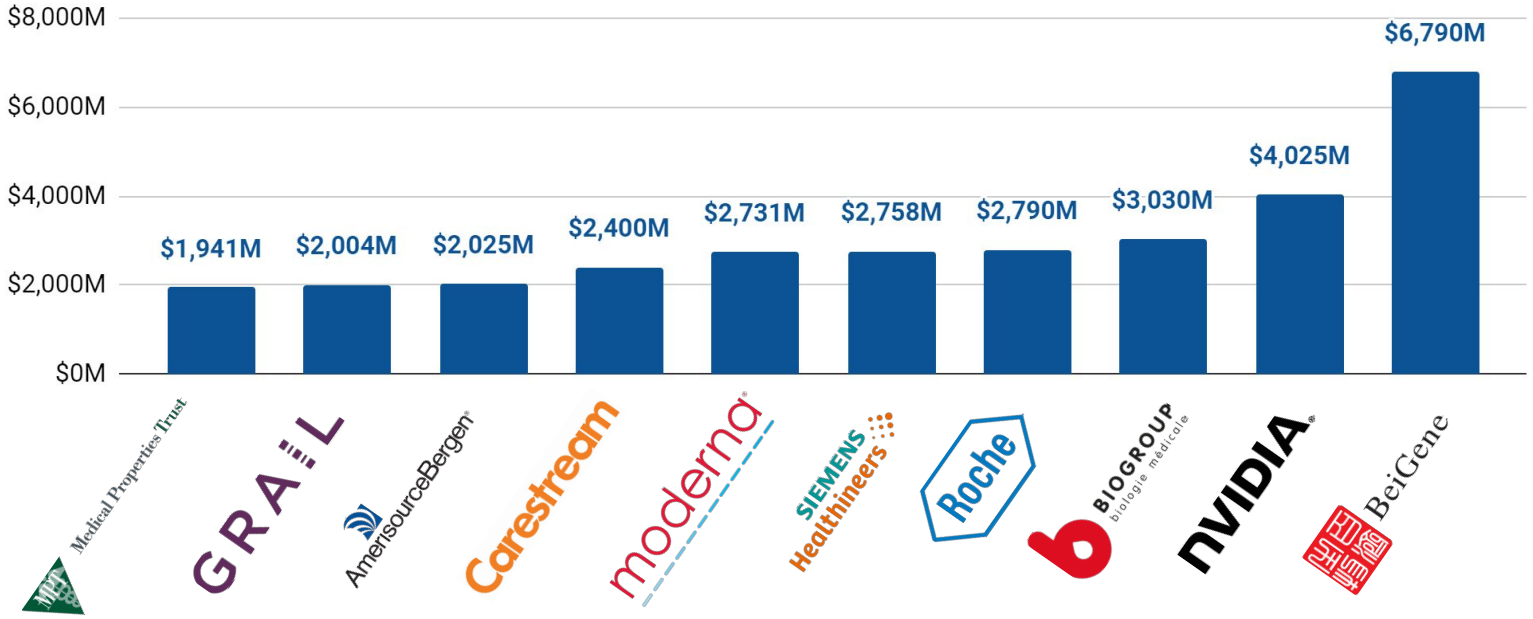
JDH 京东健康
YgEia3
aimmune THERAPEUTICS
Calm
ALCRESTA THERAPEUTICS
NEPTUNE WELLNESS SOLUTIONS
WELL Health
Truepill
SevenBridges
PACIRA BIOSCIENCES, INC.

Top 10 Longevity-Focused Companies by Investments in 2021



Half-year 2021 demonstrates the lasting trend of boosted growth of the biotech capital market and the development of the longevity sector. Pandemic has stimulated an increase in investments in the longevity industry, where total funding of top 10 Longevity-focused companies exceeds **$10.78B** as of July 2021. Biogroup-LCD, the France-based private company, is the leader by the amount of total investments having raised a total of **$3.03B** in funding over 4 rounds. PharmEasy and Ro are private companies which are listed above due to late-stage mega-rounds in 2021.

Top 10 Longevity-Focused Companies by Total Investments



Half-year 2021 demonstrates the lasting trend of boosted growth of the biotech capital market and the development of the longevity sector. Pandemic has stimulated an increase in investments in the longevity industry, where total funding of top 10 Longevity-focused companies exceeds **$30.5B** as of July 2021. BeiGene, the leader of rating, has raised a total of $6.8B in funding over 7 rounds. Their latest funding was raised on Jul 12, 2020 from a Post-IPO Equity round.

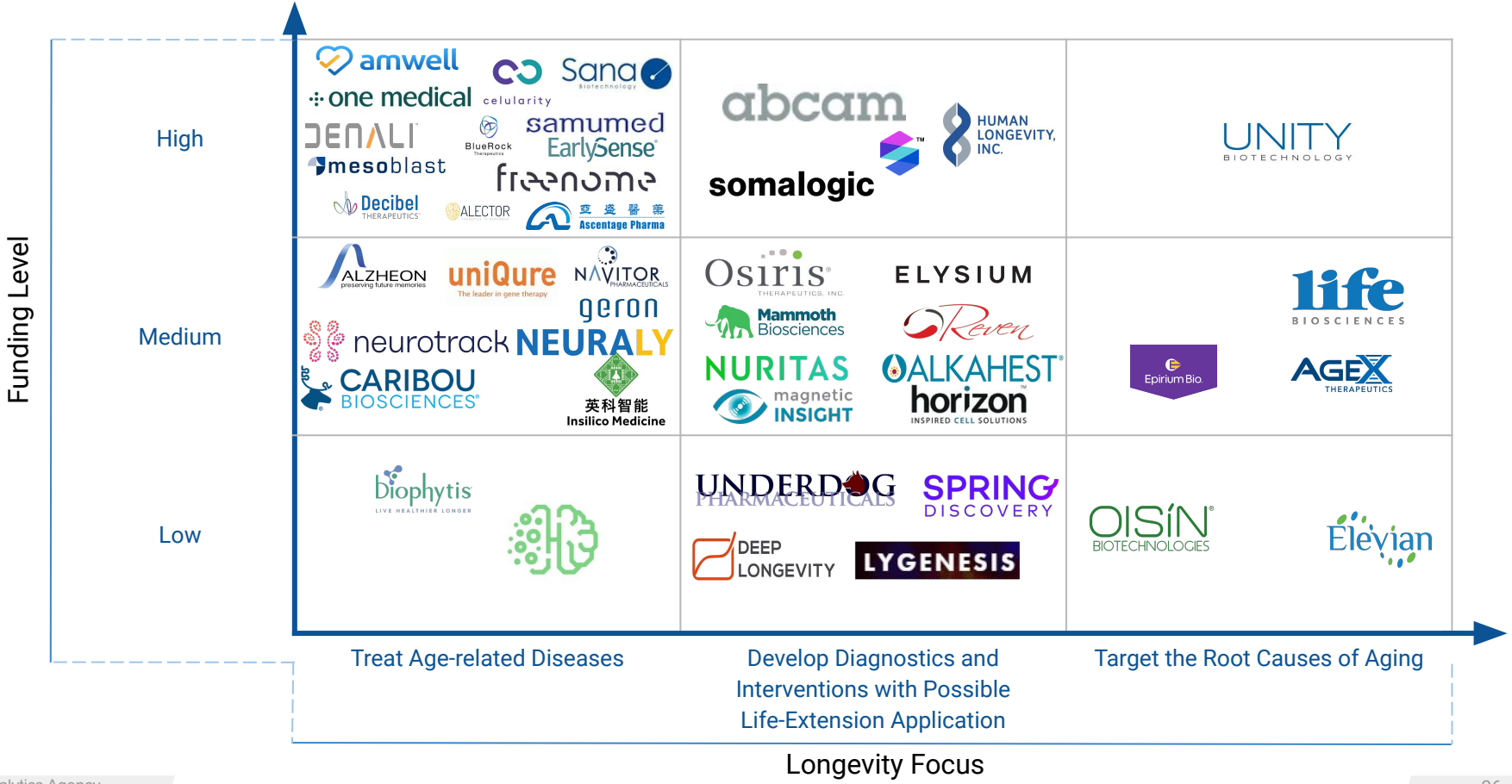
50 Leading Companies in Longevity Sector

1	Abcam
2	AgeX Therapeutics
3	Alector
4	Alkahest
5	Alzheon
6	Amwell
7	Ascentage Pharma
8	Biophytis
9	Birdie
10	BlueRock Therapeutics
11	Caribou Biosciences
12	Celularity
13	Decibel Therapeutics
14	Deep Longevity
15	Denali Therapeutics
16	EarlySense
17	Elevian
18	Elysium
19	Epirium Bio
20	Freenome
21	Geron
22	Haunt.AI
23	Herophilus
24	Horizon Discovery
25	Human Longevity

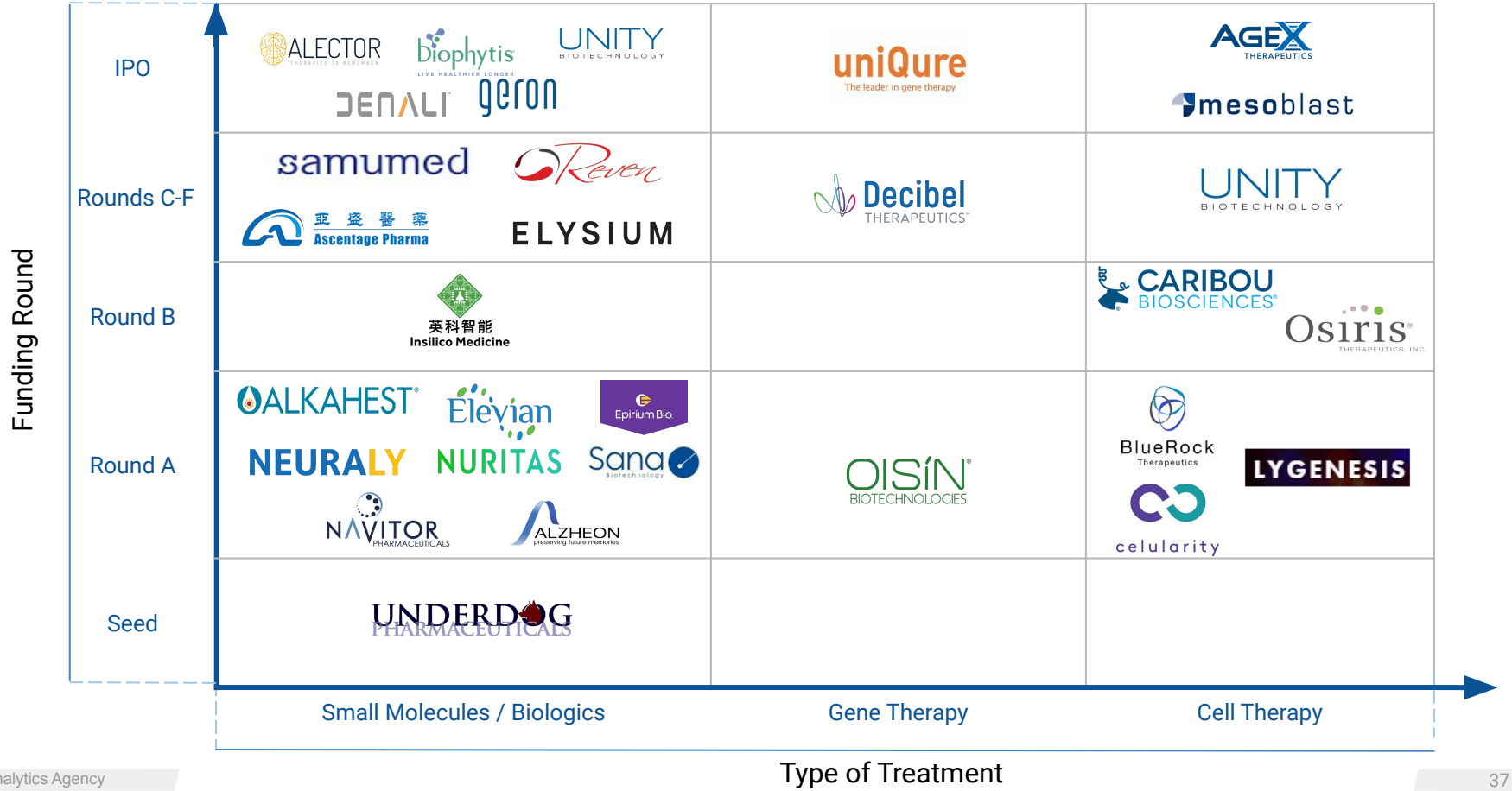
50 Leading Investors in Longevity Sector

26	Insilico Medicine
27	Juvenescence
28	Krydel
29	Life Biosciences
30	LyGenesis
31	Magnetic Insight
32	Mammoth Biosciences
33	Mesoblast
34	Navitor Pharmaceuticals
35	Nectarine Health AB
36	Neuraly
37	Neurotrack
38	Nuritas
39	Oisin Biotechnologies
40	One Medical
41	Osiris Therapeutics
42	PharmEasy
43	Reven Pharmaceuticals
44	Samumed
45	Sana Biotechnology
46	SomaLogic
47	Spring Discovery
48	Underdog Pharmaceuticals
49	UniQure
50	UNITY Biotechnology

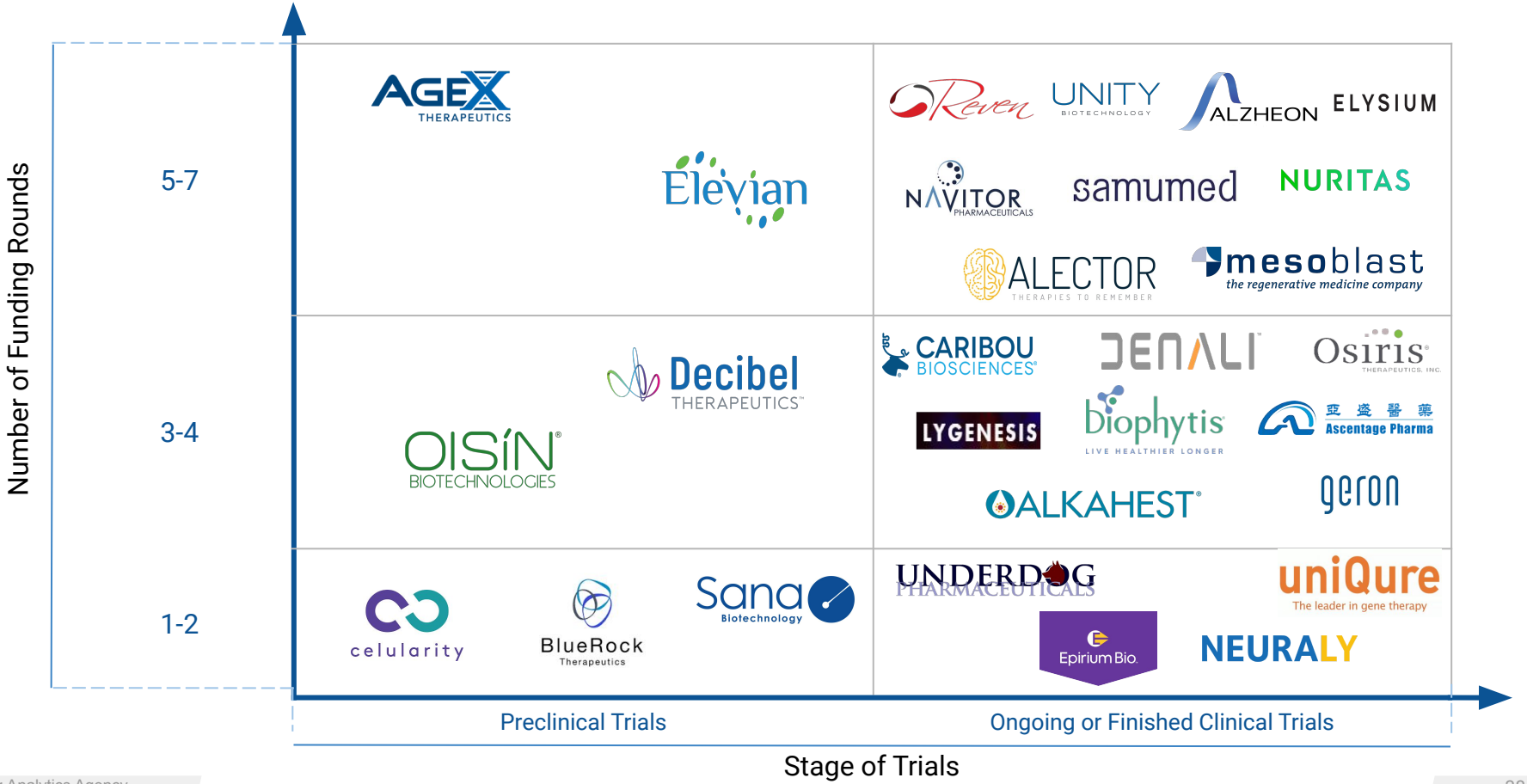
Top Longevity Companies by Funding Level and Specialization



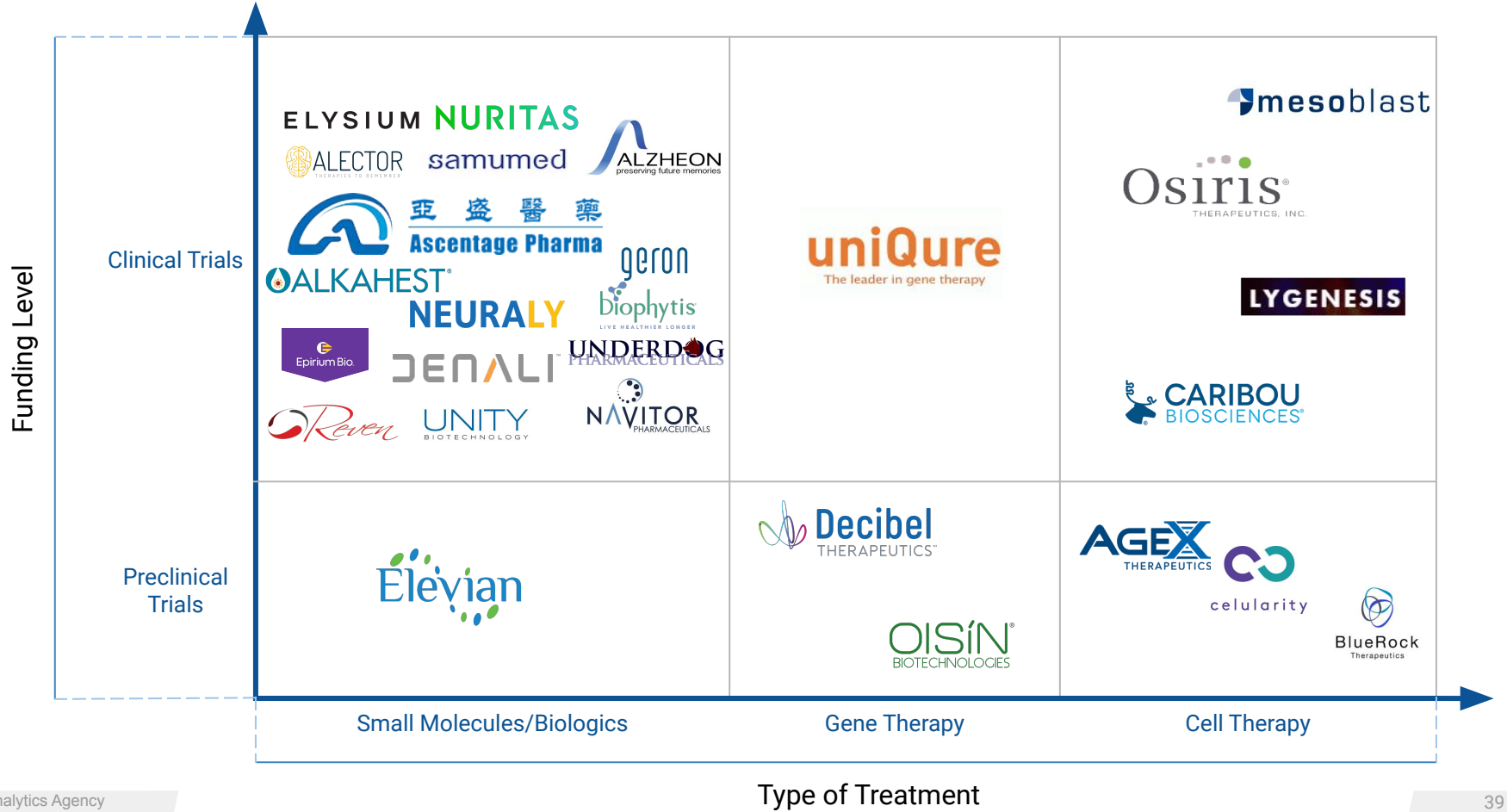
Top Longevity Companies by Funding Level and Specialization



Top Longevity Companies



Top Longevity Companies



Top Investors in the Longevity Industry

50 Leading Investors in Longevity Sector

1	500 Startups
2	Advent Life Sciences
3	Apollo Ventures
4	ARCH Venture Partners
5	Berkeley SkyDeck
6	Bill & Melinda Gates Foundation
7	Bold Capital Partners
8	Celgene
9	Clarus Ventures
10	CRG L.P.
11	Deep Knowledge Ventures
12	Eight Roads Ventures
13	Esas Ventures
14	Essex Woodlands Health Ventures
15	F-Prime Capital
16	Flagship Pioneering
17	Forbion Capital Partners
18	Foresite Capital
19	Formic Ventures
20	Founders Fund
21	GE Capital
22	GV
23	Illumina
24	Index Ventures
25	Innovate U.K.

50 Leading Investors in Longevity Sector

26	Jefferson Health System
27	Juvenescence
28	KIZOO Technology Capital
29	Longevity Vision Fund
30	MassChallenge
31	Maverick Ventures
32	Methuselah Fund
33	National Institutes of Health
34	Novartis
35	Novartis Venture Fund
36	Novo Holdings
37	Omega Funds
38	OrbiMed
39	Pitch@Palace
40	Polar Light Ventures
41	Polaris Partners
42	RA Capital Management
43	Roche Venture Fund
44	Social Capital
45	SR One
46	StartX (Stanford-StartX Fund)
47	The Longevity Fund
48	Venture Kick
49	VI Partners
50	Vickers Venture Partners

Comparison of Longevity Investment Funds
Research Focus / Investment Portfolio Focus

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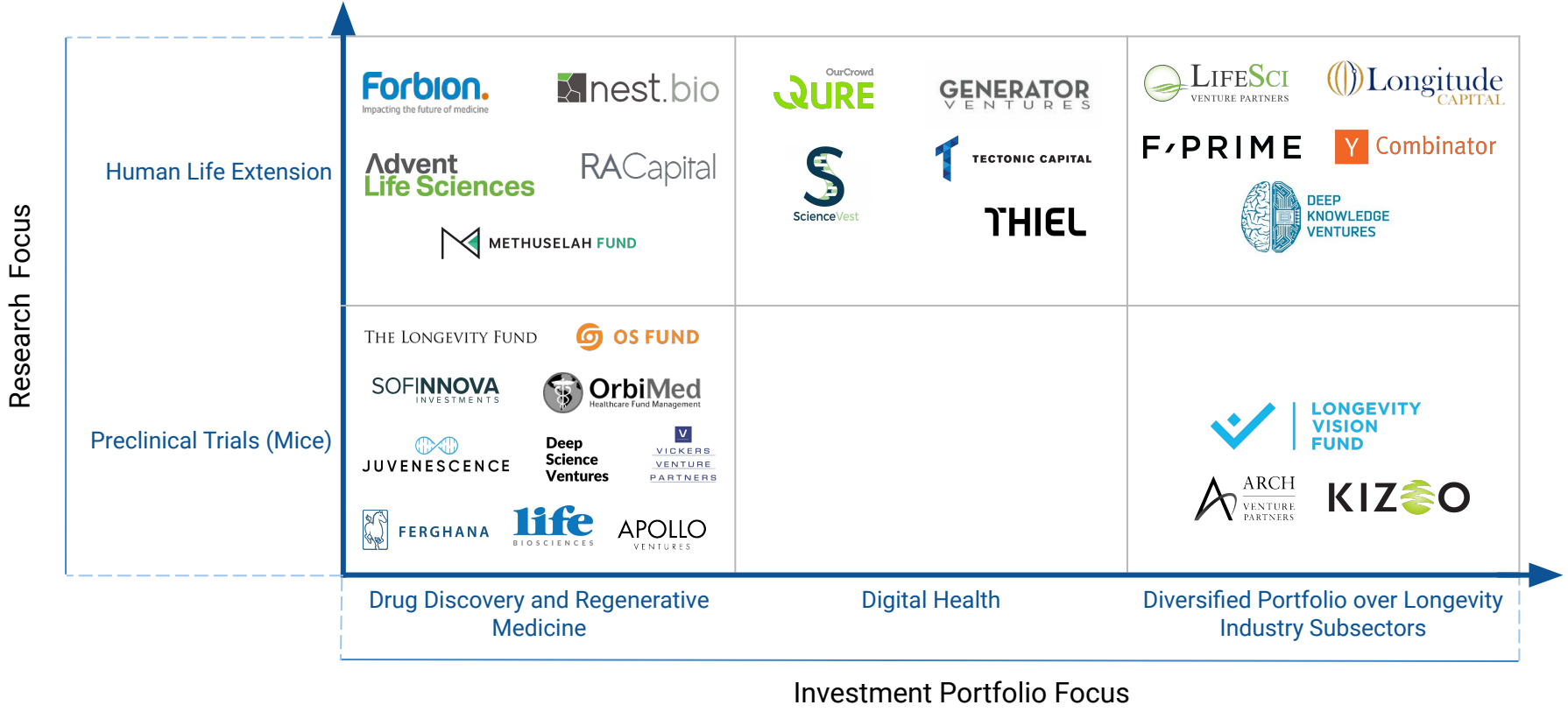

Comparison of Longevity Investment Funds
Funding Round Focus / Company Stage Focus

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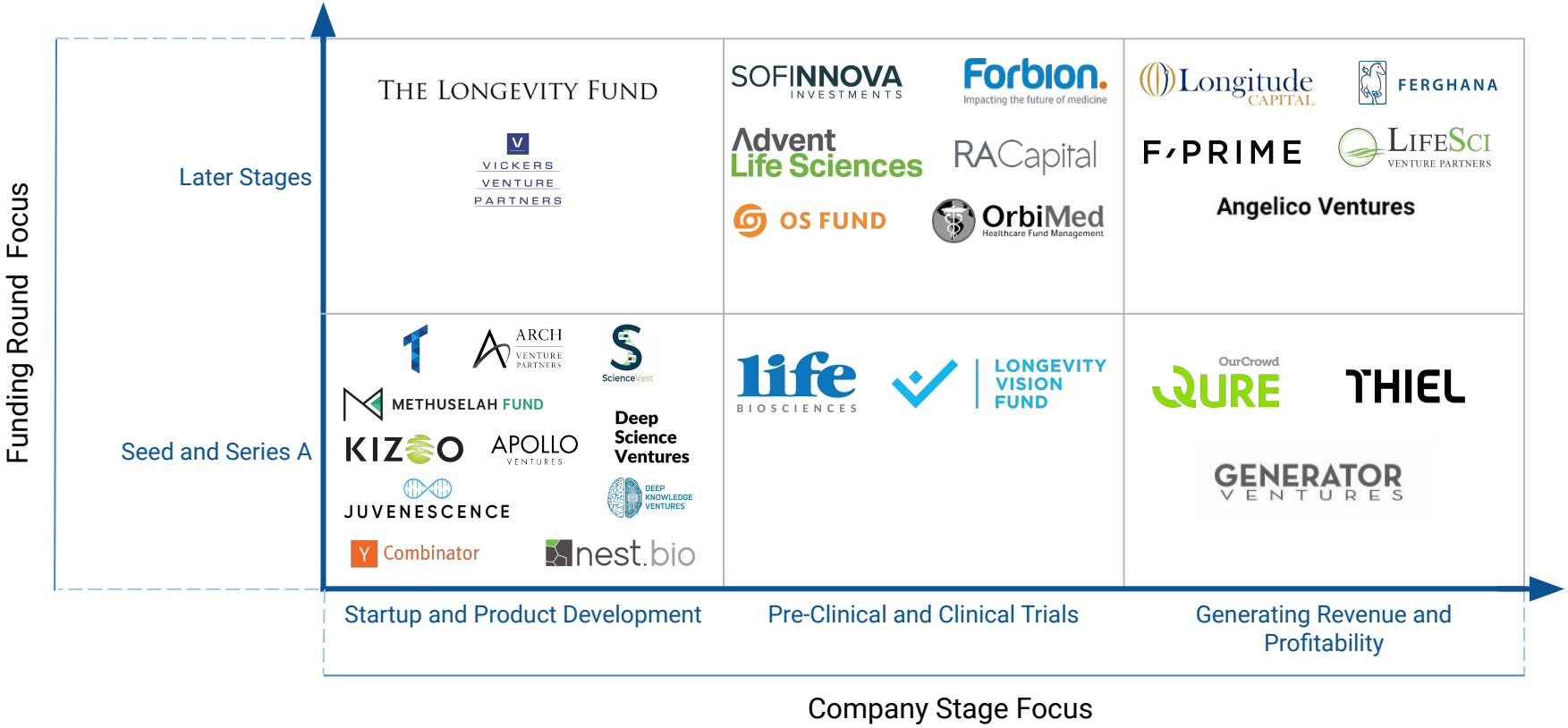

Comparison of Longevity Investment Funds
Investment Specialization / Investment Approach

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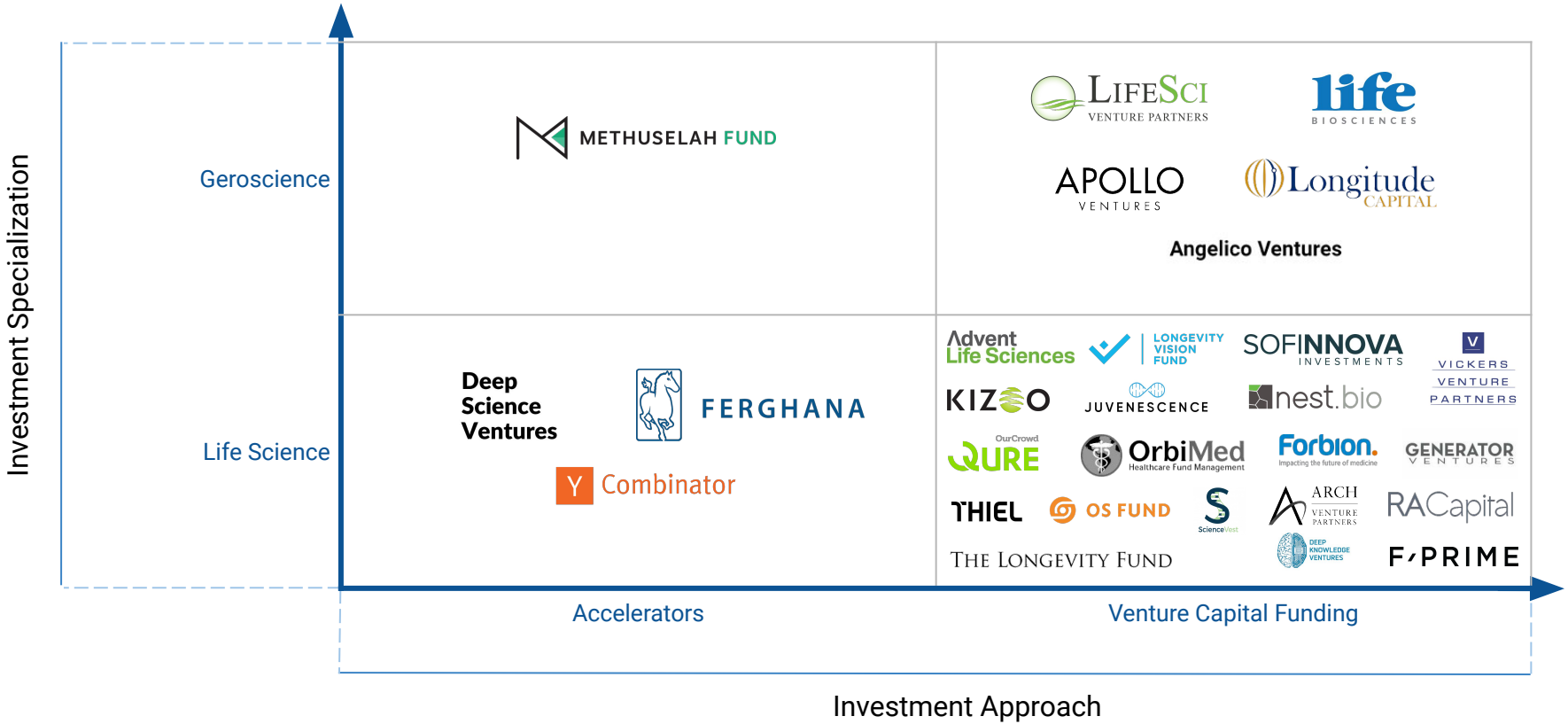

Comparison of Longevity Investment Funds
Number of Investments / Geographical Distribution of Assets

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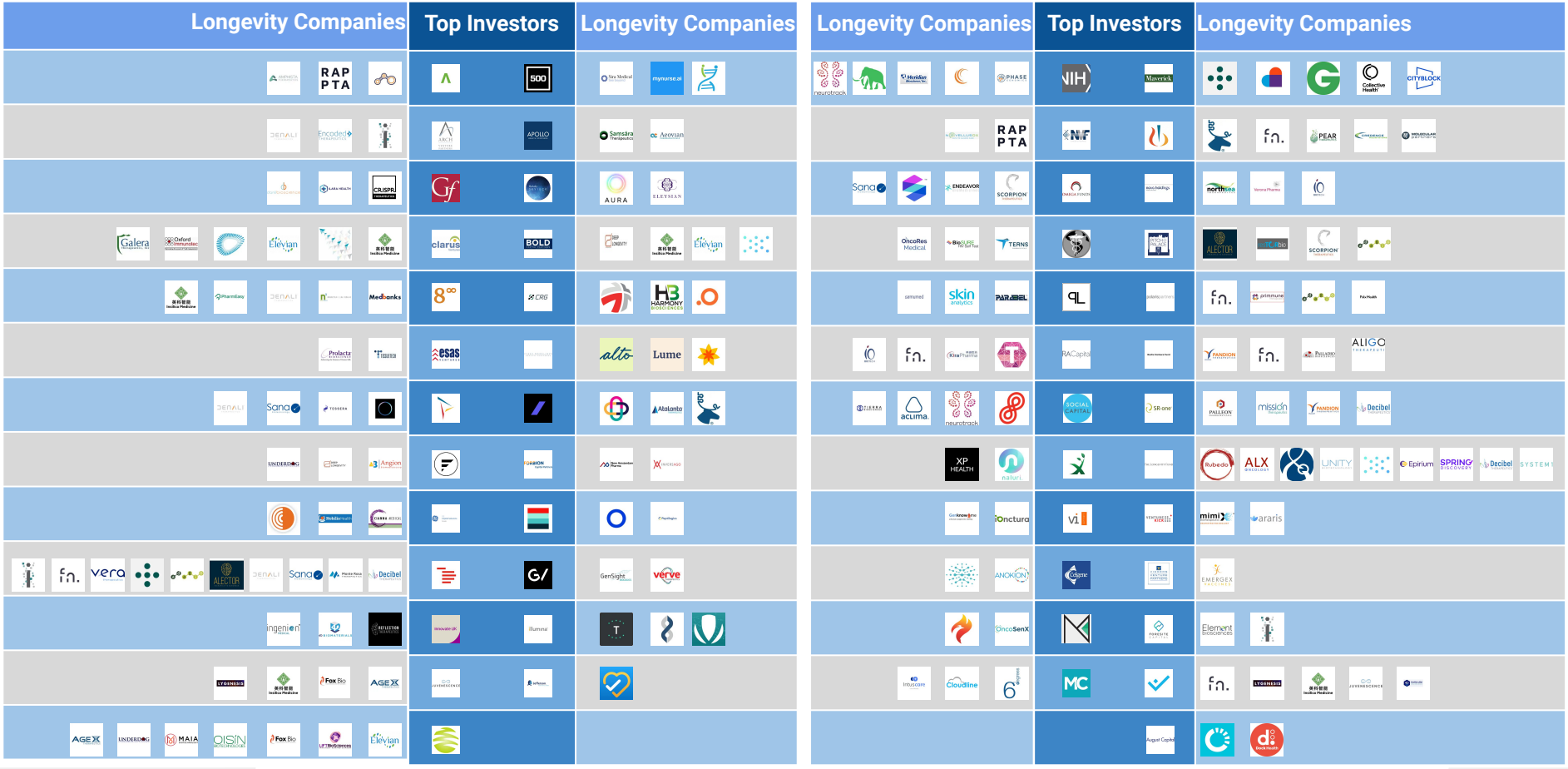
50 Top Investors in the Longevity Sector



Longevity Industry Market Timeline

The first approaches — 2013-2015

- The first scalable approaches for longevity biomedicine and biomarkers of ageing were developed and several industry players with forward-thinking executives started launching pilot collaborations and making small investments.
- However, only few market players believed in anti-aging technologies.

Criticism — 2016-2017

- Many pilot projects failed due to the lack of scientific validation and immaturity of the technologies, creating a lot of criticism towards the whole industry.
- Since then the race for the acquisition of the longevity startups began.
- Testing of the technology began.

Industry development — 2018

- Capitalization of the industry was continuously growing.
- Many bets of early investors appeared to be justified.
- Large financial institutions, as well as government agencies, started to express interest in the longevity industry.

Transition from quantity to quality — 2019

- An important milestone in transitioning from the quantity of longevity startups to qualitative gains — significant number of practical validations of previously conducted research appeared during this year.
- Competition for the most successful pharma AI companies increased dramatically.
- Most developed longevity startups are becoming mature companies, large institutional investors are being attracted to the industry, full-fledged longevity infrastructure is being developed.

Intensive competition — 2020-2022

- Intensive cooperation of longevity companies with corporations, banks, and governments begins.
- Competition among advanced longevity companies booms.

Conclusions

Most of the longevity-focused investment funds invest in drug discovery and depend on the success of clinical trials. Longevity-focused investment funds follow a strategy whereby they invest in one another, drug discovery and AI-driven pharma companies. Investors are highly exposed to risks associated with drug failure because most of portfolio drug discovery companies specialize in animal clinical trials. Animal models have limited concordance with human pathology. A molecule that extends a healthy lifespan in one species often extends a lifespan in other species. To minimize the risk of failed clinical trials and increase the probability of successful commercialization of treatment, researchers should determine the effects of the drug on the human body, assess its dosage and safety, and obtain a safe and optimal dosage that is likely to be effective for the proposed indication.

Lack of portfolio diversification over Longevity industry subsectors. Although venture funds, by definition, are supposed to prioritize investments into the most disruptive technologies and startups, most of them actually prefer to specifically avoid DeepTech sectors or enter investment rounds at later stages. **Longitude Capital**, **F-Prime Capital** and **LifeSci Venture Partners** have a sufficiently diversified investment portfolio both by longevity subsectors and by the level of companies' maturity. They prefer to invest in AgeTech, Drug Discovery, and P4 Medicine projects at different funding stages.

Lack of effective de-risking investment strategies in terms of "time diversification" and company stage. The majority of longevity-focused funds (e.g. KIZOO, Apollo Ventures, and Juvenescence) are early-stage investors, which are exposed to critical investment risks. They understand that building a new business takes time and ongoing support, so they typically expect to make multiple investments in a single company as it develops. The challenge is to design de-risking strategy that can cost-effectively catalyze private investment and deliver a successful outcome for every portfolio project.

The Longevity industry will inevitably exhibit growth. It is beneficial for investors, as it accelerates their access to biomedical technology and life extension. It is of great benefit to humanity, creating the products and services that will help us enter a new era of long, comfortable and productive lives. Being the most ethical way of conducting business, it also helps generate enormous profits, contributes to developing the most advanced longevity technologies, and makes humanity healthier.

Longevity Investment Big Data Analytics Dashboard

www.aginganalytics.com/longevity-investment-dashboard

Longevity Governance and National Healthcare Budgets

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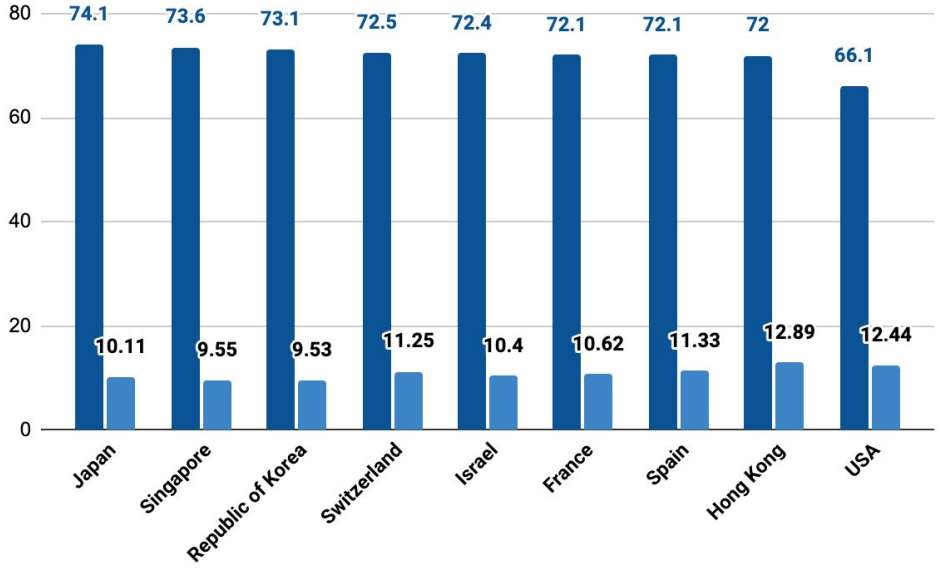
Longevity Governance Industry: Overview



The main goal of the Longevity Governance Industry is to **reduce the gap between life expectancy and HALE** (Health-Adjusted Life Expectancy). Global Longevity Governance is a special analytical study that uses data across 50 countries to measure Healthy Longevity according to HALE. In so doing, it is able to identify the existing gaps between HALE and unadjusted life expectancy. All the parameters used in the report depend on the social policy, healthcare, medical, financial and socio-economic factors in a particular country. We provide an overview of countries with the lowest to highest HALE indicators.

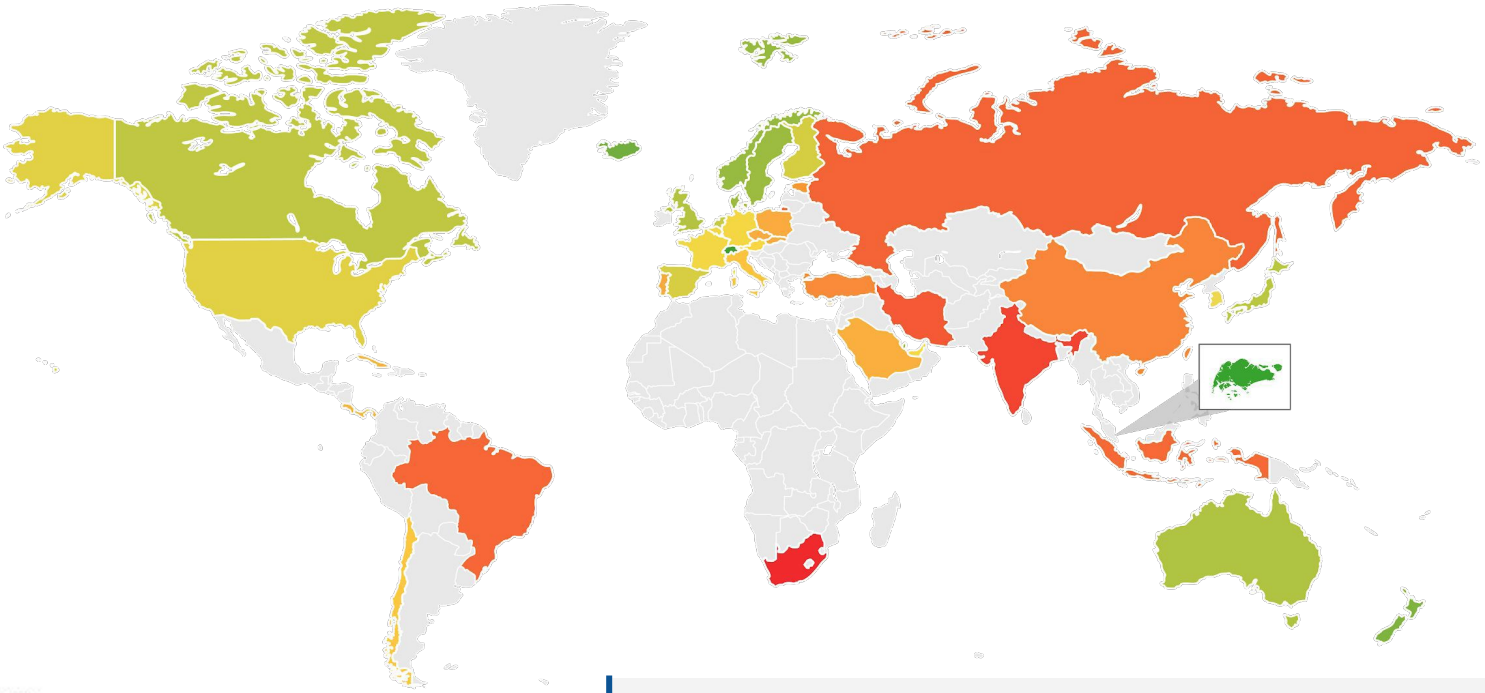
The lowest gap between HALE and Life Expectancy is observed in **Singapore** where people tend to be wealthier and are, therefore, able to eat healthy food and have access to the best health care. However, this rule is not applicable to **the US**, which spends a significant amount of money on health care but still has a relatively low HALE. Countries in which people live in poor environmental conditions, do not have access to modern healthcare and eat poor-quality food also have a low HALE.

https://www.aginganalytics.com/longevity/governance-dashboard

50 Countries: Analysis of Longevity Progress

1	Argentina	13	Estonia	26	Japan	39	Saudi Arabia
2	Australia	14	Finland	27	Luxembourg	40	Singapore
3	Austria	15	France	28	Malta	41	Slovakia
4	Belgium	16	Germany	29	Mexico	42	Slovenia
5	Brazil	17	Greece	30	Netherlands	43	South Africa
6	Canada	18	Hong-Kong, SAR	31	New Zealand	44	Spain
7	Chile	19	Iceland	32	Norway	45	Sweden
8	China	20	India	33	Panama	46	Switzerland
9	Costa Rica	21	Indonesia	34	Poland	47	Turkey
10	Cuba	22	Iran	35	Portugal	48	United Arab Emirates
11	Czech Republic	23	Ireland	36	Qatar	49	United Kingdom
12	Denmark	24	Israel	37	Republic of Korea	50	United States of America
		25	Italy	38	Russian Federation		

HALE Ranking and Gap Estimation



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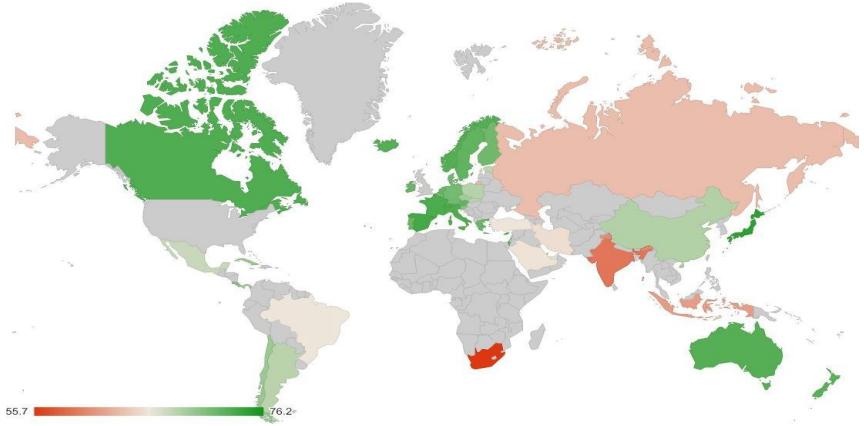
0.755

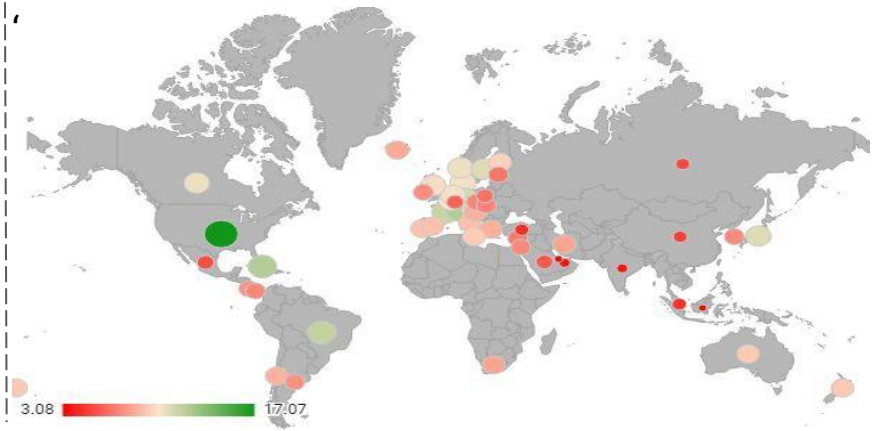
Health-Adjusted Life Expectancy (HALE), used here as a measure of Healthy Longevity, is the average number of years an individual can expect to live free of chronic age-related disease.

HALE and Life Expectancy: Factors Affecting HALE

Both sexes HALE



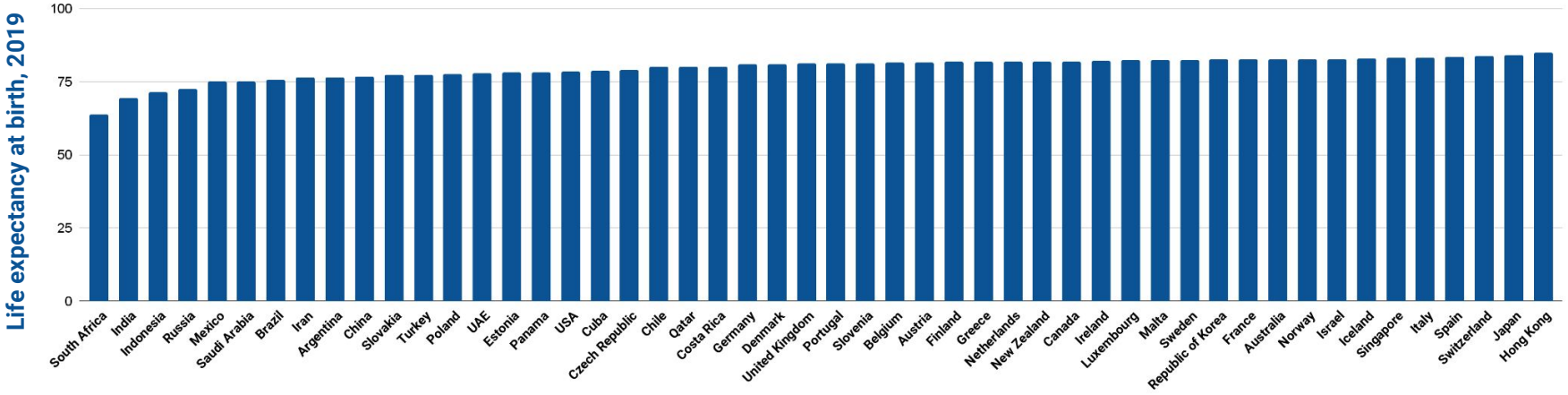
Public health expenditures (as % of GDP)



Being a major characteristic of a country's healthcare policy, public health expenditure is, therefore, a key variable as far as the research purpose is concerned. There is a wide variation in the percentage of public healthcare expenditure across different countries, which reflects profound differences in their healthcare systems. Hence, public spending on healthcare affects the latter's efficiency than being an input in the health production function.

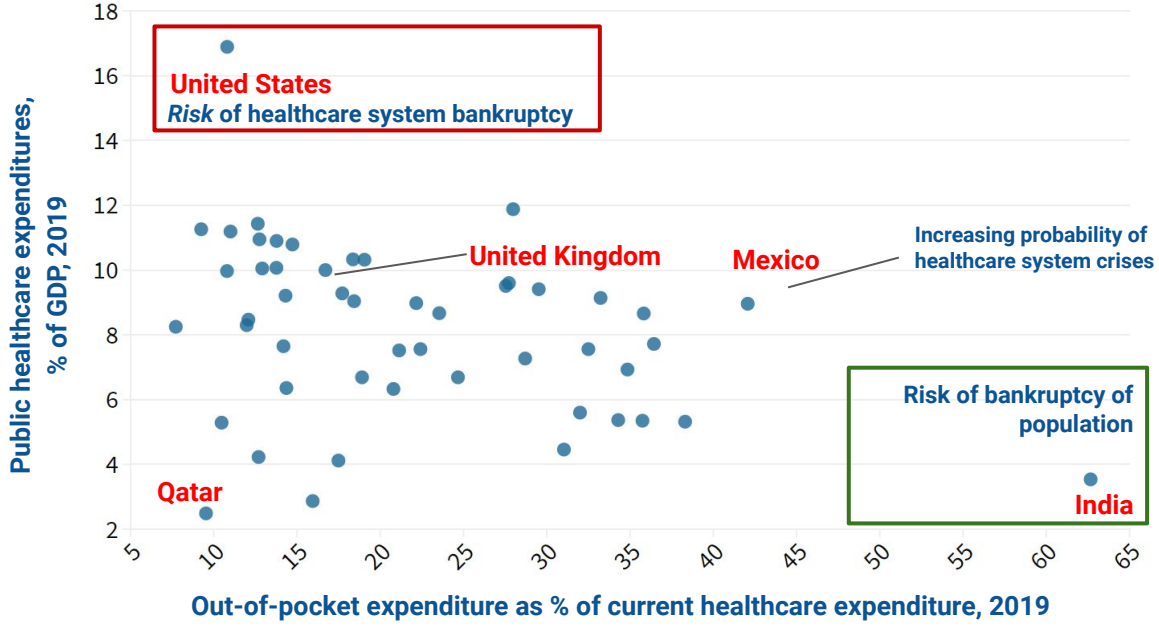
Efficiency of a healthcare system cannot be measured by health expenditure as percentage of GDP Health expenditure involves consumption of healthcare goods and services, including personal healthcare and collective services. It is a complex indicator that varies across different countries. Healthcare spending in developed countries is impacted by higher prices, as well as higher administrative and transaction costs. That is precisely why increased healthcare spending does not always result in a more efficient healthcare system and better health of a country's citizens.

Health-Adjusted Life Expectancy at Birth



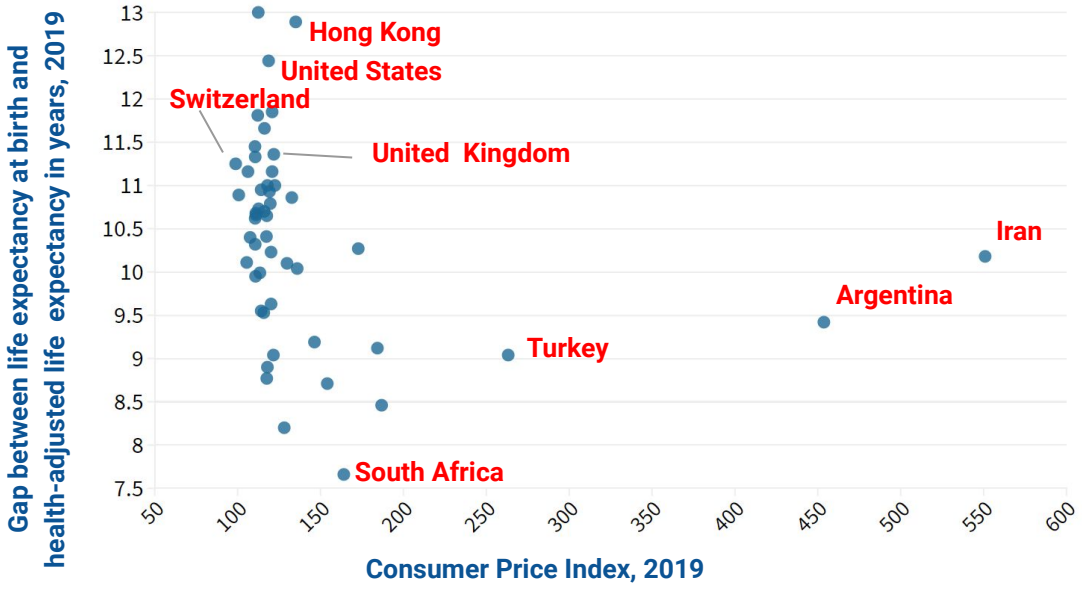
Developed countries have higher health-adjusted life expectancy comparing to developing countries. HALE at birth in countries varies significantly. The highest value is in japan and the lowest value is in South Africa, they equal 74.1 and 56 years accordingly. The United States is the high-income country where life expectancy is marginally low the average level of chosen countries (70 years). Slovakia has the lowest HALE among European Union countries presented in the report.

Public Healthcare and Out-of-Pocket Expenditure



Unregulated direct charges often pose a significant hurdle to individuals that require health care. They also tend to contribute to high out-of-pocket payments and cause problems with financial protection. Out-of-pocket expenses place a heavy burden on households' financial resources and make healthcare unaffordable to low-income groups. As a result, there appear significant disparities in healthcare status between groups with different income levels. In contrast, public spending on health care is central to universal health coverage and social protection. However, no clear trend signifying that is observable at the moment. In the US, healthcare expenditure is a result of high administrative costs and corruption in healthcare.

Economic Instability and a Gap Between HALE and Life Expectancy

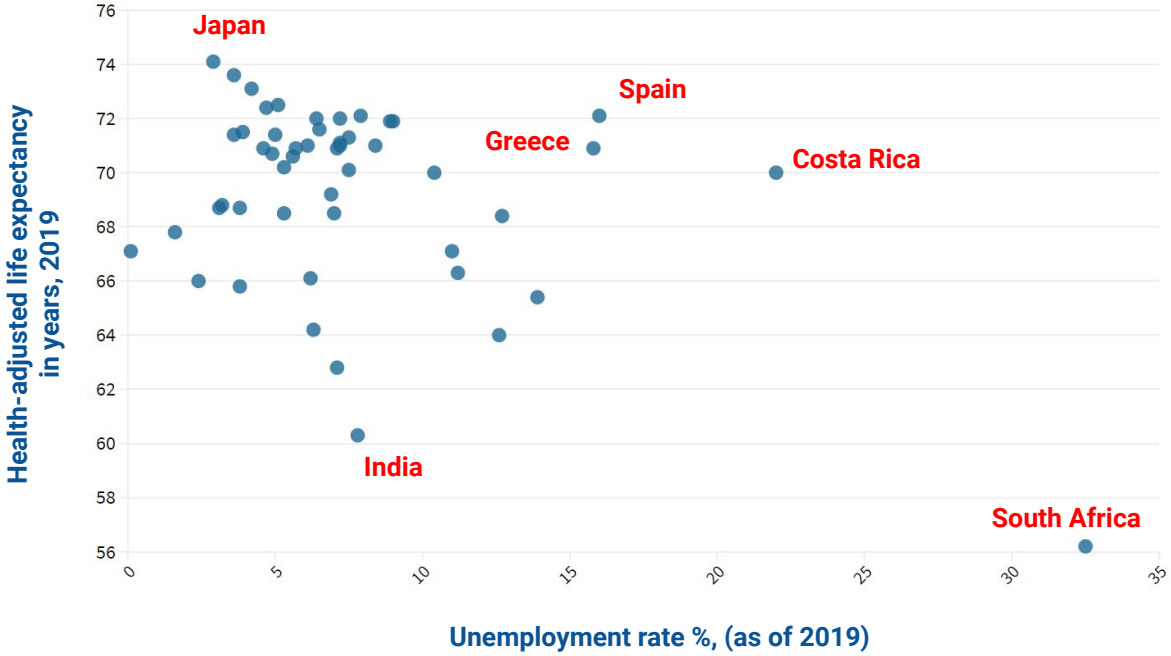


The Consumer Price Index (CPI) is used to measure the average change in prices paid by consumers for goods and services over time. CPI characterises prices' instability and economic instability, whereas inflation indicates recession or systemic crises.

According to the 2019 **Medical Trends Around the World survey**, health conditions, supplier factors and consumer habits are the primary factors contributing to increased costs. A surge in prices for basic medical services and goods makes healthcare less affordable and leads to higher inequality in a healthcare status.

The graph shows that an **increase of CPI** contributes to an increase in a gap between **life expectancy at birth and HALE**. The lowest level of CPI in 2019 was observed in **Switzerland**, while the highest one was in **Iran**.

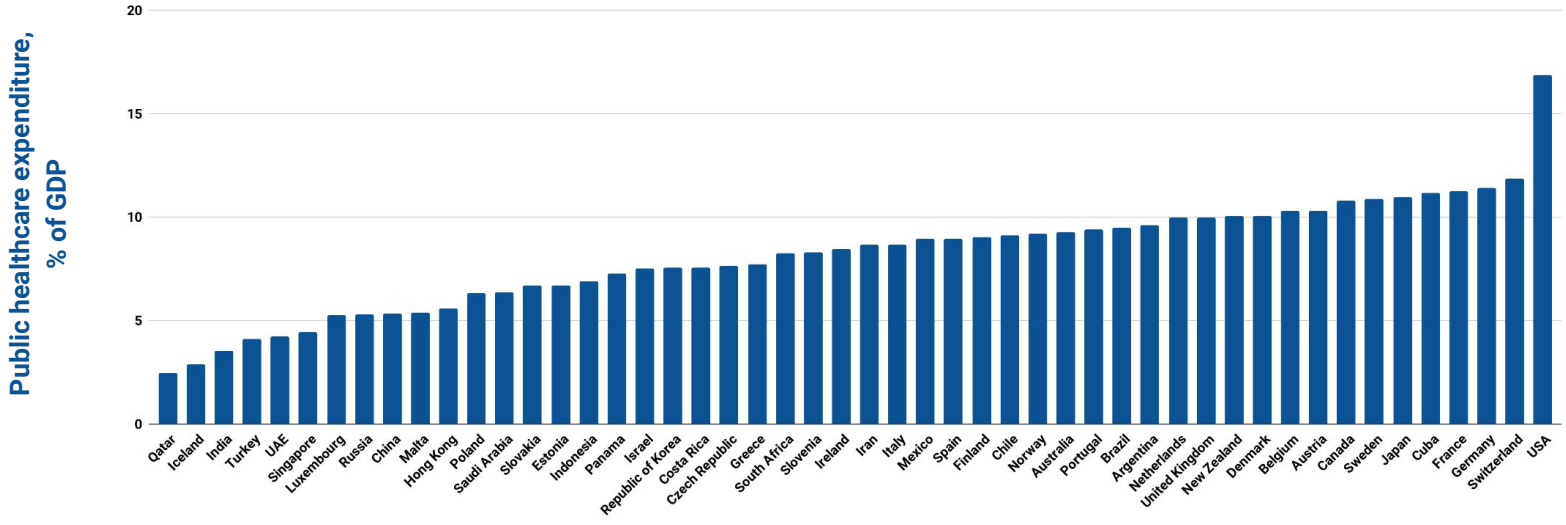
Unemployment and Healthy Longevity



A high unemployment rate leads to the reduction in health-adjusted life expectancy. Countries with a low unemployment rate (i.e. those of them that are close to natural level of unemployment) have higher HALE. A high unemployment rate also leads to social inequality and inability of people to afford basic goods and services.

However, the graph also show that an increase in unemployment rate leads to a decrease in a gap. Such inverse relations can be explained by the fact that life expectancy and HALE are modeled indicators, with the latter being more inertial in nature and having lower elasticity than the former.

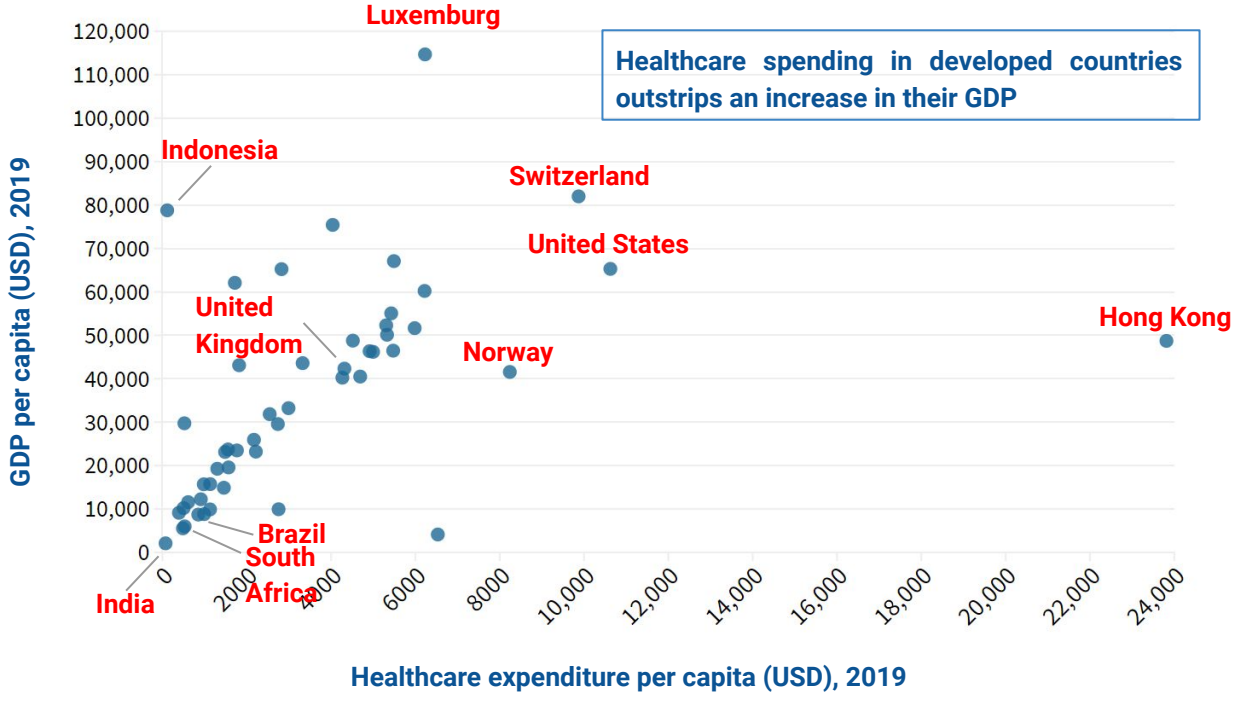
Public Healthcare Expenditure



It is absolutely vital for countries to invest in their healthcare sector. Evidence shows that investing in the healthcare sector results in substantial benefits for a country's economy. In developing countries, increased healthcare expenditure will lead to the improvement of the health status of the population of an entire region.

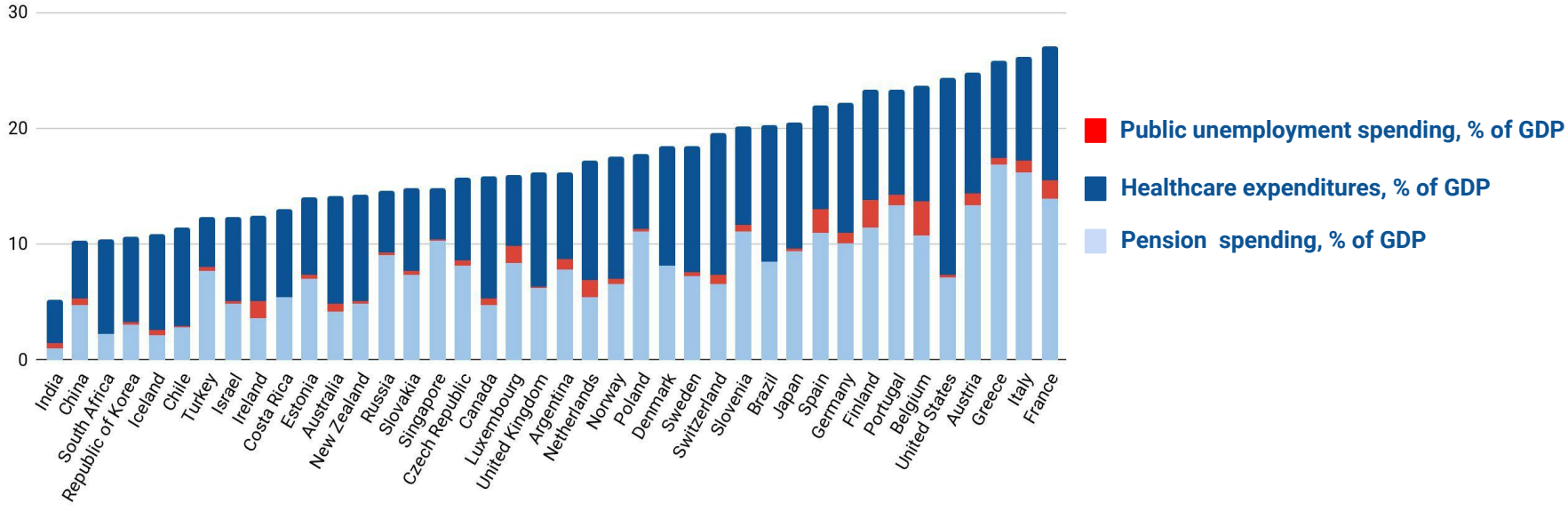
The only exception to this rule is the United States, which spends a disproportionate amount of money on health care. This, in turn, leads to increased financial burden and has very little effect on general public health.

Healthcare Spending and GDP



This chart represents a correlation between healthcare spending and GDP per capita. Data provided by the World Bank and Organization of Economic Cooperation and Development (OECD) in 2019 suggests that wealthy countries, such as Hong Kong, United States, Switzerland, and Norway, tend to increase Healthcare budgeting, in comparison with middle-income countries, such as India, Brazil, South Africa, and Indonesia. Comparing health spending in different countries can be a challenge due to the political, economic, and social systems.

Social Protection and Healthcare



Different countries have different political, economic, and social systems. Hence, they tend to allocate various sums of money to social protection programs. In 2019, the US spent some 17.1 percent of its GDP on healthcare – more than twice the average among developed countries.

Greece has the most significant pension expenditure (16.9%), but this does not allow you to pay high pensions. It is caused by the solidarity pension system, which continues to operate in Greece and won't be changed in the nearest future. Therefore, due to a disproportionately high number of pensioners and the low number of workers, the current state is not changing and worsens.

Healthcare Spending Per Capita by Country

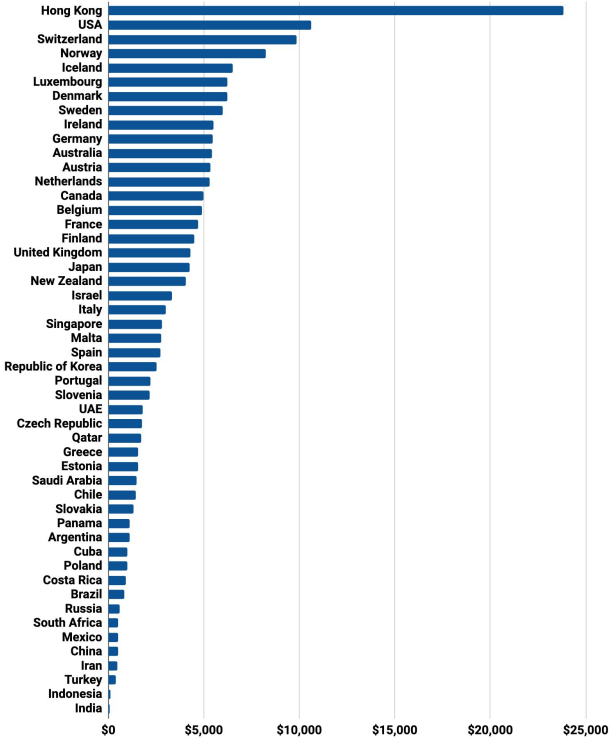
How much a country spends on its healthcare system and how its health expenditure changes over time is impacted by a number of social and economic factors, as well as the structure of a country's healthcare system.

The United States spends more on healthcare than any other country in the world, with its federal government being one of the biggest spenders. Relative to the size of its wealth, the US spends a disproportionate amount of money on healthcare - 80% more than Germany and twice as much as Japan, Canada and France. In the medium term, the US Center for Medicare and Medicaid Services (CMS) expects healthcare spending to exceed the country's GDP. It explains the increase by rapidly growing prices for medical supplies.

After a slowdown in 2009-2011 caused by the global financial crisis, health expenditure per capita in different countries continued to grow in 2016.

In Singapore, health expenditure is projected to grow faster than GDP, which may potentially result in the growth of private healthcare. The growth may also lead to increased spending on research and development of pharmaceutical products, medical devices and laboratory services.

Healthcare Expenditure per Capita (USD), 2019

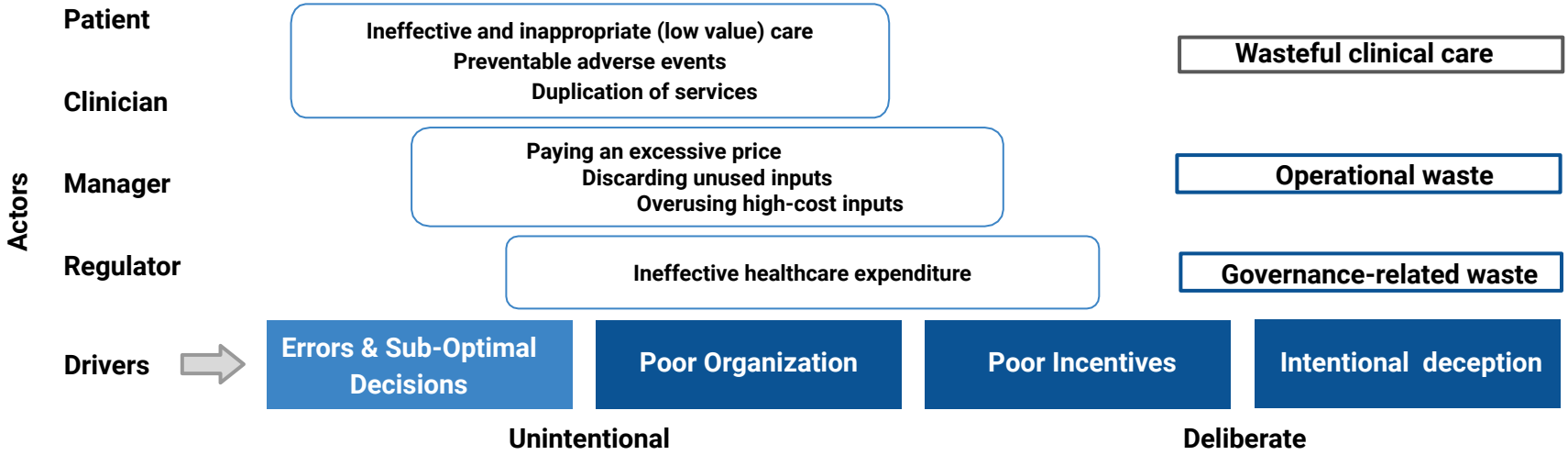


Disproportionately High Health Expenditure

Health expenditure is rising in the United States and in the majority of OECD countries. However, an increase in health expenditure is having little or no effect on the improvement of people's health. In some cases, it even results in worse health outcomes. The US could potentially spend significantly less on healthcare without a detriment to its healthcare system or adverse health outcomes.

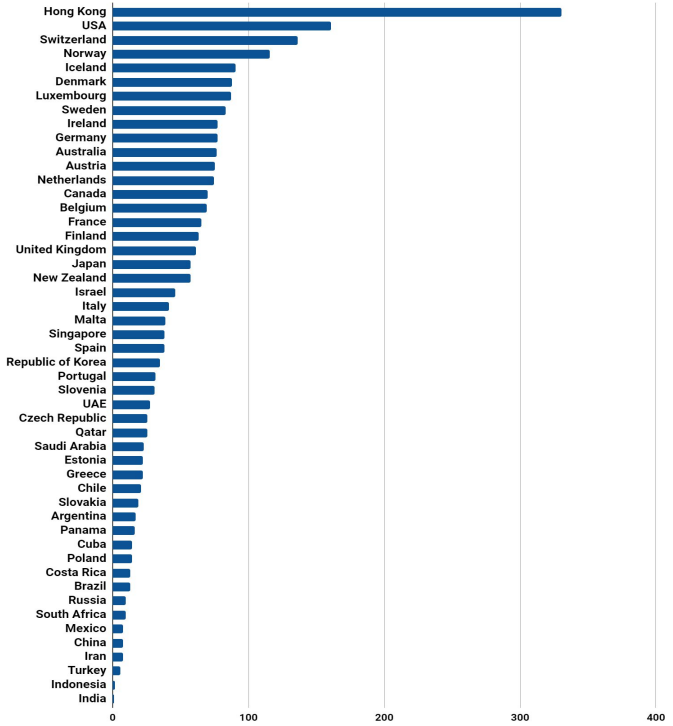
Behavioral root causes of disproportionate health expenditure include:

- imperfect knowledge and cognitive biases;
- poor management, organization and coordination;
- incentives misaligned with system goals.



Healthcare Spending and HALE

Healthcare Expenditures per Capita / HALE



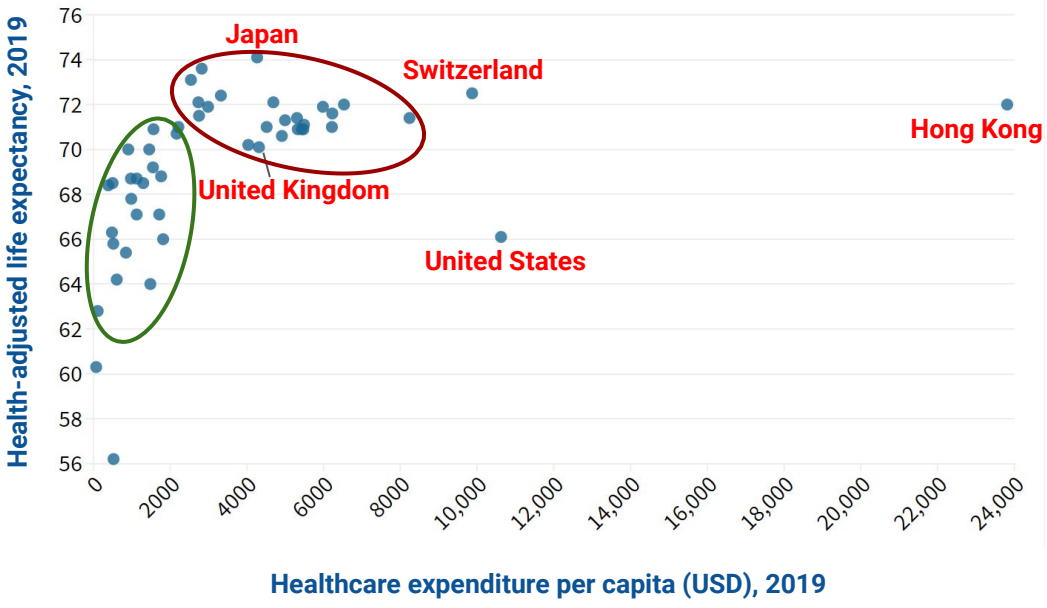
Healthcare spending per capita divided by HALE equals an efficiency ratio, i.e. a country's average health expenditure in one healthy life year.

Despite spending a disproportionately high amount of money on healthcare (more than any other country in the world), the US has a relatively low HALE. In fact, its HALE is the lowest among high-income developed countries, including Western European countries, Australia, and Japan. This is explained by the fact that chronic diseases pose the biggest threat to longevity in the country nowadays.

Having one of the most comprehensive healthcare systems in the world, Luxembourg can provide its citizens with virtually unrestricted access to healthcare. Luxembourg also ranks fifth for per-capita health expenditure. The country spends almost 8% of its Gross Domestic Product (GDP) on healthcare, which translates into a high HALE and life expectancy.

Spending the least on healthcare, India has the lowest HALE value. Lack of healthcare facilities in the country further contributes to bad health of its citizens and a low HALE value.

Healthcare Spending and Health-Adjusted Life Expectancy



Based on 2019 data from the OECD and World Health Organization, this chart represents a correlation between health expenditure and Health-Adjusted Life Expectancy (HALE).

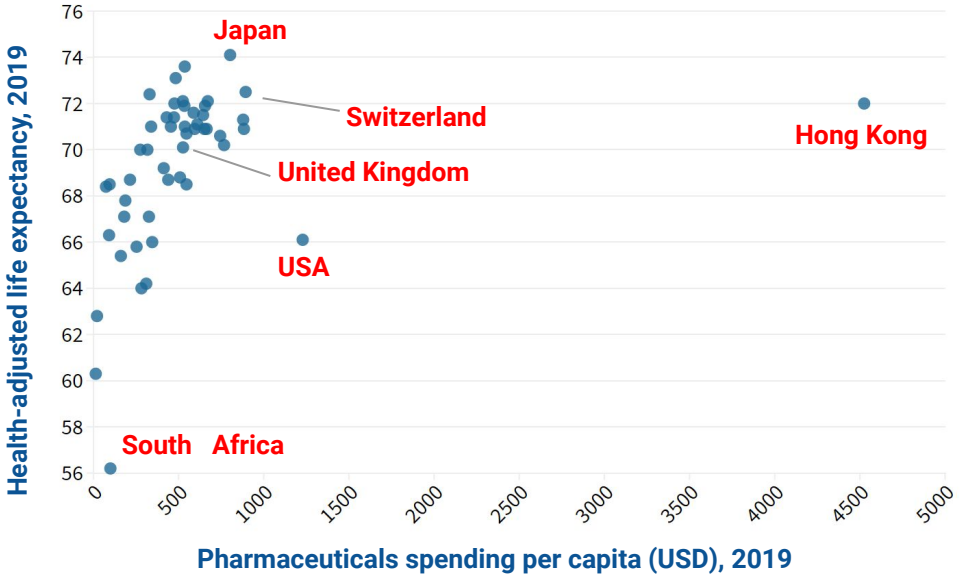
As we can see, there is no linear relationship between life expectancy and health expenditure. What it means is that increased public expenditure on healthcare does not guarantee a healthier and longer life.

The graph is divided into two main groups. The first one represents developing countries, such as India, Brazil, Russian Federation, Argentina, where increased public spending contributes to an increase in healthy life.

The second group represents developed countries whose per capita health expenditure, including healthcare-related expenses, is much higher than that of lower-income countries; however, that does not lead to an increase in the life expectancy of their citizens.

If we compare the United States and Singapore, we can see the most striking difference in the effectiveness of public healthcare expenditure. As of 2019, their per capita GDP stood at $65,297 and $65,233 respectively, which means that they have roughly the same level of wealth. However, lower per capita health expenditure in Singapore contributes to higher Health Adjusted Life Expectancy (HALE), as compared to the United States.

Pharmaceuticals Spending per capita and HALE



This chart collection takes a look at how pharmaceuticals spending are correlated with Health – Adjusted Life Expectancy. The analysis looks at 2016 health data from OECD and World Health Organization.

There is no strong relationship between HALE and pharmaceuticals spendings as only 23% of variation in HALE is explained by variation in pharmaceuticals expenditures per capita.

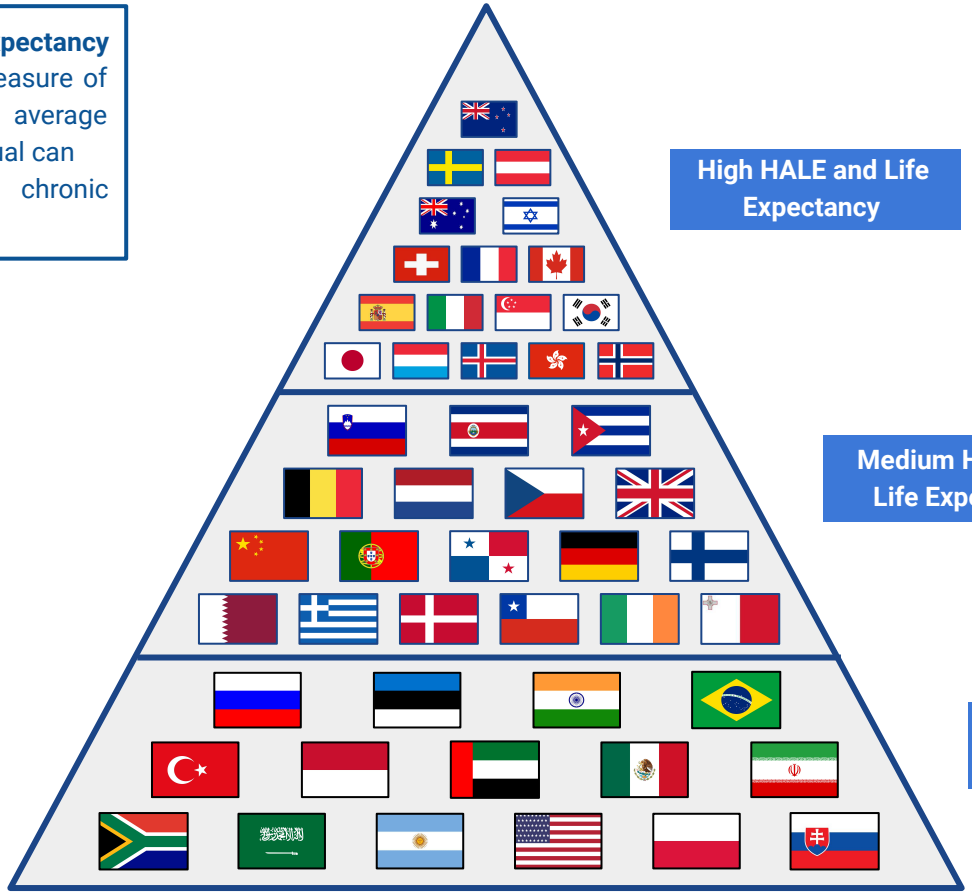
Pharmaceuticals spending is an adjusted indicator as it covers expenditure on prescription medicines and self-medication, often referred to as over-the-counter products.

It is aggregated and its components vary across countries. In some countries, different medical non-durable goods are included. Total pharmaceutical spending refers in most countries to “net” spending, i.e. adjusted for possible rebates payable by manufacturers, wholesalers or pharmacies.

The high value of pharmaceuticals spendings in the Hong Kong is caused by high medical prices. United States is the second by this indicator and Switzerland is third. The growth of pharmaceuticals spendings in Switzerland is due to the launch of new and innovative medicines – especially for cancer. In Japan the government pursues cost-effective approach for drugs development and other medical treatment, that is why relatively small amount of spendings corresponds to the highest HALE across observed countries.

Global Healthy Longevity Landscape Overview

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.



High HALE and Life Expectancy

Medium HALE and Life Expectancy

Low HALE and Life Expectancy

50 Countries:

High HALE and Life Expectancy - **17**

Medium HALE and Life Expectancy - **18**

Low HALE and Life Expectancy - **15**

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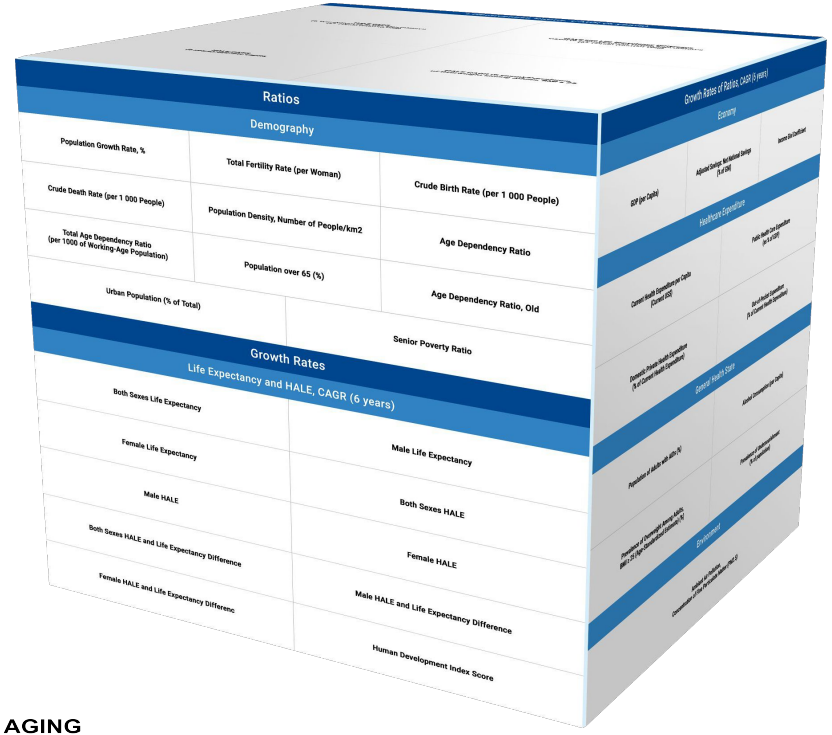
Big Data Analysis: Growth Rates, Growth Rates of Ratios, Effectiveness Ratios



Absolute values are enhanced by relative ones, and using both of them enables one to have a better understanding of the interaction between the two. It also provides one with an opportunity to investigate factors that have the biggest impact on HALE and life expectancy in a particular country.

Multicollinearity between some metrics is caused by the use of dummy variables and inclusion of a variable which is computed from other variables in a data set.

Each level of metrics is based upon extension, further subdivision or comparative combination of metrics in a preceding level, or is derived from insights provided by them.

Our analysis is based on open source data and information provided by the WHO, OECD, World Bank, and various institutions operating in a particular country.

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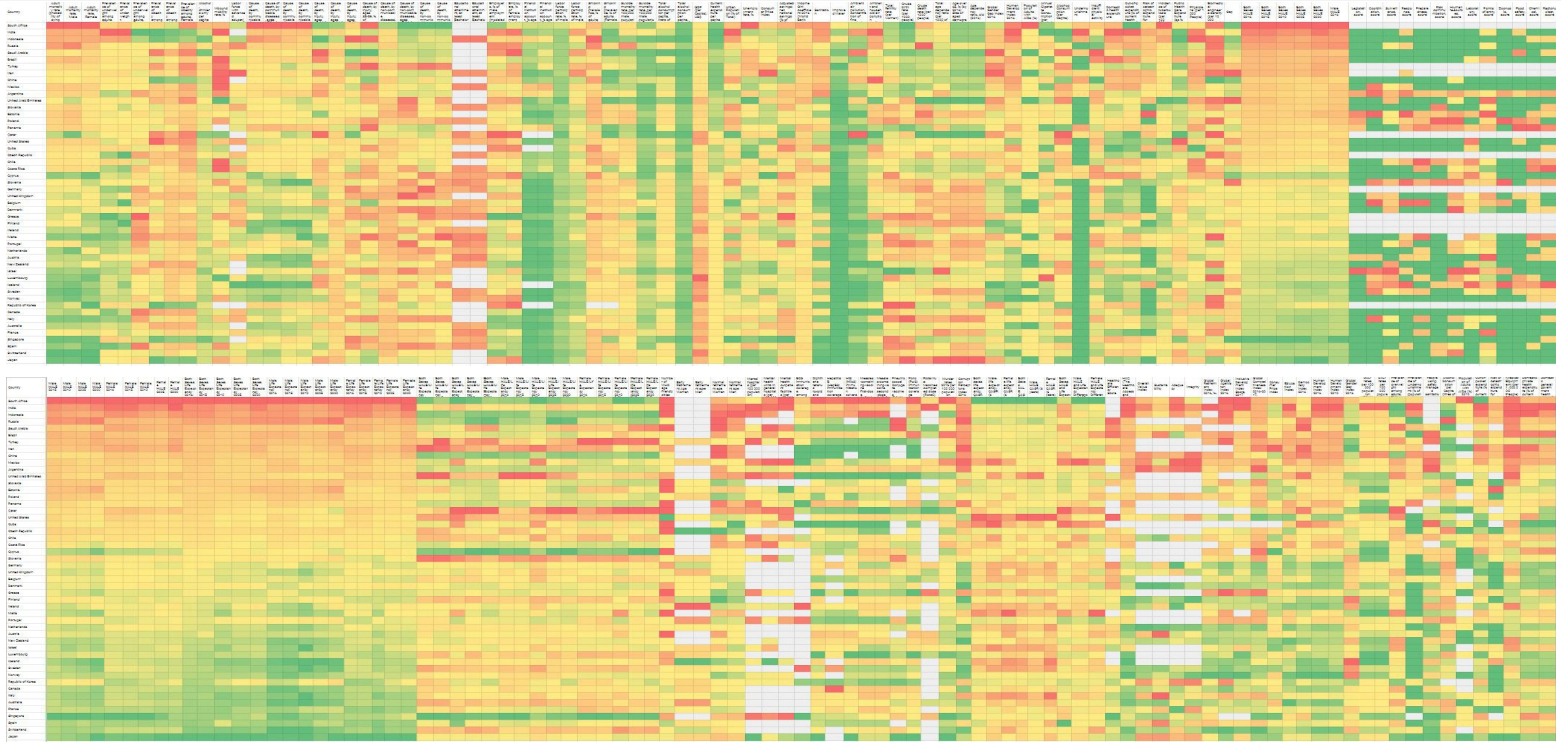
50 Countries and 200 Parameters

Based on the comparison of 200 parameters across 50 countries, patterns are recognized according to their distribution and variation. In so doing we aim to identify an interconnection between various metrics and classify countries into groups.

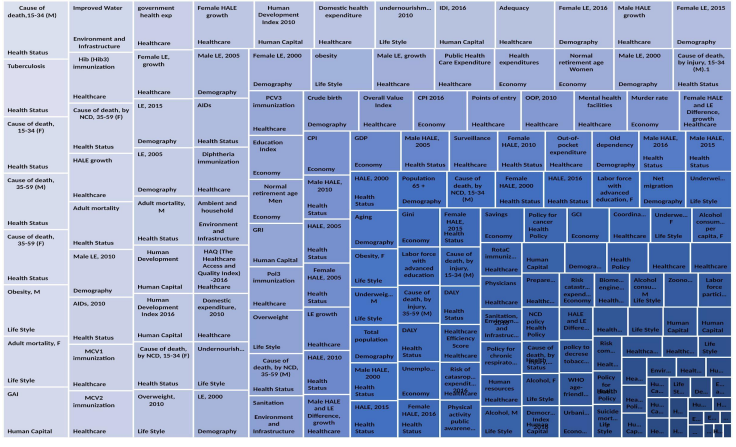


Big Data Comparative Analysis Framework

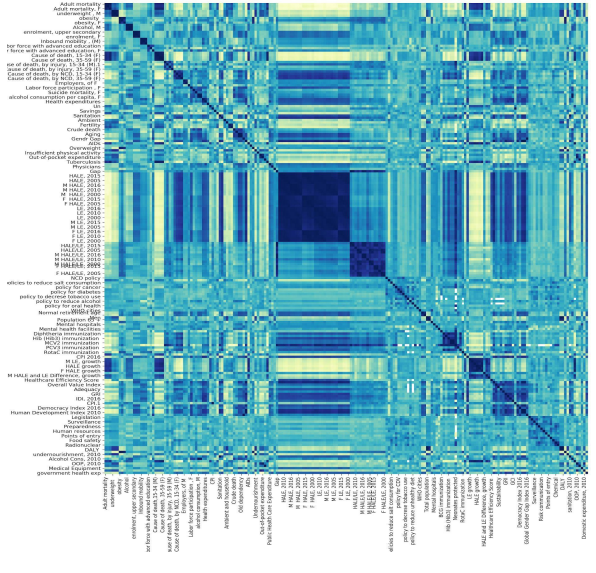
Big Data comparative analysis is based on the specific nature of parameters and their relationship. They help determine the development of healthy longevity progress across countries with different levels of economic development.

50 Countries

6 Layers and 200 Parameters



Correlations Between Parameters



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Longevity Governance: Big Data Analytics Dashboard

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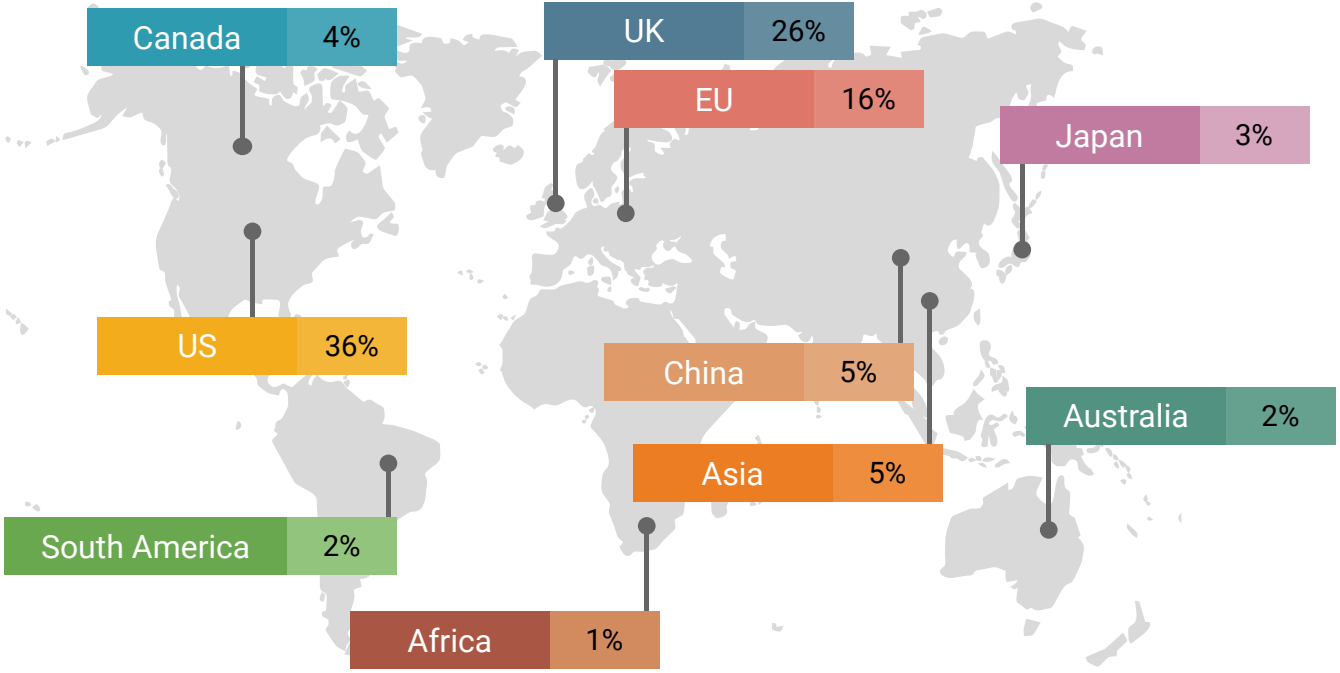
Longevity-Focused Financial Institutions

300 Financial Institutions: Regional Proportion



The chart represents the distribution of longevity-focused financial institutions by country. On the one hand, the largest number of the selected companies have their headquarters in the US because of the high availability of developed financial markets. On the other hand, quite a few companies are headquartered in the UK and the EU for a similar reason.

Top 300 Financial Institutions Advancing the Longevity Industry

105 Asset Management Firms

75 Banks

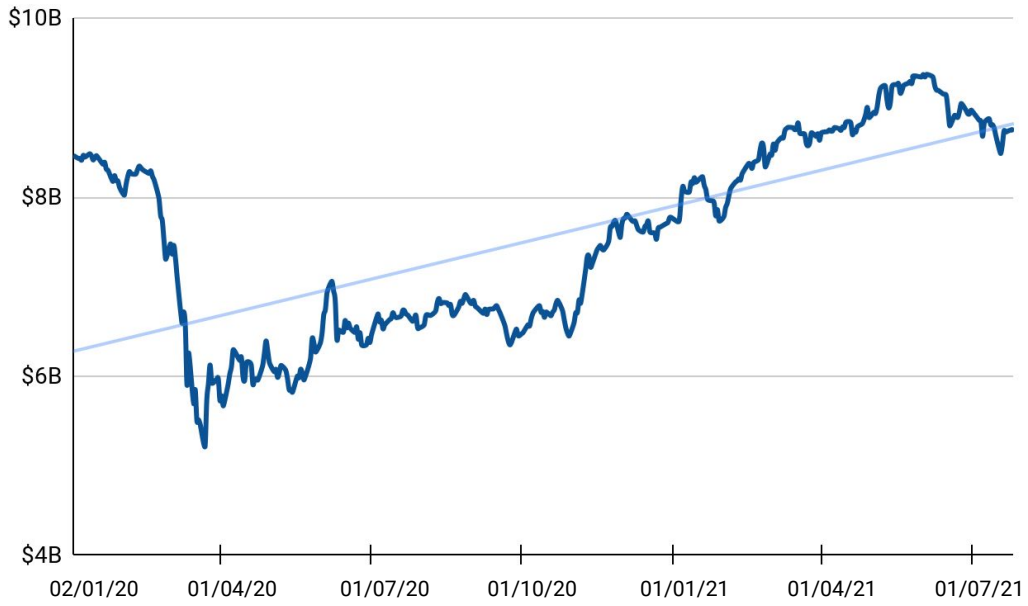
55 Insurance Companies

20 Reinsurance Companies

45 Pension Funds

Financial Institutions Advancing the Longevity Industry

Cumulative Capitalization Dynamics in 2020-2021

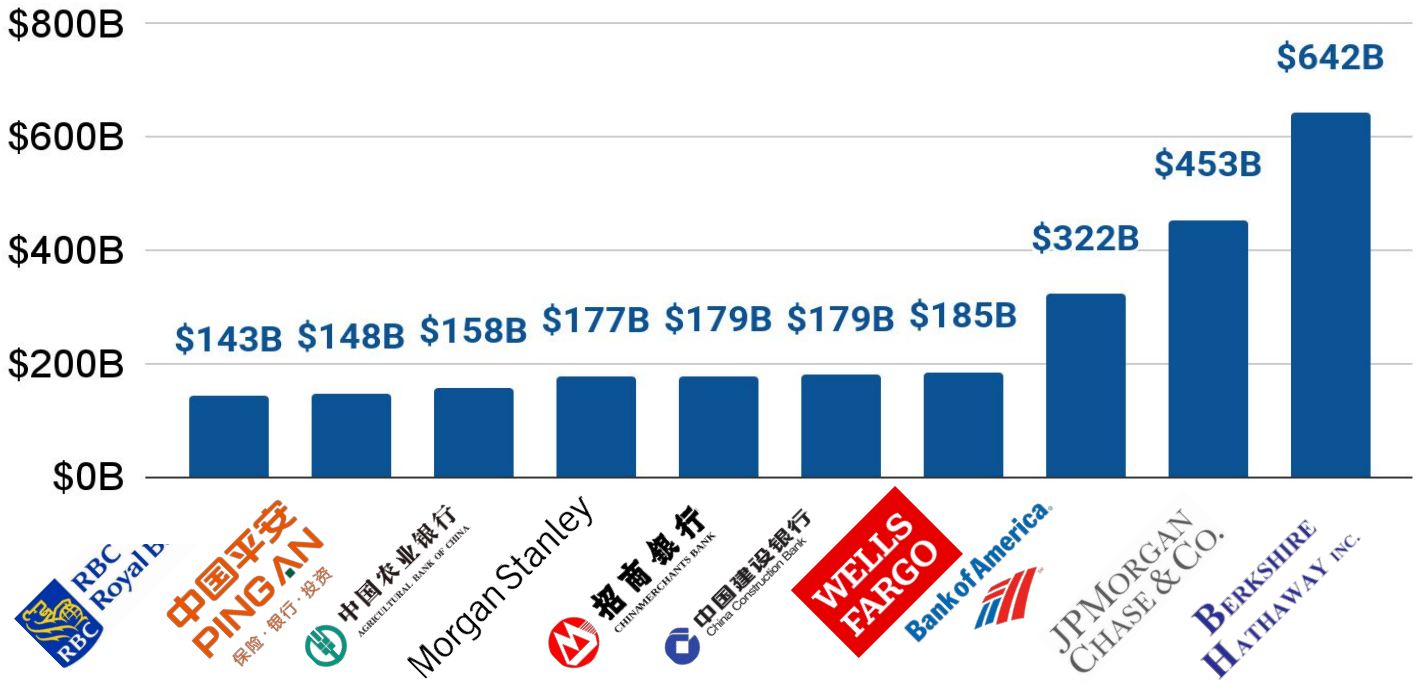


Since Q1 2020 market downturn, 194 financial institutions have fully recovered by year-end and continued to grow in 2021.

The largest institutions by market capitalization are Berkshire Hathaway, JPMorgan Chase & Co., Bank of America, and Wells Fargo & Co.

Given that many longevity advancing financial institutions are included in the S&P 500, this chart represents the approximate dynamics of the whole stock market.

Top 10 Financial Institutions in 2021 (by Market Capitalization)



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Top 20 Financial Institutions by Stock Exchange

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NYSE

US-Based

- Berkshire Hathaway (BRK-B) — Market Cap: $642B
- American Express (AXP) — Market Cap: $137B
- Citigroup (C) — Market Cap: $141B
- JPMorgan Chase & Co.(JPM) — Market Cap: $453B
- The Blackstone Group (BX) — Market Cap: $138B
- Goldman Sachs Group Inc. (GS) — Market Cap: $133B
- Bank of America Corp.(BAC) — Market Cap: $322B
- Morgan Stanley (MS) — Market Cap: $177B
- Wells Fargo & Co. (WFC) — Market Cap: $185B

Canada-Based

- Royal Bank of Canada (RY) — Market Cap: $143B
- Toronto-Dominion Bank (TD) — Market Cap: $120B

UK-Based

- HSBC Holdings (HSBC) — Market Cap: $113B

Australia (ASX)

Australia-Based

- Commonwealth Bank of Australia (CBA) — Market Cap: $130B

China (SSE)

China-Based

- Ping An Insurance (PNGAY) — Market Cap: $148B
- Agricultural Bank of China (ACGBY) — Market Cap: $158B

Hong Kong (HKEX)

China-Based

- China Construction Bank (CHICHY) — Market Cap: $179B
- China Merchants Bank (CIHKY) — Market Cap: $183B
- Bank of China (BACHY) — Market Cap: $130B
- AIA Group(AAGIY) — Market Cap: $138B
- China Life Insurance (LFC) — Market Cap: $103B

Longevity-Focused Financial Institutions: Market Indices

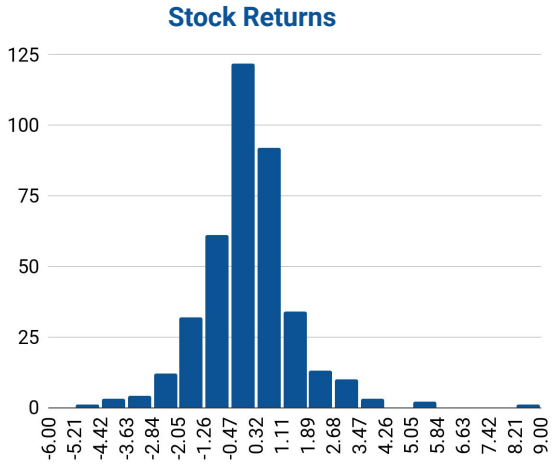
Our longevity stock index includes 179 longevity-focused corporations operating in the financial sector.

The index exhibits the returns close to the S&P 500 index.

While the volatility of such a longevity-focused index is higher compared to the S&P 500 index, the distribution of its returns is right-skewed, which differentiates it from the vast majority of stock indices. That means that the extraordinary positive events are more likely to happen in longevity sector compared to other market segments.

The distribution of longevity-focused financial institutions stock returns cannot be referred to as normal but it is close to normal (kurtosis 2.78).

Index	Correlation with FInancial Institution index	Average daily return in Q3 2020 - Q2 2021	Average daily volatility in Q3 2020 - Q2 2021	Skewness	Kurtosis
FInancial Institution index		0.114	1.21	0.29	2.78
S&P 500	0.44	0.118	0.95	-0.76	1.77
Nasdaq Bank Index	0.63	0.164	2.04	0.62	4.01
SSE Composite Index	0.24	0.012	0.95	-0.24	1.27



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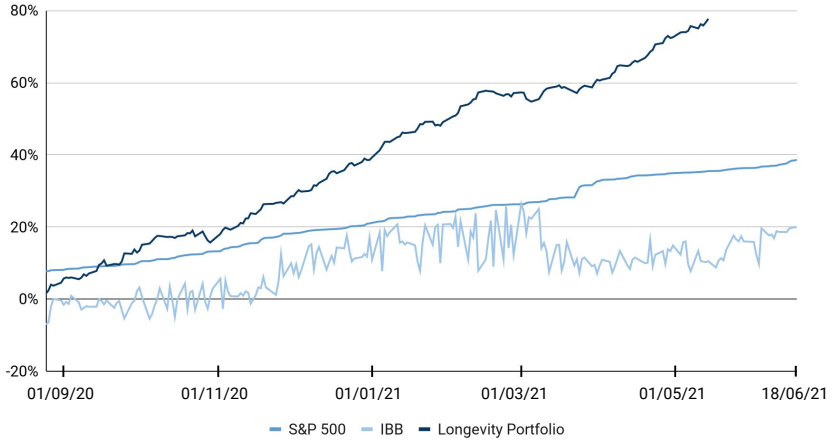
Longevity Index vs. Other Indices

The Longevity Industry is relatively volatile (as measured by standard deviation), however, growth in the market capitalisation of longevity-focused companies far exceeds that of the S&P 500 and the iShares Biotechnology ETF (hereinafter the "IBB"). The table below shows that **average daily returns of our Longevity ETF** during the tracked period 2020-2021 are **4 times higher** as compared with benchmark indices while simultaneously demonstrating significantly lower average daily volatility. This implies that the companies we selected demonstrated more stable, higher returns. Of the comparables below, the Longevity Index's skewness is closest to zero, which is characteristic of a normal distribution, indicating more predictable performance as compared to other indices.

Index	Correlation with Longevity ETF	Av. daily return 2020/2021	Av. daily volatility 2020/2021	Skewness	Kurtosis
Longevity Index	-	0.41%	0.72	-0.18	0.07
iShares Biotechnology ETF (IBB)	0.33	0.07%	1.56	-0.20	0.08
S&P 500	0.39	0.10%	1.05	-0.69	1.11

S&P 500 vs. IBB vs. Longevity ETF Returns Performance



The portfolio's near-zero kurtosis indicates low probability of the occurrence of extreme values in the returns distribution.

This fact, coupled with the portfolio's low volatility as compared to other indices, suggests that the Longevity portfolio may be a good choice for risk-averse investors.

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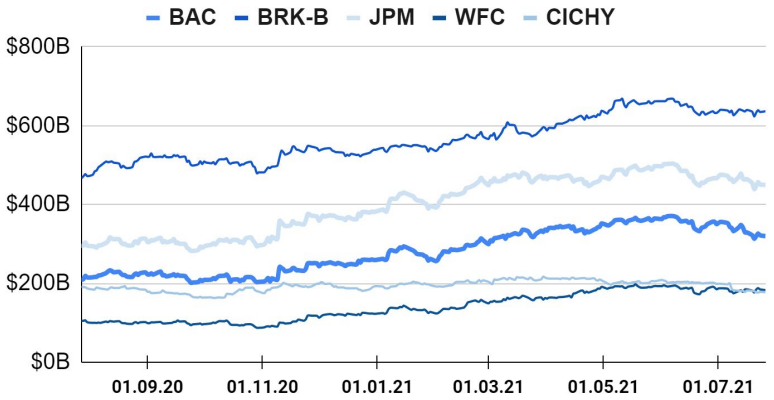
Longevity-Focused Financial Institutions: Market Indices

Top 5 Overview

Four out of five most prominent financial institutions (by market capitalization) advancing the Longevity Industry are represented by banks. Nevertheless, the first place is taken by Berkshire Hathaway's asset management firm. Despite the Covid-19 dive at the beginning of 2020, all financial institutions have reached even higher market capitalization than before the pandemic, China Construction Bank being the only exception.

Capitalization Change in 2020/2021, $B



Name	Country	Market Cap	Annual Revenue	Net Income	Volume	Total Return Level (1Y)	ROE	ROA	PE Ratio	Beta (1Y)
Berkshire Hathaway	USA	641.89B	248.84B	103.98B	4.60M	45.1%	25.37%	12.74%	6.36	0.91
JPMorgan Chase & Co.	USA	452.56B	121.12B	47.83B	14.16M	56.50%	18.84%	1.39%	10.11	1.17
Bank of America Corp.	USA	322.34B	86.20B	27.63B	45.16M	57.95%	10.56%	0.96%	12.76	1.53
Wells Fargo & Company	USA	185.44B	75.73B	15.70B	27.01M	79.11%	9.56%	0.93%	12.33	1.35
China Construction Bank	China	179.38B	111.09B	41.98B	86.21K	-8.84%	11.59%	0.98%	4.23	0.65

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Berkshire Hathaway

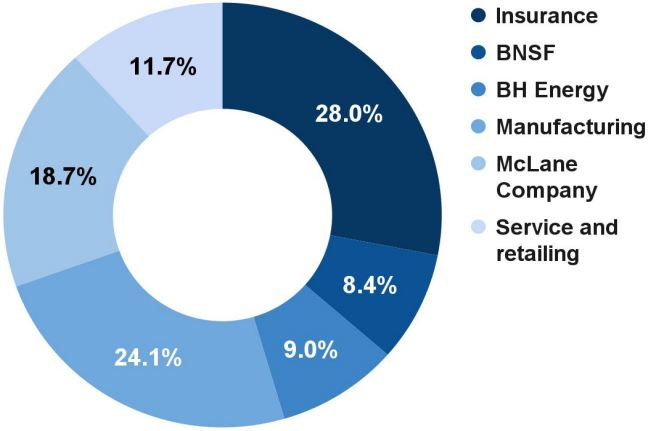
BERKSHIRE HATHAWAY INC.

Berkshire Hathaway, Inc. engages in the provision of property and casualty insurance and reinsurance, utilities and energy, freight rail transportation, finance, manufacturing, and retailing services.

The company's revenue structure is as follows:
The Insurance segment consists of private passenger automobile insurance, multiple lines of property and casualty insurance policies for primarily commercial accounts, excess-of-loss and quota-share and facultative reinsurance.
The BNSF segment operates railroad systems in North America.
The BH Energy segments deals with regulated electric and gas utility.
The Manufacturing segment includes industrial products.
The McLane Company segment offers wholesale distribution of groceries and non-food items.
The Service and Retailing segment mainly provides fractional aircraft ownership programs and aviation pilot training.

Stock Price

Revenue Structure, Q1 2020 - Q1 2021



Ticker	Volume (M)	Capitalization (B$)	Growth Rate(%)	Beta (1Y)
BRK.B	4.603	641.89	45.10	0.91

JPMorgan Chase & Co.

JPMORGAN CHASE & CO.

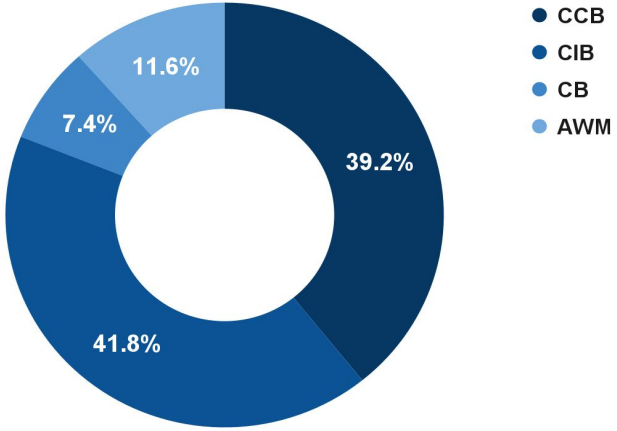
JPMorgan Chase & Co. is a global financial services provider operating in four segments: Consumer & Community Banking (**CCB**), Corporate & Investment Bank (**CIB**), Commercial Banking (**CB**), and Asset & Wealth Management (**AWM**). It offers a wide range of investment banking products and services in all capital markets, including advising on corporate strategy and structure, capital raising in equity and debt markets, risk management, market making in cash securities and derivative instruments, and brokerage and research.

The company's revenue structure looks as follows: **The CCB** segment offers lending, deposit, and cash management and payment solutions to small businesses. **The CIB** segment provides investment banking products and services. **The CB** segment provides financial solutions to small business, large and medium-sized corporations, local governments, and non-profit clients. **The AWM** segment offers multi-asset investment management solutions to institutional clients and retail investors.

Ticker	Volume (M)	Capitalization (B$)	Growth Rate(%)	Beta (1Y)
JPM	14.16	452.56	56.50	1.17

Stock Price

Revenue Structure, Q1 2020 - Q1 2021



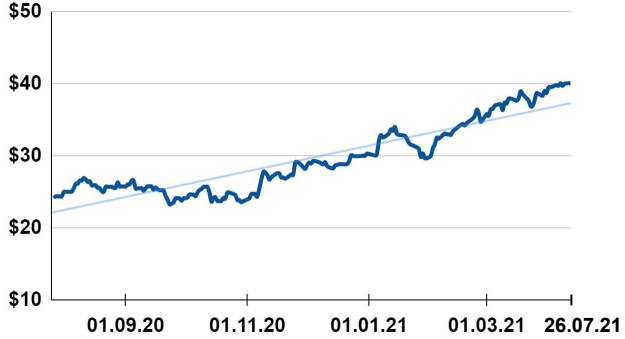
Bank of America Corporation

Bank of America Corporation operates through the following segments: Consumer Banking, Global Wealth and Investment Management, Global Banking, Global Markets, and All Other. It provides banking and financial products and services for individual consumers, small and middle-market businesses, institutional investors, large corporations, and governments worldwide.

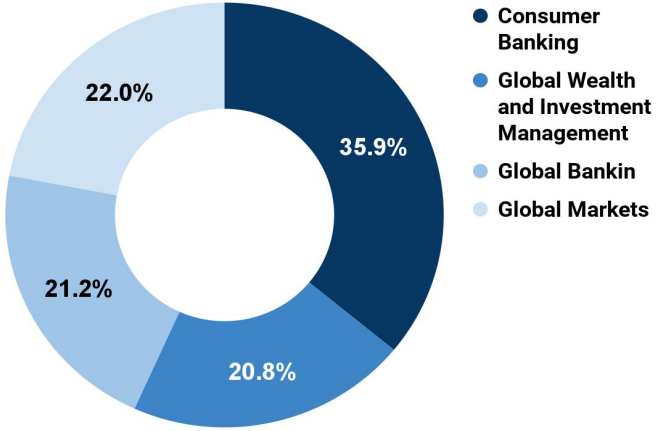
The company's revenue structure is as follows: **The Consumer Banking** segment provides credit, banking, and investment products and services to consumers and small businesses. **The company's Global Wealth & Investment Management** segment provides investment management, brokerage, banking, and trust and retirement products and services. **The Global Banking** segment provides lending products and services. **The Global Markets** segment provides market making, financing, securities clearing, settlement, and custody services.

Ticker	Volume (M)	Capitalization (B$)	Growth Rate(%)	Beta (1Y)
BAC	45.16	322.34	57.95	1.53

Stock Price



Revenue Structure, Q1 2020 - Q1 2021



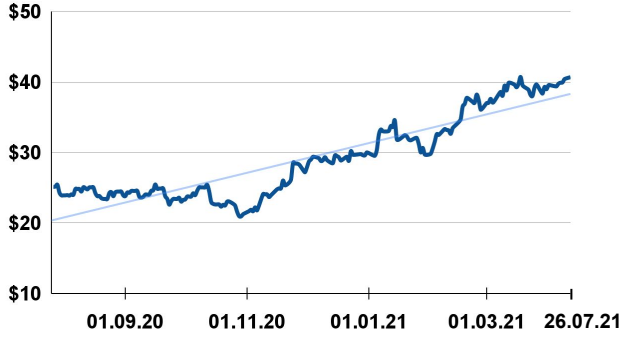
Wells Fargo & Company

Wells Fargo & Company provides a diversified set of banking, investment and mortgage products and services, as well as consumer and commercial finance, through four reportable operating segments.

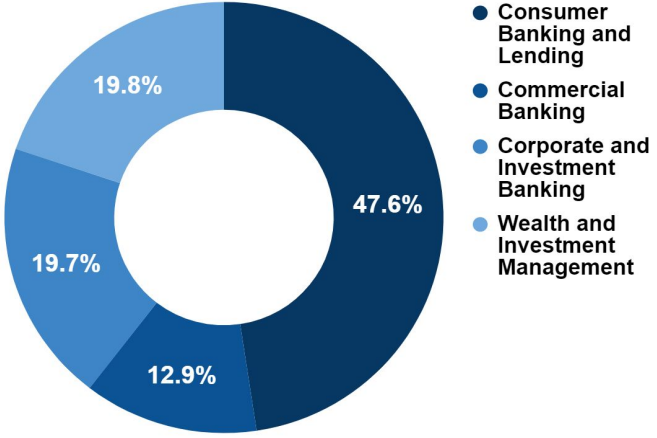
The company's revenue structure is as follows: **Consumer Banking and Lending** offers diversified financial products and services for consumers and small businesses with annual sales generally up to $5 million. **Commercial Banking** segment provides financial solutions to private, family owned and certain public companies. **Corporate and Investment Banking** segment delivers a suite of capital markets, banking and financial products and services to corporate, commercial real estate, government and institutional clients globally. **Wealth and Investment Management** segment provides personalized wealth management, investment and retirement products and services to clients across U.S.-based businesses.

Ticker	Volume (M)	Capitalization (B$)	Growth Rate(%)	Beta (1Y)
WFC	27.01	185.44	79.11	1.35

Stock Price



Revenue Structure, Q1 2020 - Q1 2021



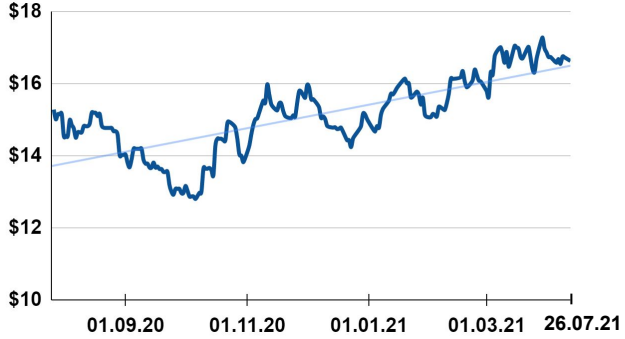
China Construction Bank Corporation

China Construction Bank Corp. engages in the provision of a wide range of financial services to corporate and non-corporate customers. It operates through the following business segments: Corporate Banking, Personal Banking, Treasury, and Others.

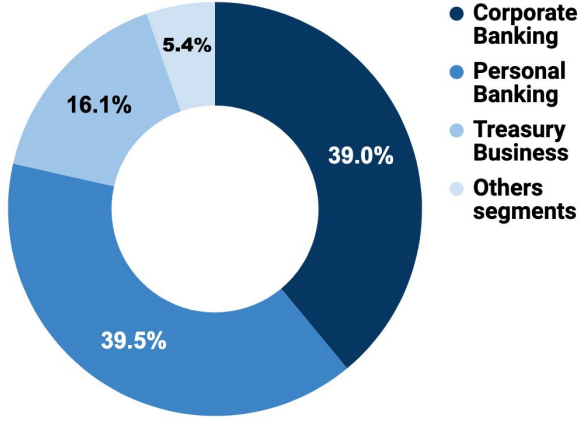
The company's operating income is as follows: **The Corporate Banking** segment provides a range of financial products and services to corporations, government agencies and financial institutions. **The Personal Banking** segment provides personal loans, deposit taking and wealth-management services, card business, remittance services, and agency services to individual customers. **The Treasury** segment engages in inter-bank money market transactions, repurchase and resale transactions, investments in debt securities, and trade of derivatives and foreign currency. **The Other** segment refers to equity investments and revenues, results, assets and liabilities of overseas branches and subsidiaries.

Ticker	Volume (K)	Capitalization (B$)	Growth Rate(%)	Beta (1Y)
CICHY	86.21	179.38	-8.84	0.65

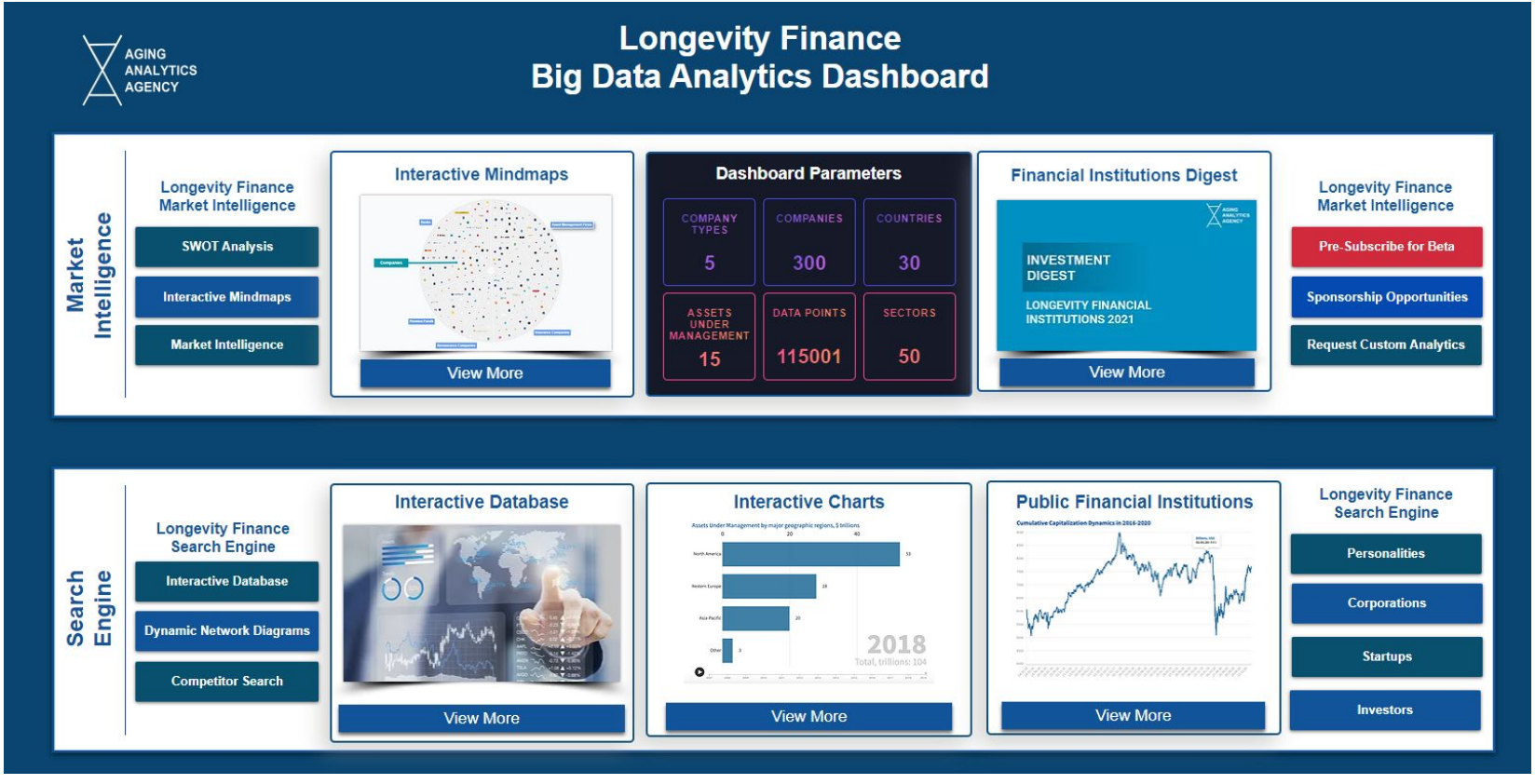
Stock Price



Revenue Structure, Q1 2020 - Q1 2021



Longevity Finance Big Data Analytics Dashboard



https://www.aginganalytics.com/finance-dashboard

Publicly Traded Longevity-Focused Companies

Top 20 Publicly Traded Longevity-Focused Companies

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NASDAQ

US-Based

- Turning Point Therapeutics (TPTX) — Market Cap: $3,217M
- Fate Therapeutics (FATE) — Market Cap: $7,976M
- Arena Pharmaceuticals (ARNA) — Market Cap: $3,873M
- Gossamer Bio (GOSS) — Market Cap: $571M
- One Medical (ONEM) — Market Cap: $3,769M
- Tandem Diabetes Care (TNDM) — Market Cap: $6,548M
- Vertex Pharmaceuticals (VRTX) — Market Cap: $52,352M
- SAGE Therapeutics (SAGE) — Market Cap: $2,611M
- Outset Medical (OM) — Market Cap: $3,331M
- Kronos Bio (KRON) — Market Cap: $1,208M

China-Based

- BeiGene (BGNE) — Market Cap: $28,992M

UK-Based

- Abcam (ABCM) — Market Cap: $4,183M
- Freeline Therapeutics (FRLN) — Market Cap: $310M
- Orchard Therapeutics (ORTX) — Market Cap: $365M
- Autolus (AUTL) — Market Cap: $386M

Euronext Brussel (BR)

Switzerland-Based

- Biocartis (BCART) — Market Cap: $272M

Copenhagen (CPH)

Sweden-Based

- Getinge (GETI-B) — Market Cap: $11,002M

Hong Kong (HKD)

Hong Kong-Based

- Endurance RP(ex-Regent Pacific Group) — Market Cap: $48M

Acquired

- Deep Longevity — Acquired by $4M

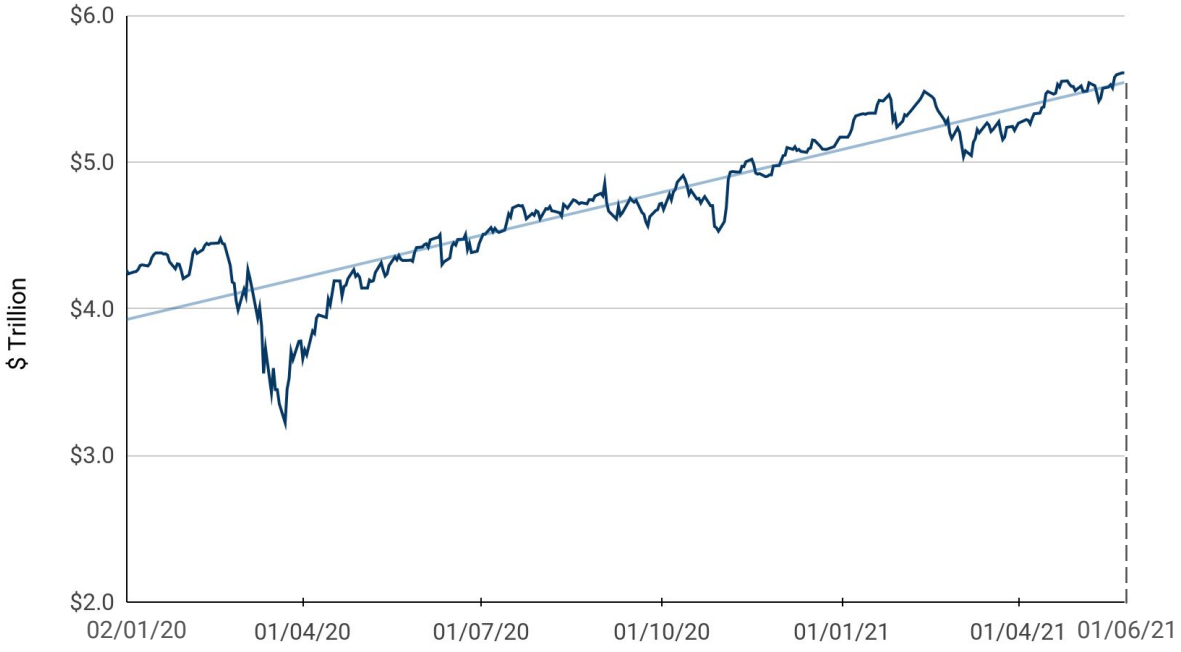
NYSE

US-Based

- Amwell (AMWL) — Market Cap: $2 803M
- Asensus Surgical(ex-TransEnterix) (ASXC) — Market Cap: $553M

Longevity Publicly Traded Companies

Cumulative Capitalization Dynamics, 2020-2021



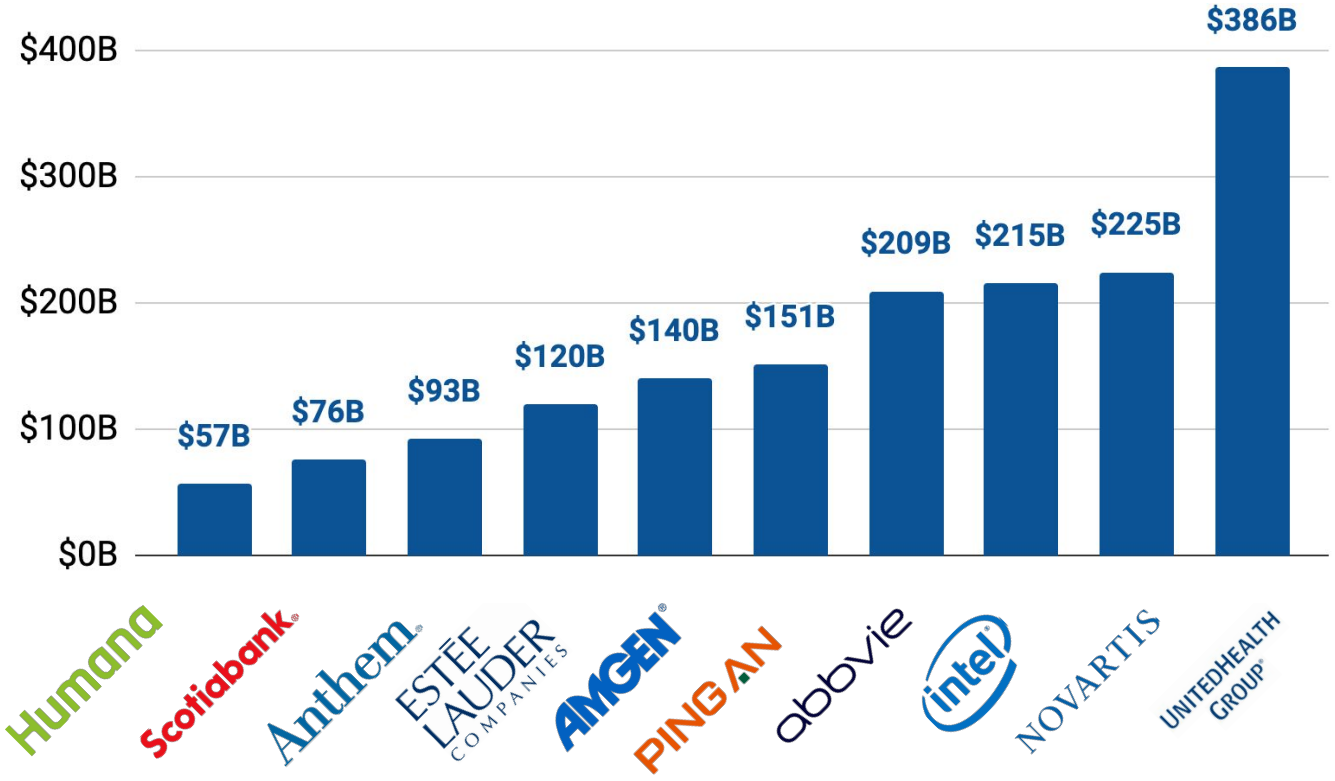
The 600+ publicly traded Longevity companies experienced growth **from $4.3T to $5.6T** of cumulative capitalisation, representing **30.2% growth** y-o-y from January 2020 to June 2021.

In 2021, **15 companies** announced the closing of their IPOs. The biggest companies are **Clover Health, Recursion Pharmaceuticals, Sana Biotechnology, and Affirm Holdings** by resulting in capitalization.

The largest longevity companies are **UnitedHealth Group, Novartis, Intel, AbbVie and Ping An.**

Technologically, publicly-traded longevity-focused companies are similar to other companies in the sector (i.e., those that reached B or C funding rounds), which means that their market capitalization growth can approximate the dynamics of the whole industry.

Top 10 Public Longevity-Focused Corporations by Market Capitalization July, 2021



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Longevity IPOs in 2021

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Longevity IPOs in 2021

Name	Country	Funding Amount. M$	Last Funding Amount (M$)	IPO Date	Capitalization (B$)	ROA	ROE	Profit margin	Net income (M)
Clover Health	USA	1,325	400	08.01.2021	3.29	119.18%	-157.16%	8.6%	-156.6
Recursion Pharmaceuticals	USA	465.3	239	16.04.2021	5.17	-26.24%	-54.57%	-1498.16%	-99.3
Sana Biotechnology	USA	700	700	04.02.2021	2.95	-25.46%	-80.76%	0	-285.3
Century Therapeutics	USA	410	160	18.06.2021	1.64	-21.76%	-	0	-62.3
HCW Biologics	USA	39.2	6.16	19.07.2021	0.171	-12.71%	-27.37%	-243.39%	-6.3
Decibel Therapeutics	USA	189.2	82.2	11.02.2021	0.179	-40.48%	-145.27%	0	-38.7
G Medical Innovations	USA	350.1	20.5	24.06.2021	0.052	-83.12%	-197.86%	13.61%	12.5
Celularity	Cayman Islands	290	250	19.07.2021	1.11	-10.25%	-264.98%	65.46%	-259.6
Longeveron	USA	8.9	3	11.02.2021	0.117	-38.83%	-4914.7%	-	-6.6
Biophytis	France	16.1	0.6	15.02.2021	0.238	-16.98%	-	0	-17.1
Affirm Holdings	USA	1520	-	13.01.2021	16.134	-5.28%	-23.17%	-31.88%	-243
Oscar Health	USA	1,632.5	140	03.03.2021	3.617	-13.89%	-101.75%	-58.28%	-397
Hims & Hers Health	USA	233.2	75	20.01.2021	1.521	-9.92%	-37.41%	-37.12%	-63.5
Cloud DX Inc	USA	20.9	3.4	15.04.2021	19.75	-136.12%	-181.69%	0	-4.5
ATAI Life Sciences	Germany	347.1	157	17.06.2021	2.41	-166.56%	194.39%	0	-185.5

Clover Health

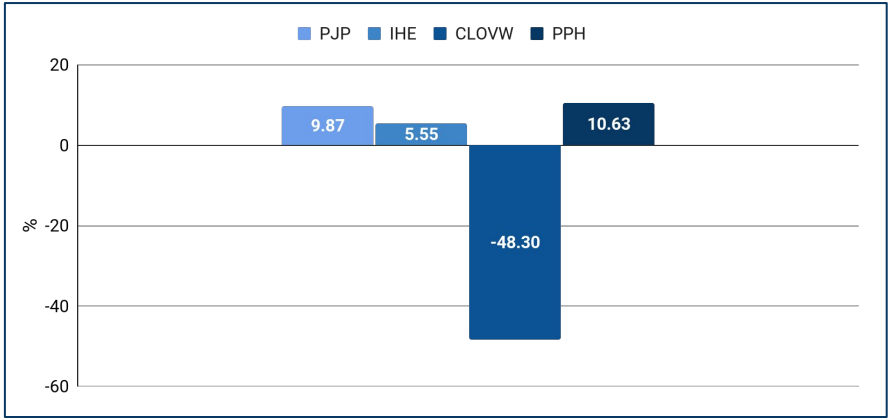
The significant spike resulted from Clover Health attracting a lot of attention from single investors, especially on the internet.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
CLOVW	-0.07%	10.08%	-48.30%	3.29

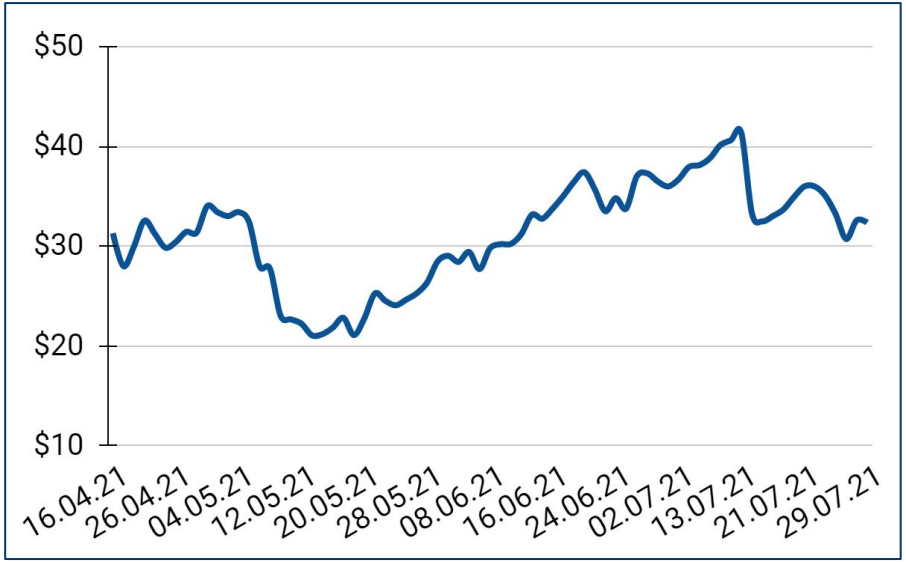
Clover Health

Clover Health through its software platform provides preferred provider organization and health maintenance organization health plans for Medicare-eligible consumers.

The graph below depicts a comparative performance of the CLOVW and 3 Pharmaceutical ETFs stocks: Invesco Dynamic Pharmaceuticals ETF (PJP), iShares Trust - iShares U.S. Pharmaceuticals ETF (IHE), VanEck Vectors Pharmaceutical ETF (PPH) between 08.01.2021 and 29.07.2021.



Recursion Pharmaceuticals

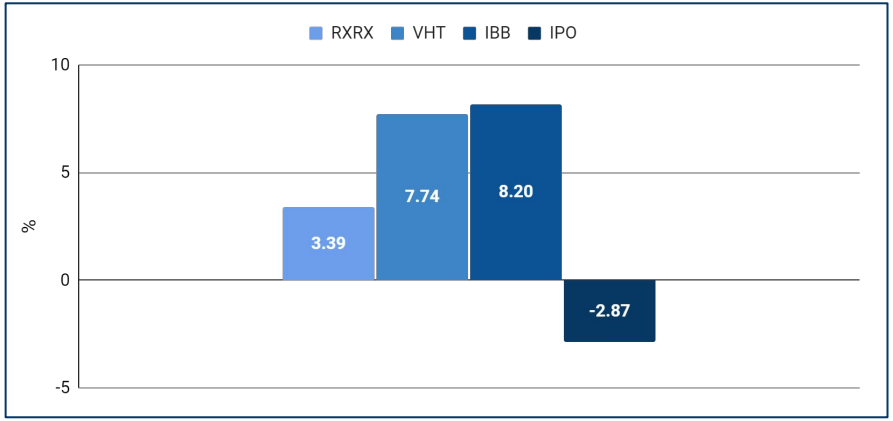


The release of the first quarter report on May 12 has set an upward trend in the Recursion Pharmaceuticals' stock price.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
RXRX	0.21%	10.08%	3.39%	5.17

Recursion Pharmaceuticals operates as a clinical-stage biotechnology company decoding biology by integrating technological innovations across biology, chemistry, automation, data science, and engineering to industrialize drug discovery.

The graph below depicts a comparative performance of RXRX and 3 ETFs starting from 19.04.2021: Vanguard Health Care Index Fund ETF (VHT), iShares Nasdaq Biotechnology ETF (IBB), Renaissance IPO ETF (IPO).



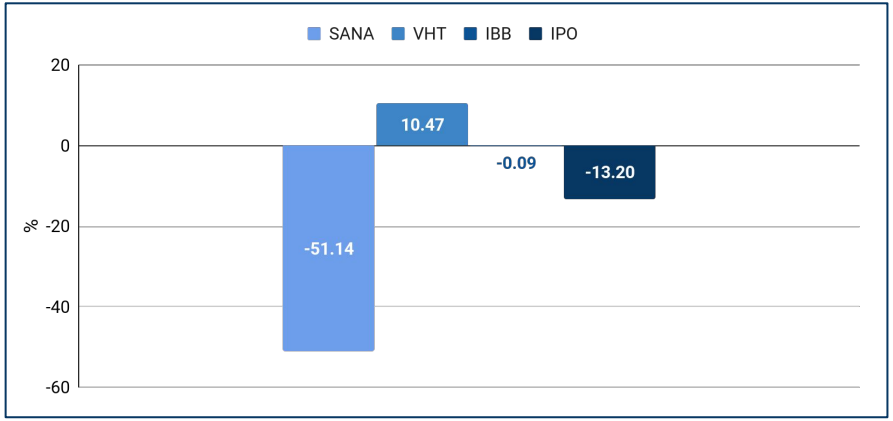
Sana Biotechnology

Sana Biotechnology experienced a decrease in price soon after IPO with a further stabilization of price starting from May.

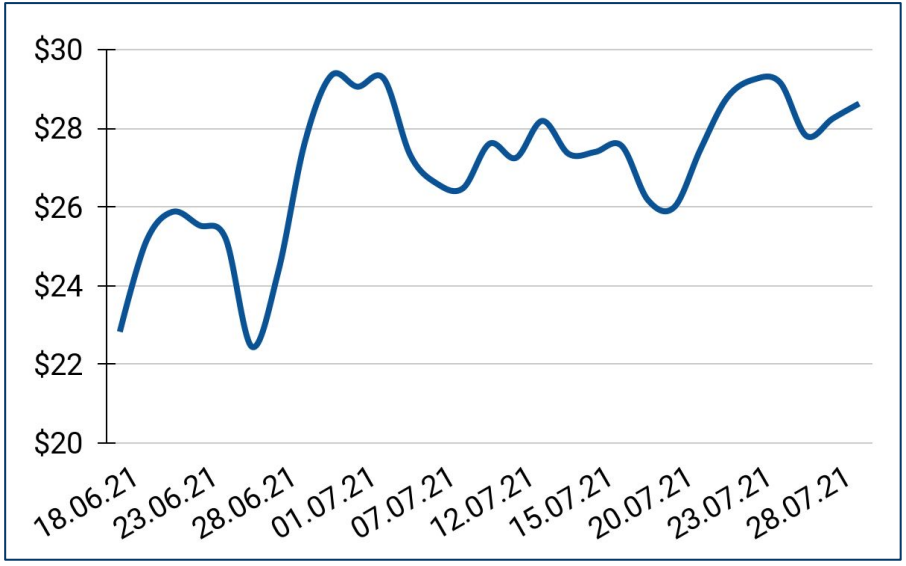
Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
SANA	-0.43%	5.67%	-51.14%	2.95

Sana Biotechnology is a biotechnology company that focuses on utilizing engineered cells as medicines. The company develops in vivo and ex vivo cell engineering platforms for various therapeutic areas with unmet treatment needs.

The graph below depicts a comparative performance of the RXRX and 3 ETFs: Benchmark ETFs: Vanguard Health Care Index Fund ETF (VHT), iShares Nasdaq Biotechnology ETF (IBB), Renaissance IPO (IPO) ETF between 08.01.2021 and 29.07.2021.



Century Therapeutics

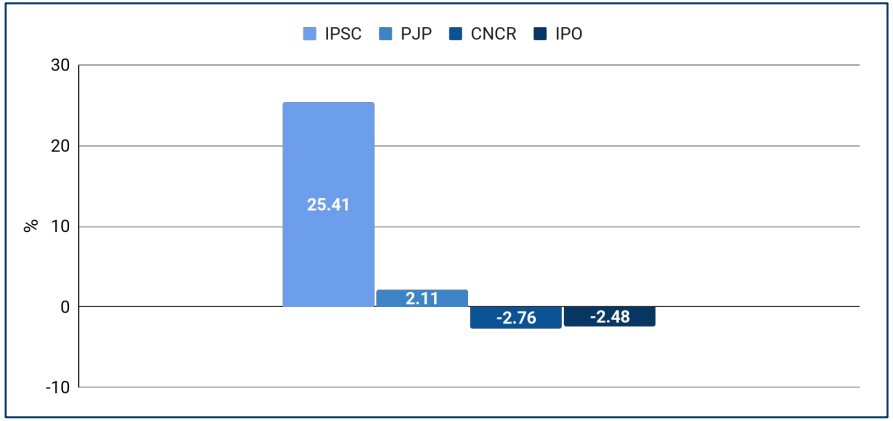


Century Therapeutics develops transformative, allogeneic, iPSC-derived NK and T cell therapies to create products for the treatment of both hematological and solid tumor malignancies with significant unmet medical need.

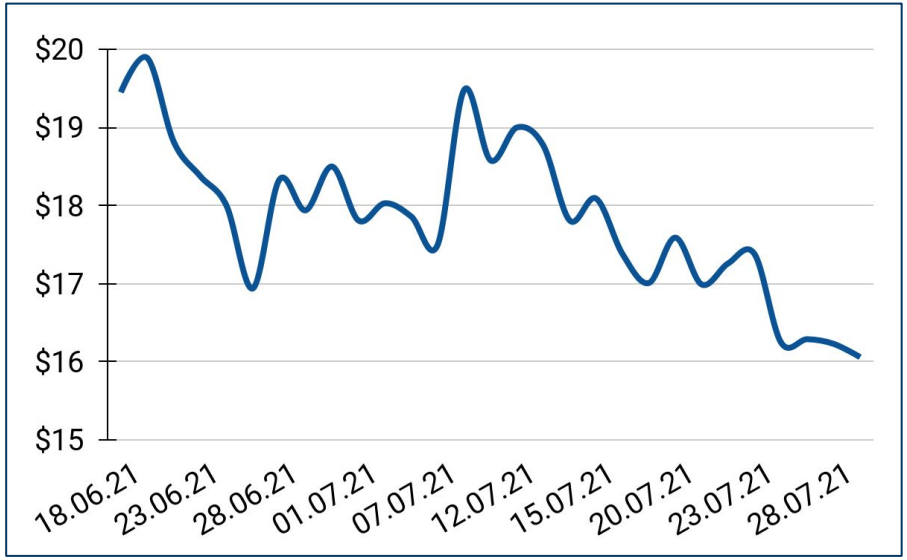
The graph below depicts a comparative performance of the IPSC and 3 benchmark ETFs: Invesco Dynamic Pharmaceuticals ETF (PJP), Loncar Cancer Immunotherapy ETF, Renaissance IPO ETF (IPO) between 22.06.2021 and 29.07.2021.

Century Therapeutics stock price declined after IPO with the consecutive increase that resulted in a 25.41% after-IPO growth.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
IPSC	0.94%	5.10%	25.41%	1.64



Atai Life Sciences

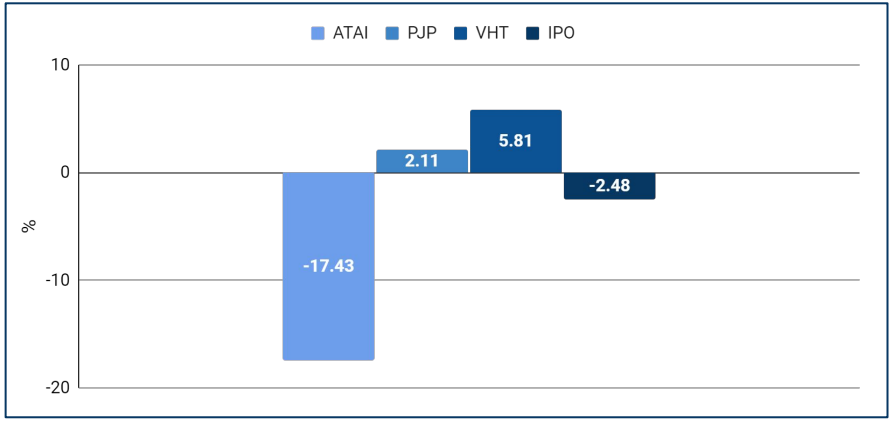


Around 11% stock price growth on July 8 happened after the company announced on July 7 its participation at the Cowen Psychedelics & Novel Mechanisms in Neuropsychiatry Summit.

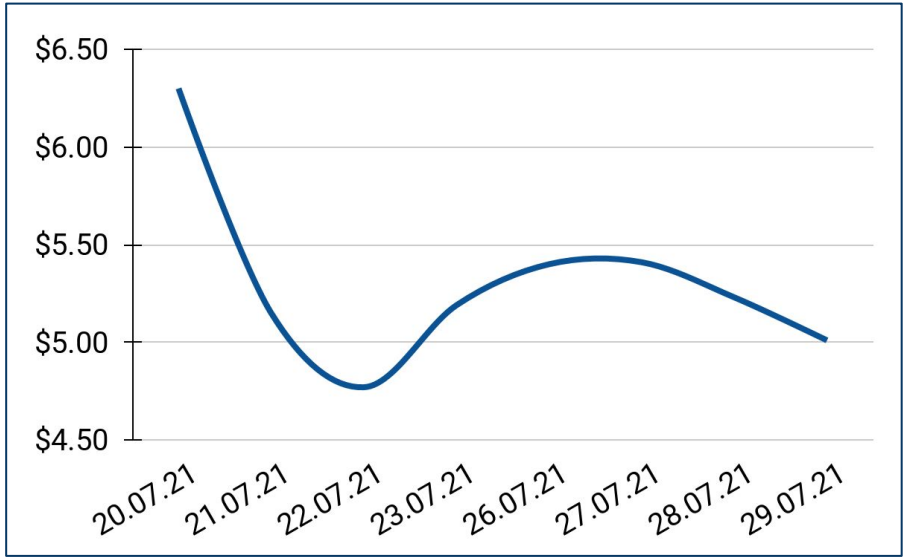
Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
ATAI	-0.60%	4.06%	-17.43%	2.41

Atai Life Sciences N.V., through its subsidiary, ATAI Life Sciences AG, operates as a clinical-stage biopharmaceutical company. It develops various therapeutic candidates that are focused on multiple mental health disorders.

The graph below depicts a comparative performance of the ATAI and 3 ETFs: Invesco Dynamic Pharmaceuticals ETF (PJP), Renaissance IPO ETF (IPO), Vanguard Health Care Index Fund ETF (VHT) between 21.06.2021 and 29.07.2021.



HCW Biologics

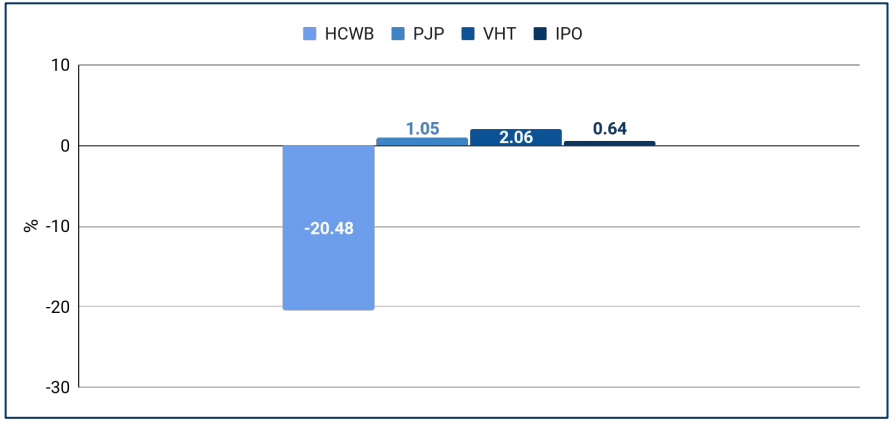


HCW Biologics finished the IPO down 35%. On July, 22 HCW Biologics's CEO made a $5.02M purchase of HCWB, buying 627,500 shares at a cost of $8.00 each.

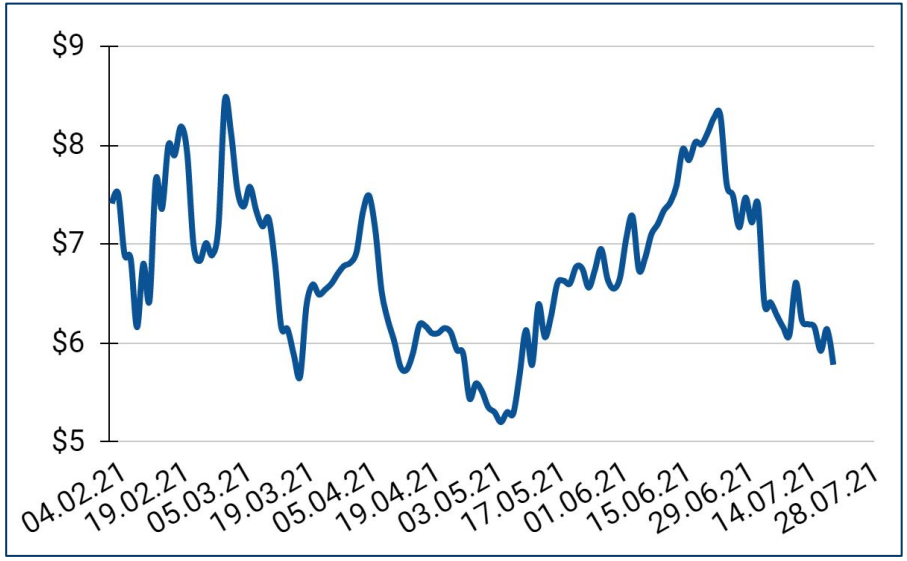
Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
HCWB	-2.88%	8.68%	-20.48%	0.17

HCW Biologics is developing immunotherapies to lengthen healthspan by disrupting the link between cellular senescence and disease.

The graph below depicts a comparative performance of the HCWB and 3 ETFs stocks: Invesco Dynamic Pharmaceuticals ETF (PJP), Renaissance IPO ETF (IPO), Vanguard Health Care Index Fund ETF (VHT) between 20.07.2021 and 29.07.2021.



Longeveron



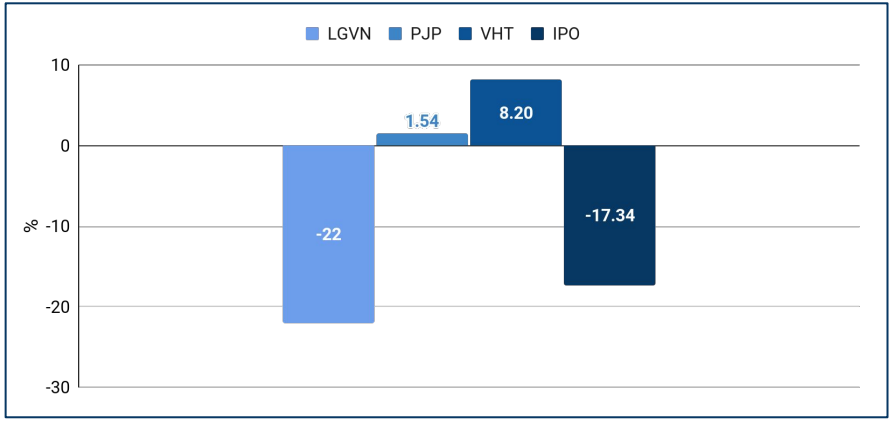
Almost 18% price increase on March 11 coincides with Longeveron's Lomecel-B™ FDA approval and the announcement of CRADA with the University of Miami on March 10.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
LGVN	-0.09%	5.17%	-22.00%	0.117

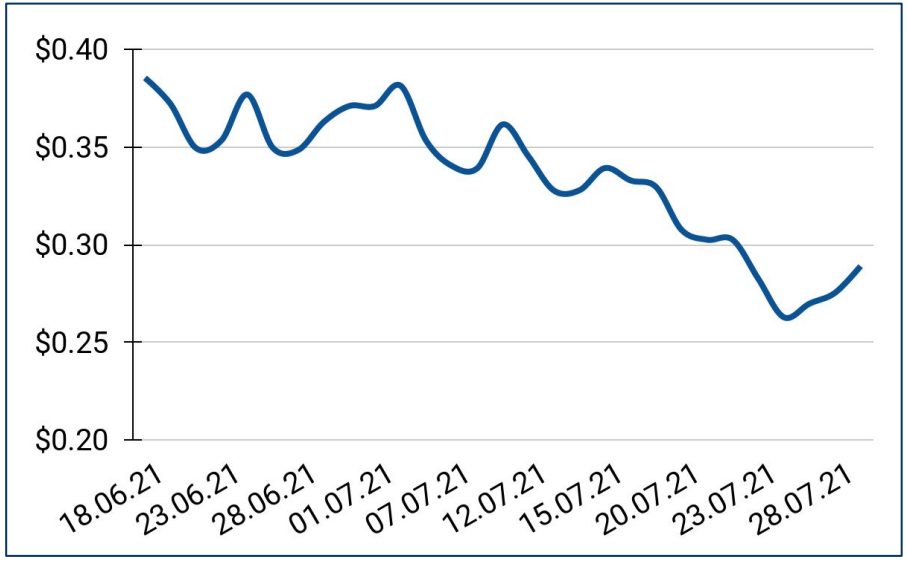
LONGEVERON™
CELL-BASED THERAPIES

Longeveron develops biological solutions for aging and aging-associated diseases. This is through the testing of allogeneic human Mesenchymal Stem Cells (MSCs) that are derived from the bone marrow of young, healthy donors.

The graph below depicts a comparative performance of LGVN and 3 ETFs stocks: Invesco Dynamic Pharmaceuticals ETF (PJP) Renaissance IPO ETF, Vanguard Health Care Index Fund ETF (VHT) between 05.02.2021 and 29.07.2021.



Cloud DX Inc

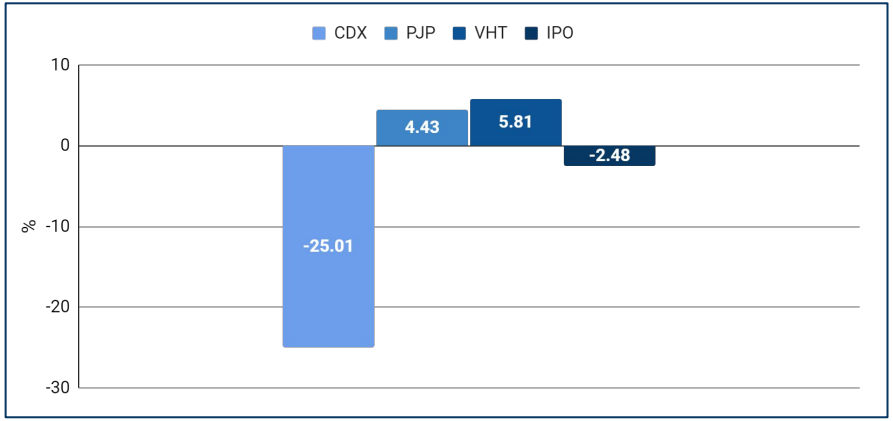


CDX stocks have a potential to growth since the company has contracted with the Lung Health Foundation (Canada) to supply remote patient monitoring.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
CDX	-0.93%	4.31%	-25.01%	19.75

CloudDX offers a range of precision vital sign monitoring equipment, software solutions, and mobile apps for the advanced healthcare industry.

The graph below depicts a comparative performance of the CDX and 3 ETFs stocks: Vanguard Health Care Index Fund ETF (VHT), iShares Nasdaq Biotechnology ETF (IBB), Renaissance IPO ETF (IPO) between 18.06.2021 and 29.07.2021.



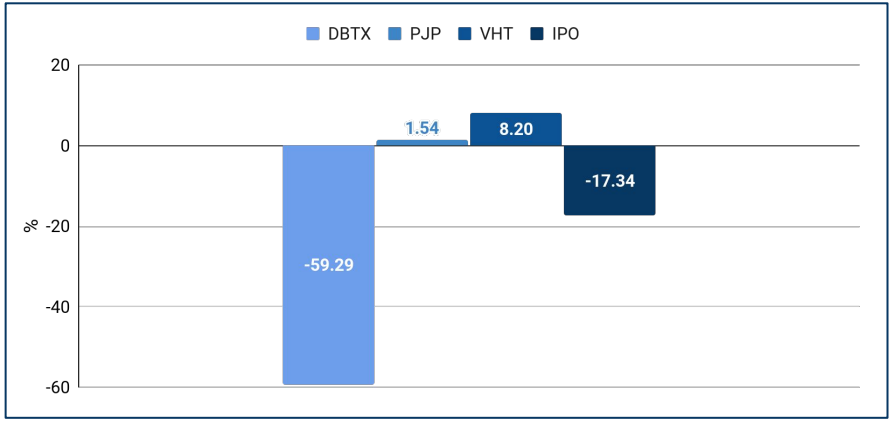
Decibel Therapeutics

Despite a price decrease over 50% since its IPO, the company is an attractive investment opportunity based on its promising platform and a unique business model.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
DBTX	-0.63%	5.52%	-59.29%	0.18

Decibel Therapeutics is a clinical-stage biotechnology company that engages in discovering and developing transformative treatments for hearing and balance disorders.

The graph below depicts a comparative performance of the DBTX and 3 Pharmaceutical ETFs stocks: Invesco Dynamic Pharmaceuticals ETF (PJP), Renaissance IPO ETF (IPO), Vanguard Health Care Index Fund ETF (VHT) between 12.02.2021 and 29.07.2021.



Hims & Hers Health

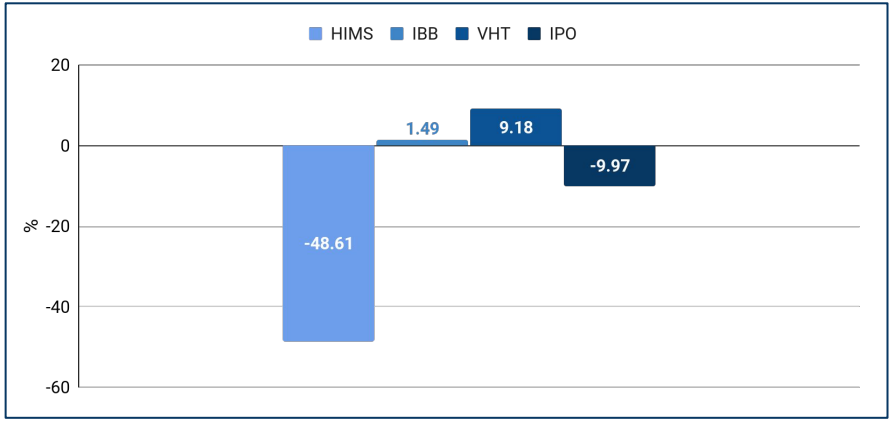
hims & hers

The only stock price jump that has a clear catalyst was a 7.8% decline on March 19 connected to the slowdown in revenue growth.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B$)
HIMS	-0.31%	6.36%	-48.61%	1.52

Hims & Hers Health operates a telehealth platform that connects consumers to licensed healthcare professionals offering a range of health and wellness products and services.

The graph below depicts a comparative performance of the HIMS and 3 ETFs stocks: Vanguard Health Care Index Fund ETF (VHT), iShares Nasdaq Biotechnology ETF (IBB), Renaissance IPO ETF (IPO) between 21.01.2021 and 29.07.2021.



Insilico Medicine Investment Case

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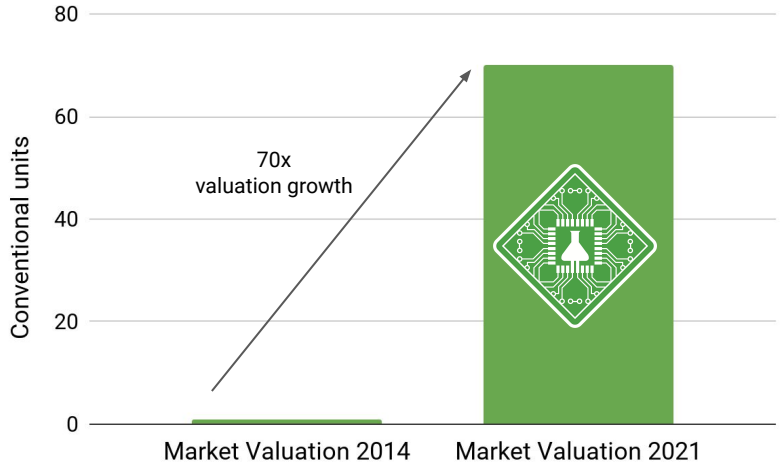
Insilico Medicine Valuation Growth Since Deep Knowledge Group's Investment

In 2014 Insilico Medicine was a little-known biotech startup that suggested a computational alternative to animal testing for research and development programs in the pharmaceutical industry by using artificial intelligence.

Deep Knowledge Group was one of the first investors who put their attention on the AI in Pharma sector. We foresaw the potential of Insilico Medicine's idea at the dawn of the industry, 4 years before the concept of AI in Pharma existed as an investable industry for institutional investors.

In 2018, Insilico Medicine succeeded in conducting groundbreaking scientific research on the design of a novel drug by AI in just 21 days, and preclinical validation just 25 days thereafter. In 2019, Insilico Medicine successfully conducted a Series B funding round, which secured the company $37 million. In 2021, Insilico Medicine announced a $255 million Series C funding round with Warburg Pincus as lead investor. This deal is evidence that the company's AI-based platform can create a new target for a disease, develop a bespoke molecule to address it and bring it through the clinical trial process at a fraction of the cost of traditional approaches in the Pharmaceutical Industry. Insilico has become one of the most high-profile companies in the Pharmaceutical Industry on a new market that was spawned and inspired by it.

Insilico Medicine Valuation Dynamic 2014 vs. 2021



Insilico Medicine's valuation has grown 70x in 7 years, showing remarkable growth, especially for a company operating on the frontier of the drug development industry

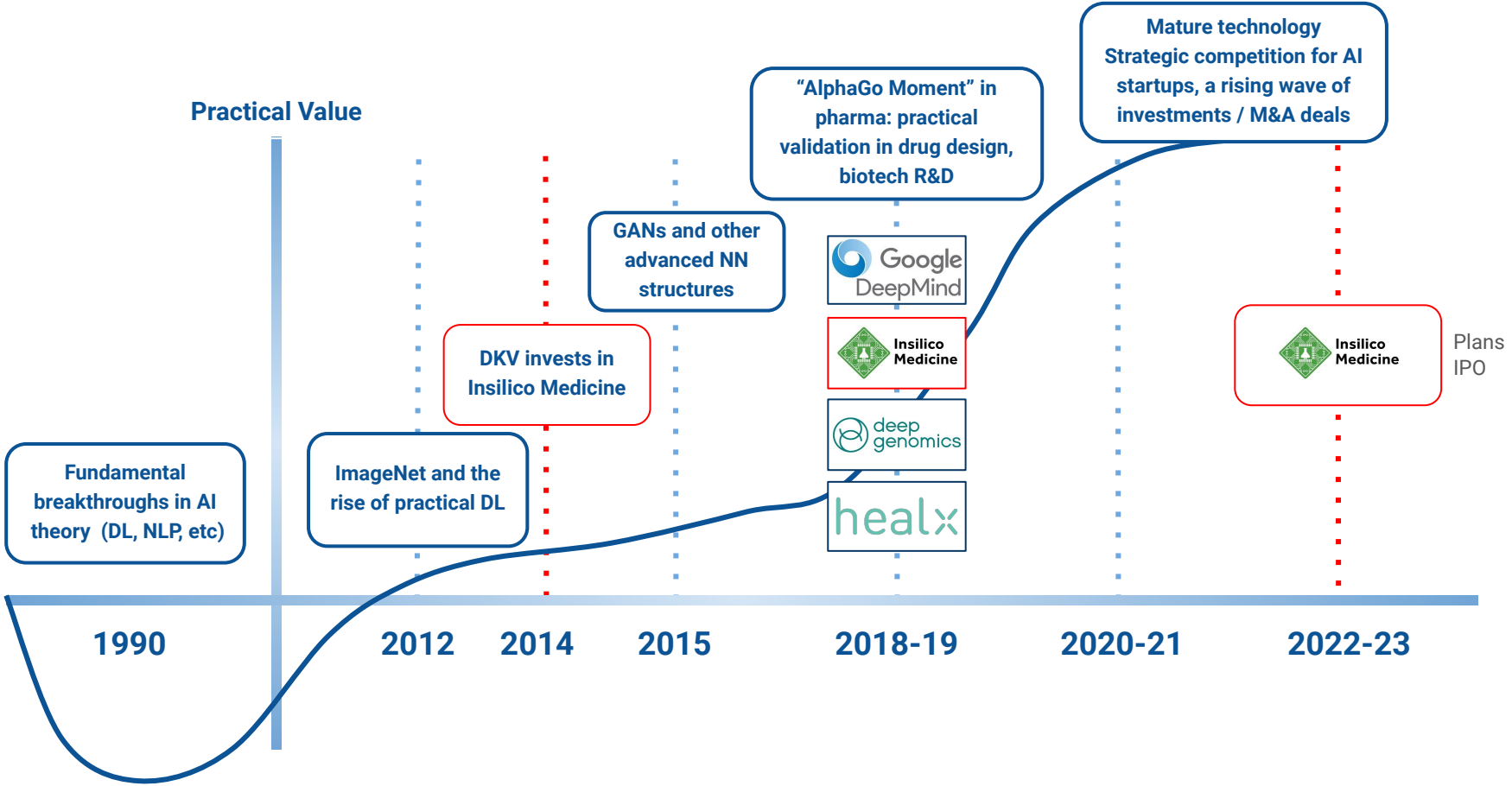
Our Investment Track Record: Insilico Medicine

Deep Knowledge Group was first to invest in Insilico Medicine

英科智能
Insilico Medicine

2014 Seed and Convertible Notes	2018 Round A	2019 Round B	2021 Round C	2022-2023 IPO
	$13M	$37M	$255M	
DEEP KNOWLEDGE VENTURES Insilico Medicine is an artificial intelligence company headquartered in Hong Kong, which pioneered the applications of the generative adversarial networks (GANs), reinforcement learning, transfer learning and meta-learning for the generation of novel molecular structures for diseases with known and unknown targets.	药明康德 WuXi AppTec JUVENESCENCE TEMASEK HOLDINGS BOLD CAPITAL PARTNERS	QIMING VENTURE PARTNERS SINOVATION VENTURES Oculus TEMASEK HOLDINGS LONGEVITY VISION FUND Baidu.ventures 百度风投 JUVENESCENCE 8VC EIGHT ROADS Lilly Asia Ventures 礼来亚洲基金 F-PRIME BOLD CAPITAL PARTNERS	WARBURG PINCUS LAKE BLEU CAPITAL 清池资本 PAVILION B Capital Group Lilly Asia Ventures 礼来亚洲基金 Maison Capital 麦星投资 8VC EIGHT ROADS OrbiMed Healthcare Fund Management Baidu.ventures 百度风投 QIMING VENTURE PARTNERS FORMIC VENTURES	IPO planned for 2022

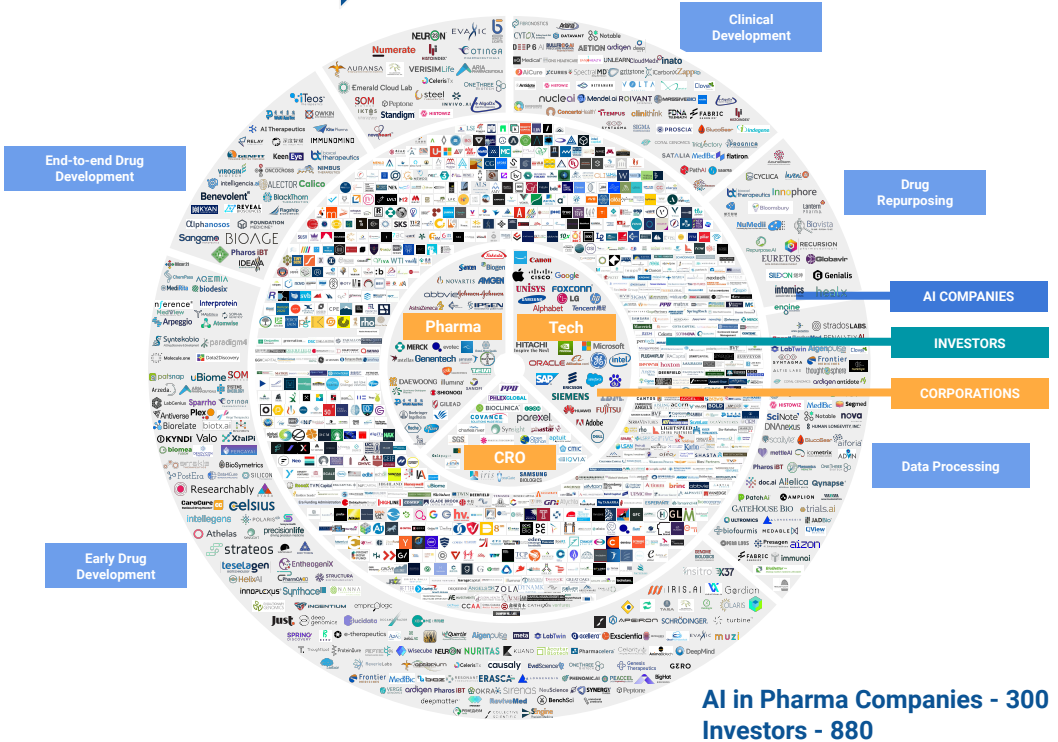
AI-driven Biotechs Change Pharma R&D Paradigm: Leaders of Change



AI for Drug Discovery Boom - 2017 vs. Q2 2021

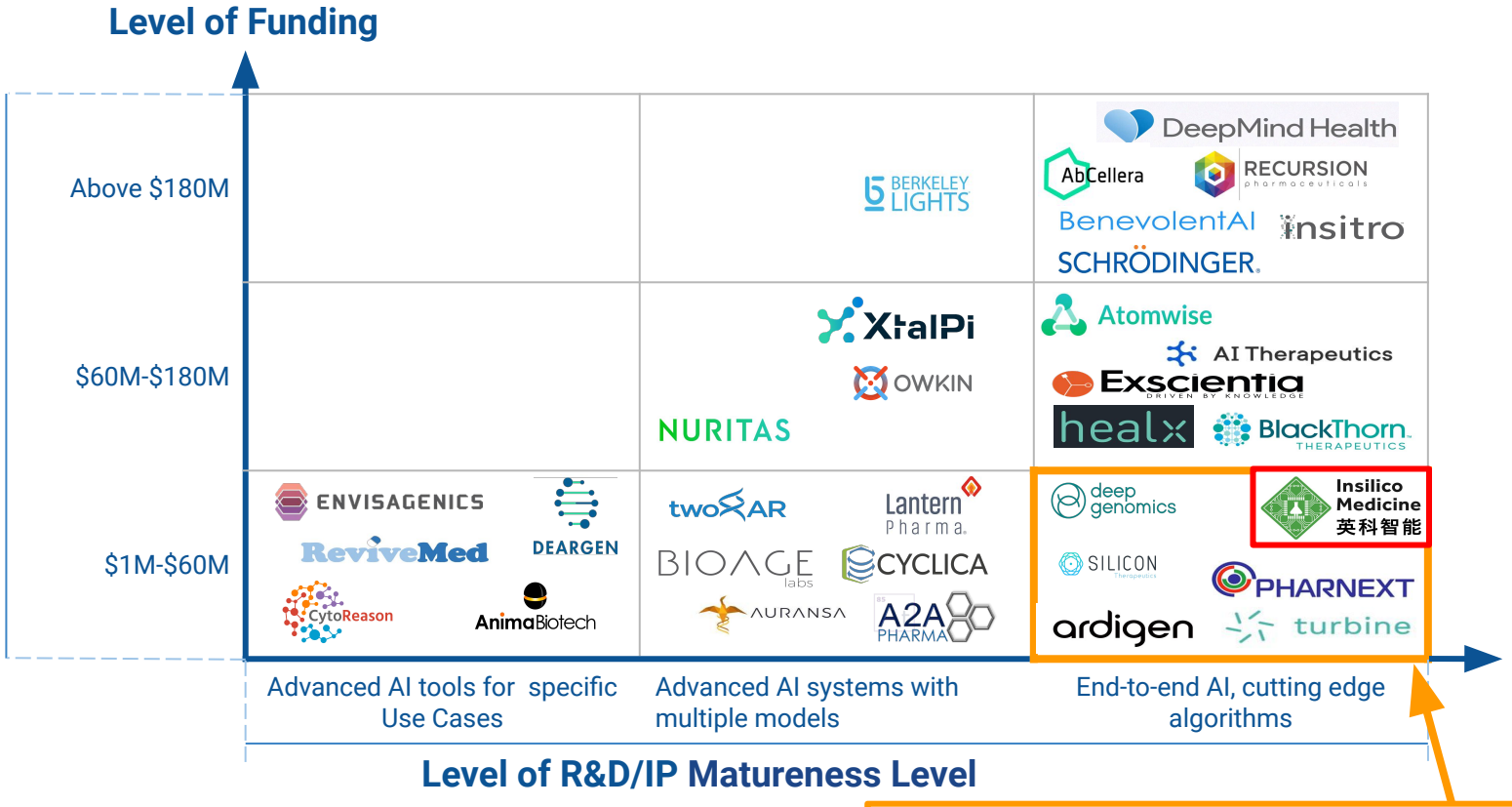
2017 → 20x industry growth → 2021

AI in Pharma Companies - 11
Investors - 30
Startups - 10



AI in Pharma Companies - 300
Investors - 880
Corporations - 100

Ratio of Funding vs. R&D Maturity & Overall Development Stage



Longevity Clinical Trials Market Overview

Q3 2021

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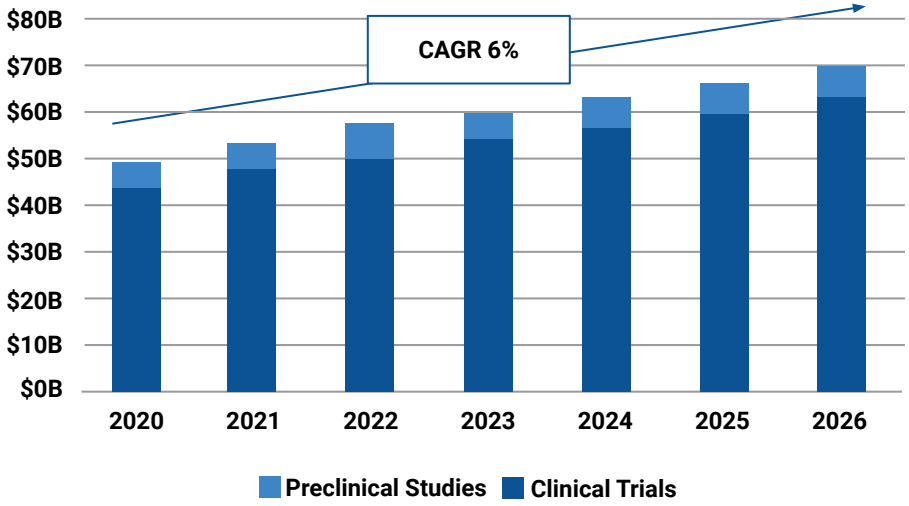
Longevity Clinical Trials Market at a Glance

Preclinical Studies and Clinical Trials Market Size, 2020-2026



3.4%
Global GDP Growth in 2021

3.7%
Global Spending Growth on Pharma R&D in 2021

0.24%
Life Expectancy Growth in 2021

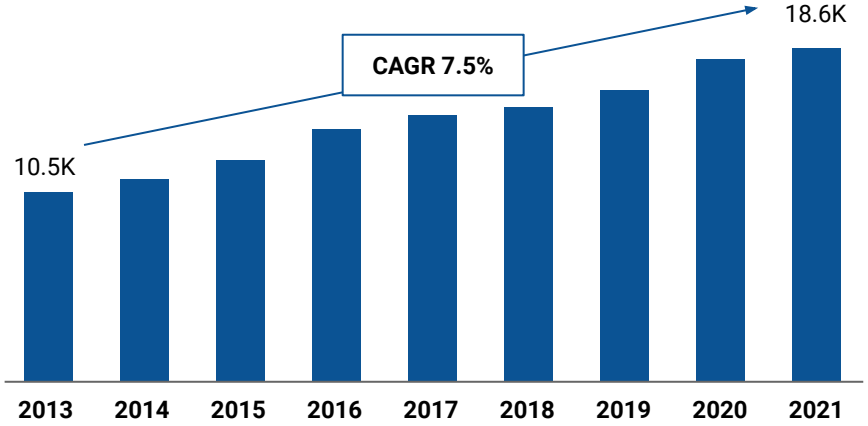
The global **Preclinical Studies and Clinical Trials Market Size** accounted for **$48.8B in 2020** and is projected to grow an average **CAGR of 6%** from 2020 till 2026 to reach **$70.5B.** Despite increasing interest in recent years, the industry remains underestimated and has high growth potential.

The key market drivers include **rising life expectancy and disposable income; increased R&D spending of new drugs** by pharmaceutical companies. Due to high competition, companies are looking to **diversify their product portfolio with specialty drugs**. Additional **demand for clinical and preclinical services arises** because more pharmaceutical companies outsource large parts of R&D, primarily to clinical research organizations, to reduce costs.

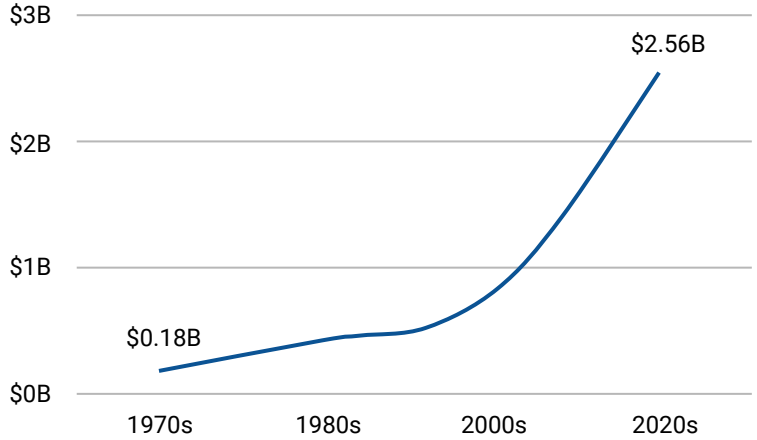
Sources: Grand View Research, Statista, IMF, Macrotrends

Longevity Clinical Trials Market at a Glance

Number of Drugs in the R&D Pipeline Worldwide, 2013-2021



Cost of Development Drugs in USA, 1970-2021



The development of a new innovative product requires significant resources and time. After the initial research, drug manufacturers must conduct a series of trials to obtain approval. The increase in the number of drugs in development **increases the need for more preclinical studies and clinical trials**. The cost in the 2020s showed that **$2.5-2.6B for development** to include approximate average out-of-pocket cost of **$1.4B and time costs** (the expected returns that investors forego while a drug is in development) of **$1.2B.** In addition, the estimated cost of post-approval research and development **of $0.31B** boosts the **full product lifecycle cost** per approved drug close to **$3B.**

Sources: Statista, ScienceDirect, ResearchGate

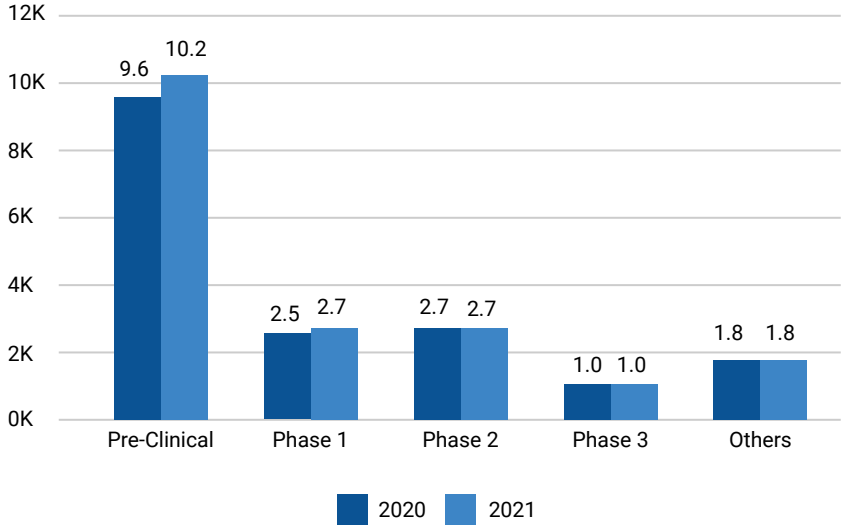
Longevity Clinical Trials Market at a Glance

Preclinical studies involve extensive preclinical studies that yield preliminary efficacy, toxicity, pharmacokinetic, and safety information, testing by using test tubes, cell culture, or animals.

The global **Preclinical Studies Market Size** accounted for **$5B in 2021** and is projected to grow an average **CAGR of 8.1%** from 2020 till 2026 to reach **$7.4B.**

In 2016 USA passed the 21st Century Cures Act, which accelerated the **approval process for advanced drugs and medical devices,** which accelerated the growth of the market, where the USA share in 2020 was **47.7%**. The largest share of the global market income in 2020 was occupied by **toxicological preclinical studies** with a share of **61.1%** due to a rise in the outsourcing of noncore preclinical CRO studies and high adoption in toxicology tests.

Number of Drugs in the R&D Pipeline Worldwide, 2020-2021

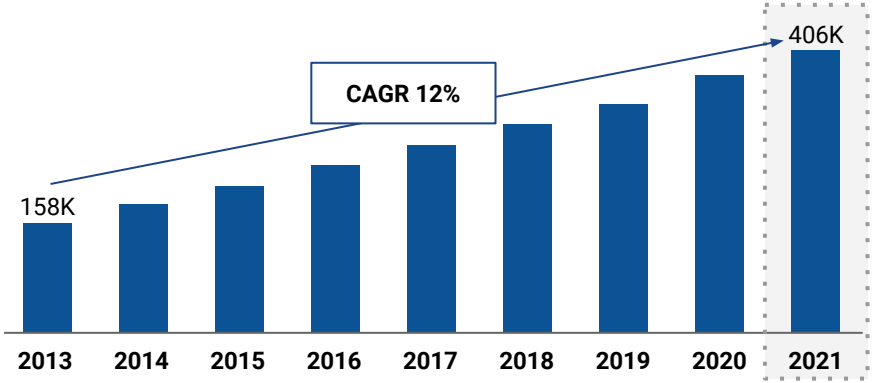


Note: Others - trials that have alternative approach to studies due to local policies.

Sources: Grand View Research, Statista

Longevity Clinical Trials Market Overview

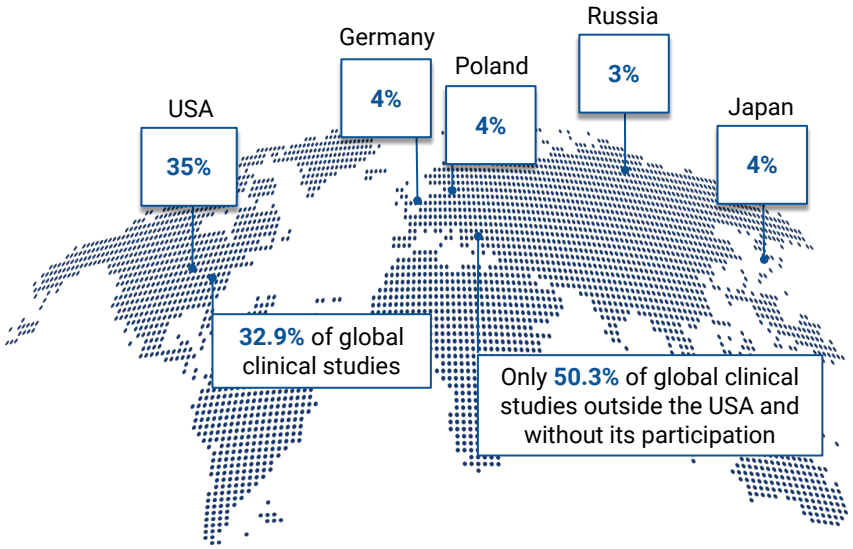
Total Number of Registered Clinical Trials Worldwide, 2013-2021



Clinical trials are the main part of the drug development process, because they determine the safety and efficacy of the drugs effect on the human body. The global **Clinical Market Size** accounted for **$47.4 B in 2021** and is projected to grow an average **CAGR of 5.9%** from 2020 till 2026. The **complexity** of conducting clinical trials in U.S. **has grown by 61%** from 2001 to 2015, which increases the demand for specialized clinical trials companies.

Sources: Grand View Research, Statista, ClinicalTrials.gov, Research Gate

Top 5 Clinical Trials Participants by Country in 2021

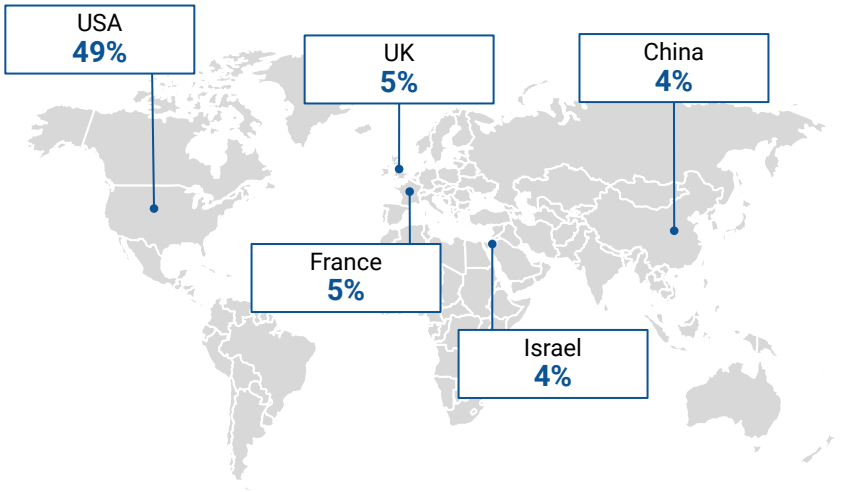


Probability of Success for Drugs in the USA in Different Development Clinical Trial Phase

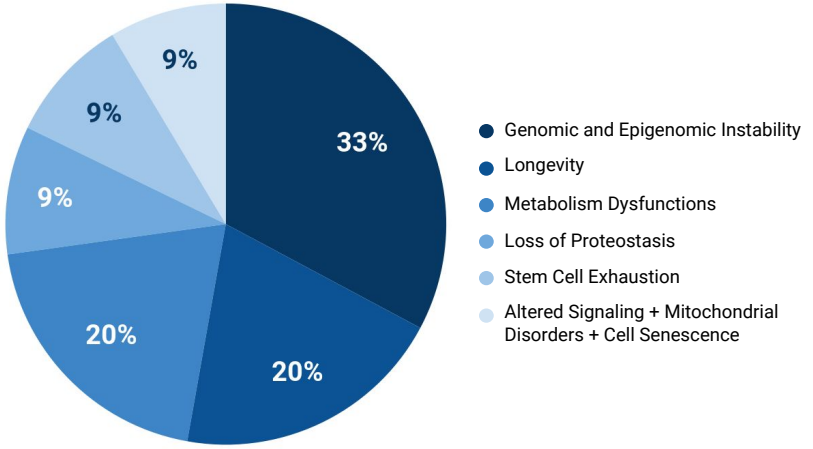
52%	28.9%	57.8%
Phase I	Phase II	Phase III

Longevity Clinical Trials Market Overview

Distribution of Companies by Country, %



Distribution of Clinical Trials by Category, %



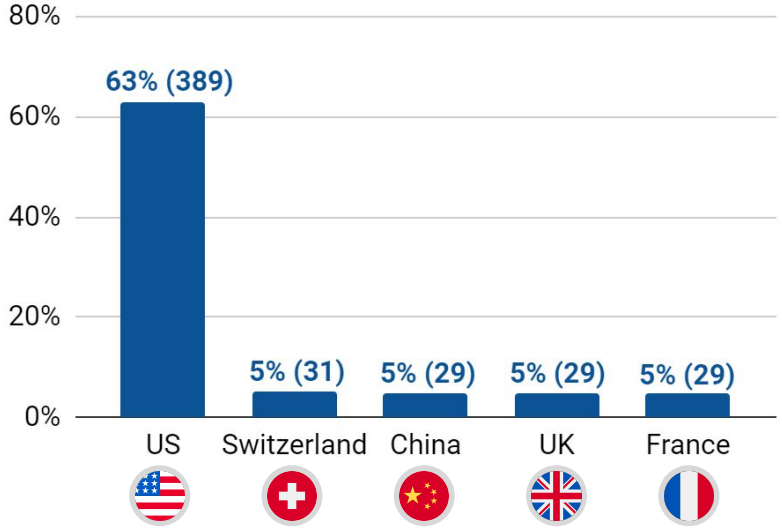
The **vast majority** of companies that conduct Clinical Trials is located in the **United States** and accounts for **49%** of the whole range of analyzed companies. The United States is followed by the **European region**, particularly by the **United Kingdom** and **France** with the total companies amount equal to **5%** of all companies in **both** of the countries.

The main domains in which Clinical Trials are being conducted are **Genomic and epigenomic instability**, **Longevity** and **Metabolism dysfunctions** which account for **33%**, **20%** and **20%** of all Clinical Trials **respectively**.

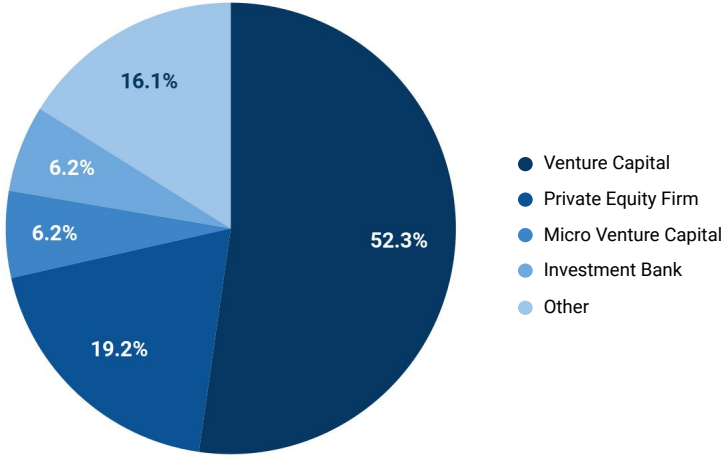
Source: Aging Analytics Agency analysis

Longevity Clinical Trials Market Overview

Countries with the Largest Number of Investments, %



Main Type of the Investors, %

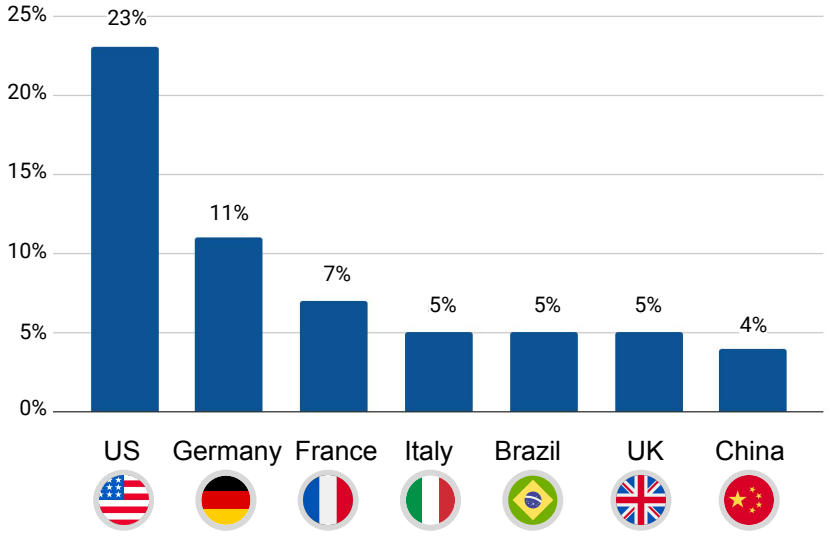


The main part of the investments in Clinical Trials was made by investors from the **United States** and accounts for **63%** of the total investments amount. Investors from **Switzerland**, **China**, **United Kingdom** and **France** follow the United States with **5%** of total investments made **in each** country. Most of the investors are **Venture Capitals** which constitute more than half of all Investors (**52.3%**). The other main types of Investors are **Private Equity Firm** (**19.2%**), **Micro Venture Capital** (**6.2%**) and **Investments Bank** (**6.2%**).

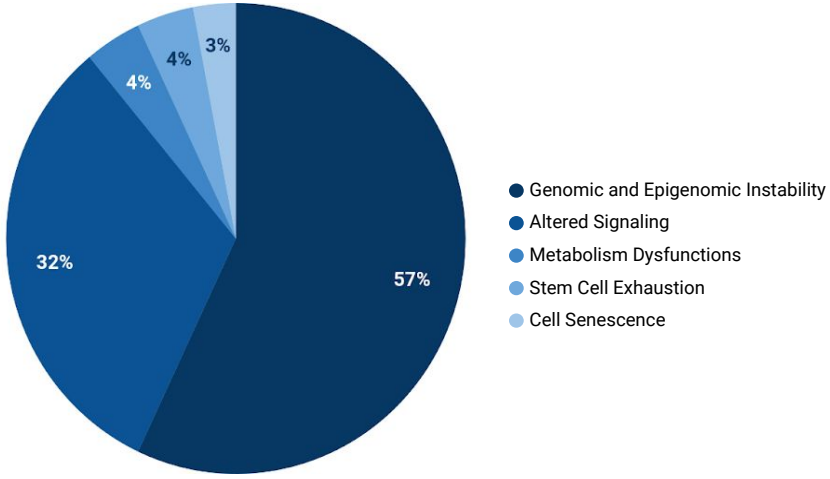
Source: Aging Analytics Agency analysis

Longevity Clinical Trials Market Overview

Countries with the Largest Number of R&D Centers, %



Distribution of R&D Centers by Categories, %



More than a fifth of leading R&D centers that conduct clinical trials on longevity-related topics are situated **in the United States.** Around **27%** of R&D centers are allocated **in the European region**: 11% - in Germany, 7% - in France, and 5% each in Italy and the United Kingdom. Among the top 5 research directions, **53%** of R&D centers are engaged in the field of **Genomic and epigenomic instability**. Another **third** of centers provide studies in the field of **Altered signaling**. **Metabolism dysfunctions, Stem cell exhaustion,** and **Cell senescence** are developed by **4%**, **4%**, and **3%** of centers **respectively**.

Source: Aging Analytics Agency analysis

Market Trends

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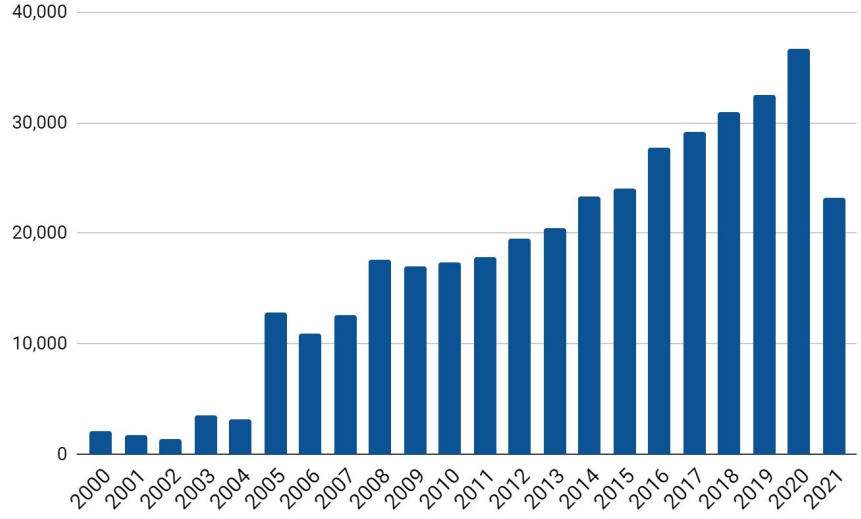
Market Trends

The graph clearly illustrates the primary trend - **the clinical trials market is growing annually by an average of 30%.** Recently, the increase in the number of clinical trials has been **provoked by the synergy of 4 key factors** - market trends.

Key Market Trends	Determinant
Vaccine Trials on Rise	**COVID-19**
Remote Trials Increase	
Clinical Trials Disruptions	
New Technologies in Clinical Trials	**Digitalization**

Source: ClinicalTrials.gov

Number of Studies for Clinical Trials, 2000-Q1 2021



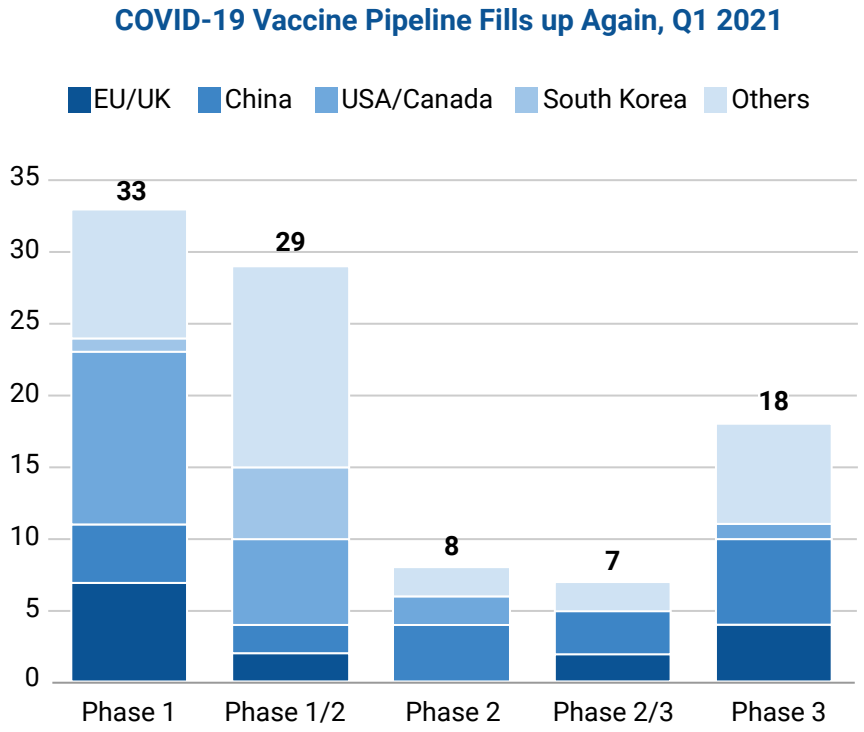
Note: despite a precipitous drop in the number of clinical trials in 2005, the market continues to grow steadily as the relative increase is greater than 1.

Vaccine Trials on Rise

Even though in some countries process of vaccination from COVID-19 is almost over, **more than 60 vaccines** are currently still listed for stage 1 or stage 1/2 trials, while **a whopping 184 candidates in pre-clinical trials** are registered with the WHO. 18 vaccines were presently listed by the WHO as being in stage 3 trials, among them shots already in use, like the Johnson & Johnson vaccine, both Sinopharm varieties, the Russian Sputnik and the Indian Bharat Biotech vaccine. On the other hand, only **five vaccines have progressed to phase 4.**

Moreover, **vaccines can increase longevity** by protecting against diseases that cannot be expected to benefit, thus affecting longevity.

Elderly individuals given the influenza vaccine in the USA had approximately **20% less chance** of suffering cardiovascular and cerebrovascular disease and **50% lower risk of mortality** from all causes than their unvaccinated counterparts.



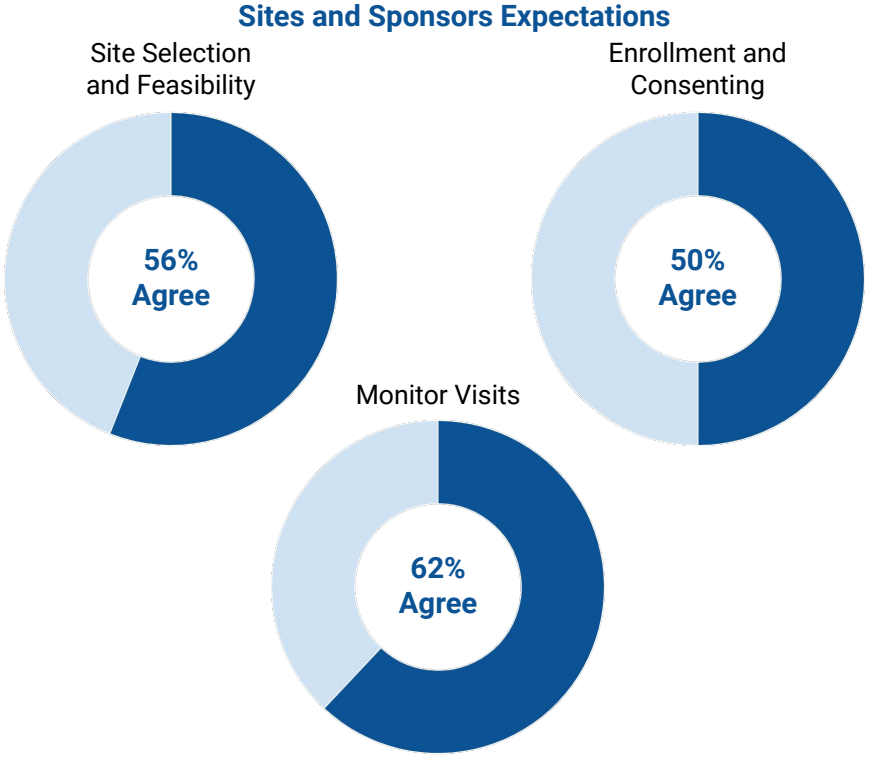
Sources: COVID-19 Vaccine Pipeline Fills up Again, Vaccination greatly reduces disease, disability, death and inequity worldwide

Remote Trials Increase

As the pandemic COVID-19 hit, **companies started to cut off additional costs and remove inefficient workflows.** In clinical trials, it was critical to the transition from on-site monitoring visits to remote site connectivity to ensure **efficiency, real-time oversight, and more timely data exchange**. As the demand for digital site connectivity is growing, both sites and sponsors expect over **fifty percent of all tasks to be completed digitally by 2023.**

Specially developed purpose-built systems that **support remote clinical trial monitoring** create cross-organizational efficiencies when the technology vendor considers both sites and sponsors' workflow needs. At the same time, additional workload, disjointed processes, and numerous portal logins for various sponsors are introduced.

Remote Clinical Trial Monitoring Benefits include standardized automatic data collection and storing, instant integration between systems, continuing tracking and efficiency, and reducing travel costs.



Source: Why Remote Clinical Trial Monitoring is the New Standard

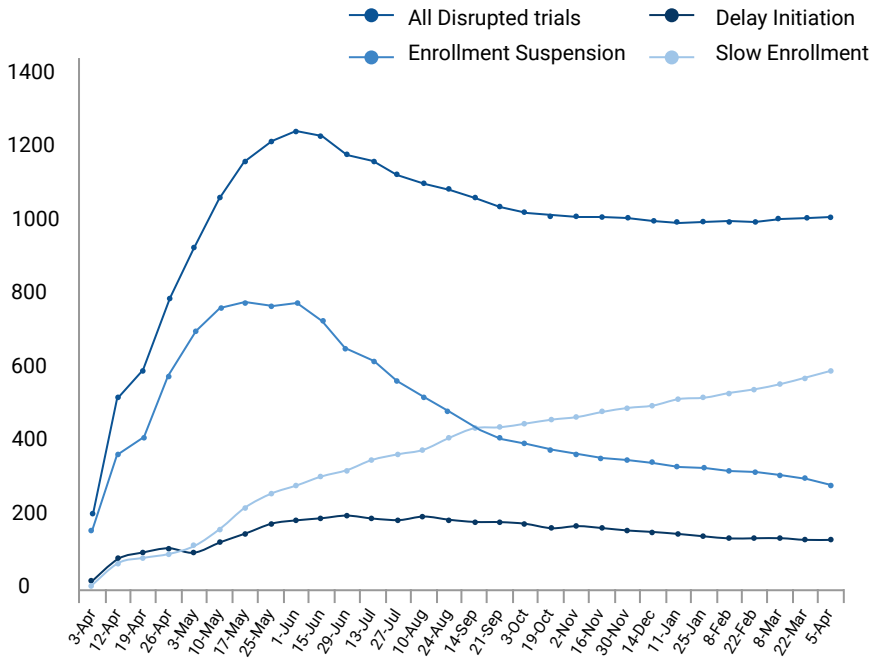
Clinical Trials Disruptions

The pandemic has had a **significant impact on the infrastructure of clinical trials,** from the countless staff furloughed or working remotely to the many labs and research institutions that have had to close temporarily. In addition, the effect of social distancing and the need to shield vulnerable patients has also led to trial suspensions at many sites.

The total number of disrupted trials has leveled off, but t**he number of clinical trials that have resumed continues to rise**, although somewhat slower than the initial rise.

As the number of trials that have been impacted by slow enrollment continues to increase, this remains an issue. In addition, there is also a high risk to subjects in a clinical trial with a severe chronic or acute condition that affects their immune system, giving them a greater chance of contracting COVID-19 and making them unwilling to enroll in a clinical trial. Thus, companies and research groups are advised to overhaul the safety guidelines to attract more test subjects.

Global Clinical Trials Disrupted due to COVID-19, April 2020-April 2021



Sources: Clinical trial disruptions, Clinical trials continue to resume, GlobalData

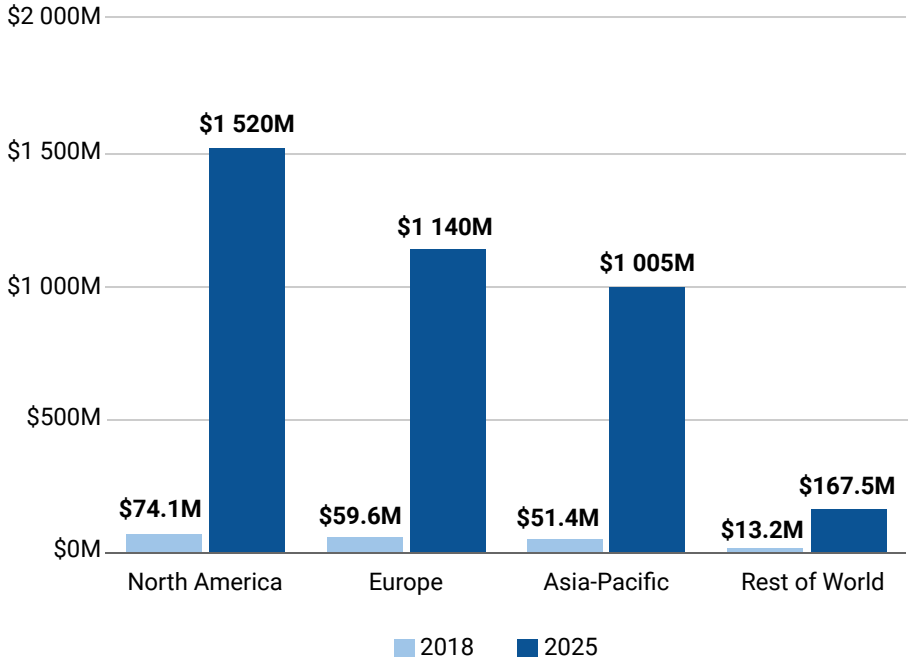
New Technologies in Clinical Trials

The biopharma industry is tied to clinical trials because of the constant competition. As a result, biopharma giants struggle to create new, more precise drugs reliably. **This implies a direct correlation between the use of AI in the biopharma industry and the use of new technologies in clinical trials.**

Global healthcare companies and governments are starting to catch up with **current trends in clinical trials,** starting from increasing engagement with digital ads ending with digitalized data collection, outsourcing more and more research to improve efficiency and decrease R&D costs.

The software technologies used will range from social media, mobile applications to AI-driven software solutions. One of the most widely used AI solutions currently underutilized on the market is in silico modeling that complements experimental research in a resource-efficient manner. It is predicted that **by 2025 the use of artificial intelligence in clinical trials will grow 15 times.**

AI Market in the Global Biopharma Industry in 2018 and a Projection for 2025, by Region



Sources: Digitalization of clinical trials , Artificial intelligence market in the global biopharma industry, Statista

Key Takeaways

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Major Observations for 2021: Key Business Takeaways

1. As a result of aging and the upcoming Silver Tsunami, **there has been an increase in interest in the Longevity industry.** Currently, the **size of the market** is estimated at **$25 trillion.** The main players in the market are **national healthcare companies** and **longevity-focused financial companies.** Longevity-focused biomedicine companies with a smaller market share have been the main focus of longevity venture investors.

2. Among all of the industry's sectors, **P4 Medicine** (Precision, Preventive, Personalized, Participatory) is the largest one in terms of the funds raised and the number of companies involved. Accounting for 50% of the entire market, it represents stable growth.

3. Region wise, the **US is an absolute industry leader.** By the percentage of longevity-focused companies **(61.5%)**, it is far ahead of **Europe (17.3%),** and **Asia (9.8%)**.

4. Despite a small number of companies, **investments in longevity-focused companies in China and India have increased** (and so has the size of the companies).

5. **The Silver Tsunami phenomenon** poses increased risks for financial institutions, such as pension funds and insurance companies. Two scenarios here are possible: optimistic and pessimistic one. In the first case scenario, most of the institutions will adapt to the new reality and transform their business models. In the second case scenario, they will not be able to adapt to aging population challenges due to lack of resolve and technological capabilities.

6. Since most developed longevity startups are becoming mature companies, large institutional investors are being attracted to the industry, besides that, longevity companies tend to intensify their corporation with banks, and governments as well as other companies in the industry, what brings **more competition in the sector.**

Observations in 2021: Key Financial and Investment Takeaways

1. Due to the COVID-19 pandemic, **the biotech and longevity sectors are on the rise**. During 2020 - half year 2021, we witnessed multiple medium and large funding rounds for biotech and longevity companies, especially for those of them that focus on drug development.

2. Within 2021 (up to August) **884 longevity-focused companies closed large-sum late-stage venture capital rounds (B, C, and D)**. Some of them are now busy developing candidates for clinical stage trials.

3. In 2021 alone, the global investments in longevity-focused companies totalled **$39.54 billion**. For comparison, in 2020 the total investments in Longevity Industry constituted **$60B**, that means that this sector is of great interest of investors.

4. Half year 2021 saw **a lasting trend of "biotech IPO boom"**, which was partly caused by the coronavirus pandemic. The latter — directly and indirectly - dramatically impacted the longevity industry.

5. 2021 was marked by **15 IPOs** in the Longevity sector. The biggest companies are **Clover Health, Recursion Pharmaceuticals, Sana Biotechnology, and Affirm Holdings** by resulting in capitalization.

6. The closing of IPOs **will attract a significant number of non-biotech investors looking to enter the Longevity sector**.

7. Publicly traded companies demonstrate rapid growth, having achieved **$5.6 trillion** of cumulative capitalization at a **30.2%** growth rate.

8. Currently, VC funds categorize longevity companies according to their seed, series A, series B and other parameters. The stage of a company's development will become less important, while **TRL levels and the level of technological development (assessed by other tangible metrics) will be of far greater significance**. They will ensure data-driven analysis and make it possible to perform certain mathematical calculations of the value of a portfolio company.

Key Technology Takeaways

1. Over the recent years, **significant progress has been achieved in aging research** (mainly in animal studies). As a result, longevity has become a complex and multidimensional science. Its diverse technological offshoots, such as geroscience, geriatrics, regenerative medicine, and precision medicine, are all developing simultaneously. This serves as a foundation for the global Longevity Industry, which will probably be humanity's largest industry by the year 2040.

2. **AI-driven biomedical research and development efforts are now more technologically mature and can be successfully used in aging research.** The key power of AI lies in its ability to accelerate real-world implementation of longevity science, such as drug discovery, biomarkers discovery, new longevity and genes identification, and bring personalized medicine to clinics based on an individual patient's records.

3. Currently, the main focus of global public health efforts is on increasing human healthspan. Achieving this requires successful **treatment and prevention of age-related diseases**, such as cancer, neurodegeneration and cardiovascular diseases.

Obstacles That Still Remain

1. Application of discoveries in animal aging to humans requires **better biomarkers** of disease risk and responses to interventions, and **increased use of electronic health records, biobank resources and cohort studies**. Absence of validated biomarkers of risk of age-related diseases poses challenges for the development of anti-aging drugs. There is still no consensus among scientists regarding biomarkers of a biological age.

2. **The ability of AI to make accurate predictions depends on data availability.** A major concern in the application of AI technologies in healthcare is related to the acquisition, generation, and use of health data. Regulatory efforts are needed to ensure proper flow and use of healthcare records.

3. There is a **shortage of financial resources necessary for the development of public health programs** capable of reducing the risk of age-related diseases. Many health promotion strategies lack scientific and clinical evidence of their efficacy.

4. It is crucial to shift focus from treating individual diseases to developing medical interventions capable of **extending the human lifespan**.

Longevity in the Global Context

Driven by the declining fertility rates and improvement in health and longevity, human populations are rapidly aging. The world is likely to have 1 billion elderly people by 2030. The most rapid increases in the proportion of people aged 65 and over are taking place in developing countries, with the most dramatic changes being observed in East Asia. There, life expectancy at birth has increased from less than 45 years (in 1950) to more than 72 years. In the near future, the elderly population is expected to grow fastest in Northern Africa. In contrast, the projected increase is relatively small in Australia, New Zealand, Europe and Northern America.

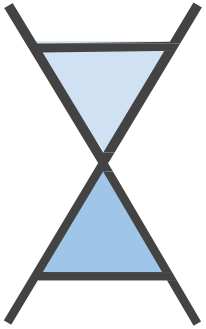
Among the developed countries, Hong Kong and Japan have the highest life expectancy rate at birth (84.7 and 84.5 years, respectively). Despite spending less on health and social care (compared to other developed economies), Hong Kong demonstrates superior social indicators — adolescent birth rate, youth involvement in education or employment, homicide rate and incarceration rate. Its superb health indicators, and more specifically, life expectancy and infant mortality rate, may be considered key longevity-related factors.

In terms of investments and number of aging research institutions (almost 50% of the total number worldwide), **the US is an undisputed leader in the longevity industry**. Suffice it to recall that the majority of major longevity-focused companies are based in the US. This contrasts sharply with health disparities which are due to socio-economic inequalities.

Among EU countries, Italy (22.8 %), Greece (22.0 %), Portugal (21.8 %) and Finland (21.8 %) had the highest percentage of individuals aged 65 and over in 2019. In their turn, Ireland (14.1 %) and Luxembourg (14.4 %) had the lowest percentage. It is expected that the percentage of individuals aged 65 and over will increase and account for 29% of the entire population by 2060.

The demographic shift is affecting each and every aspect of social life, from health system pressures to economic impact on public finances. It presents opportunities to individuals and society; however, it also poses challenges which have to be addressed in government policies. That is precisely why redesigning pension systems has become a priority in many countries.

About Aging Analytics Agency



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Aging Analytics Agency is primarily interested in strategic collaboration with international corporations, organisations and governments of countries in longevity-related projects and initiatives.

Aging Analytics Agency is open for cooperation with strategic clients via a variety of approaches, including:

- Conducting customised case studies, research and analytics for internal (organizational) use, tailored to the precise needs of specific clients;
- Producing open-access analytical reports;
- Offering customised analysis using specialised interactive industry and technology databases and IT-platforms.

In certain specific cases, and if it meets our interests, Aging Analytics Agency is open to co-sponsoring research and analytics for the production of internal and open-access industry reports, as well as special case studies for a variety of governmental, international and corporate clients. Their topics may include Longevity, the Longevity Financial Industry, Longevity Policy and Governance, as well as the development and execution of full-integrated National Healthy Longevity Development Plans tailored to the specifics of national governments and economies.

www.aginganalytics.com info@aginganalytics.com

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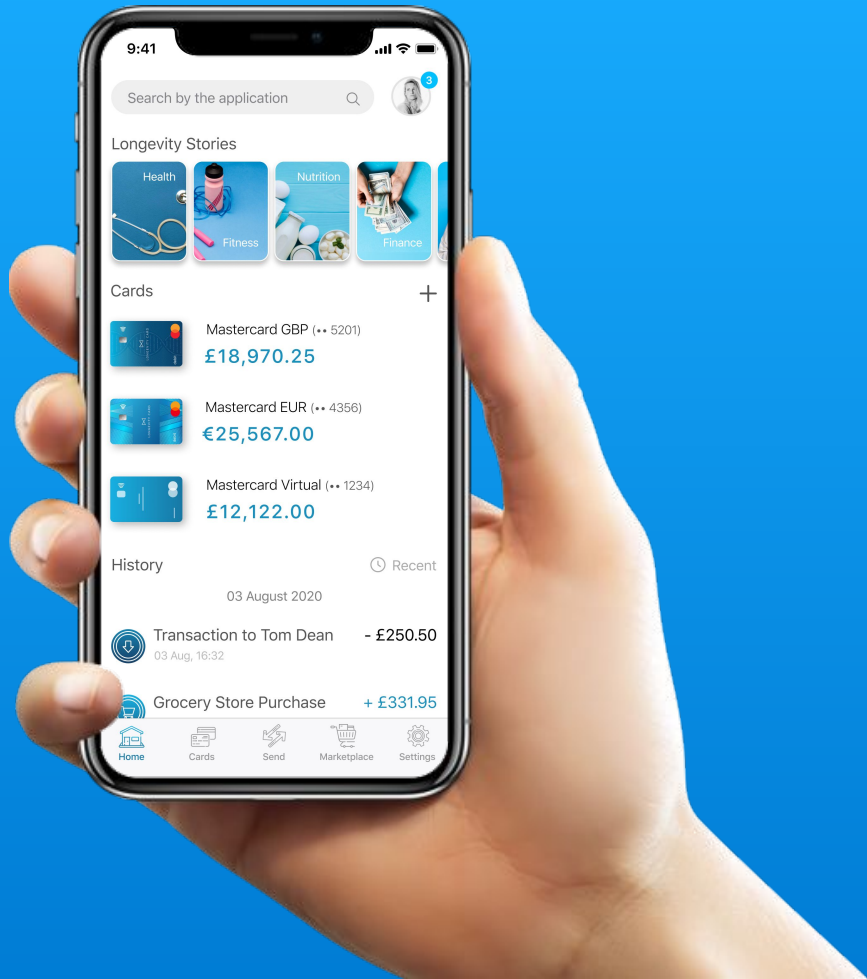
HEALTH IS THE NEW WEALTH



ACCOUNT FEATURES

UK IBAN

MULTI CURRENCY ACCOUNTS

DEBIT CARD

MONEY TRANSFERS

CASH LOAD

LONGEVITY MARKETPLACE

PERKS

FAST SIGN UP

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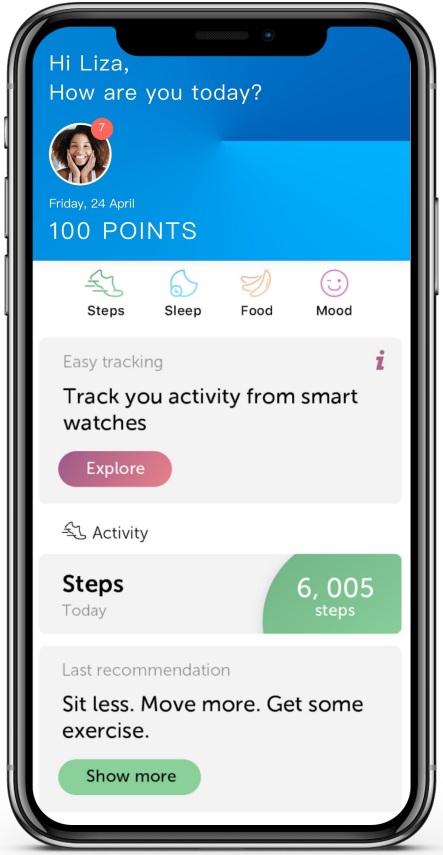
HEALTHTECH INTEGRATION

HEALTHSPAN AND FITNESS GAMIFICATION

LONGEVITY POINTS

DAILY ACTIVITY ANALYSIS

SLEEP ANALYSIS



AI POWERED PERSONALISED RECOMMENDATIONS

WEARABLES COMPATIBLE

LONGEVITY STORIES

NUTRIENT TRACKING

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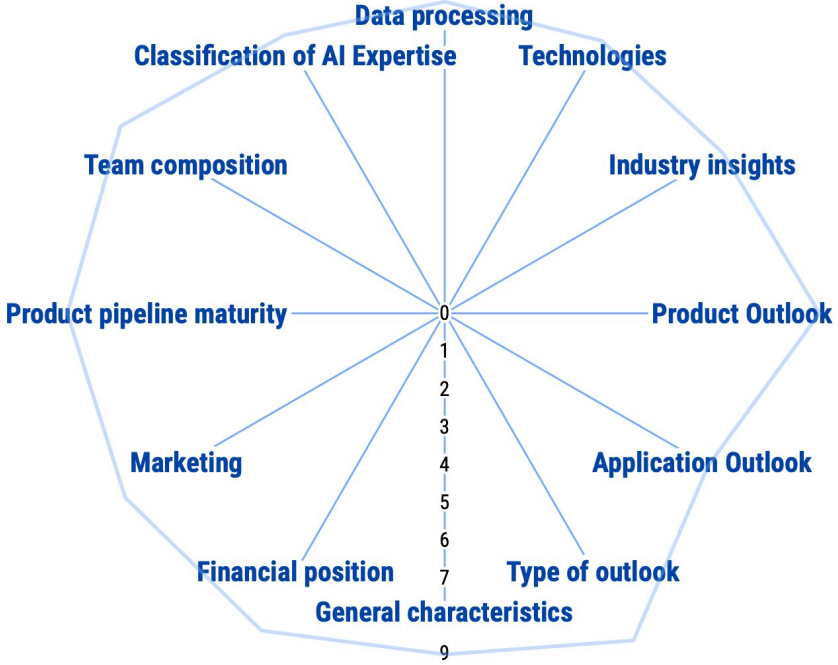
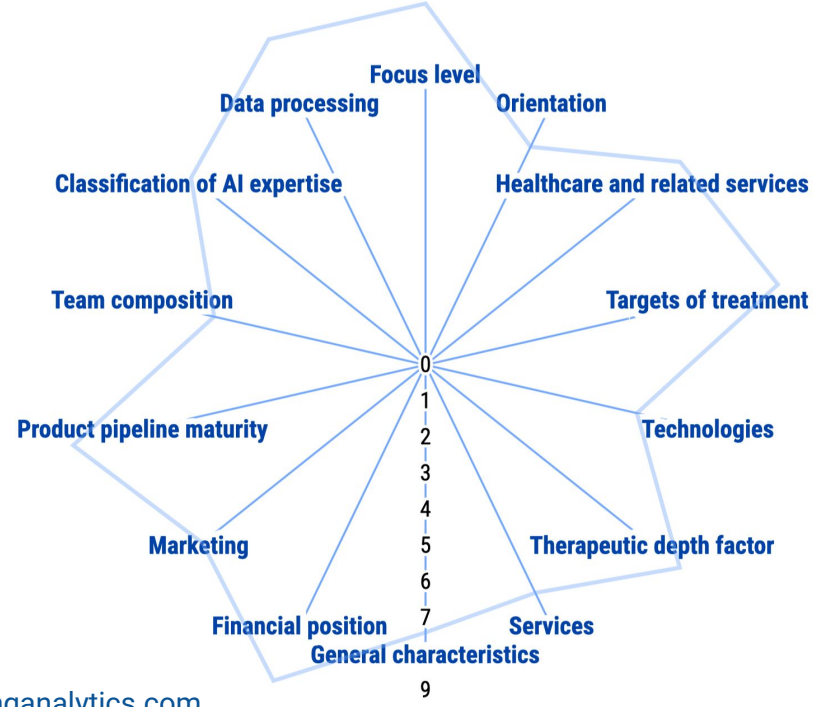
Multiparametric Assessment Analysis (Using Big Data Analytics Platform)

Aging Analytics Agency offers a state-of-the-art AI-based **SWOT analysis system** covering **6,000+** companies that are divided into 12 categories.

By comparing a company's multiple parameters in 12 vectors of its business development, our system makes it possible to conduct its initial data-driven due diligence **instantly, automatically, and holistically**. The results of the analysis are presented in easy-to-perceive 2D and 3D radar charts.





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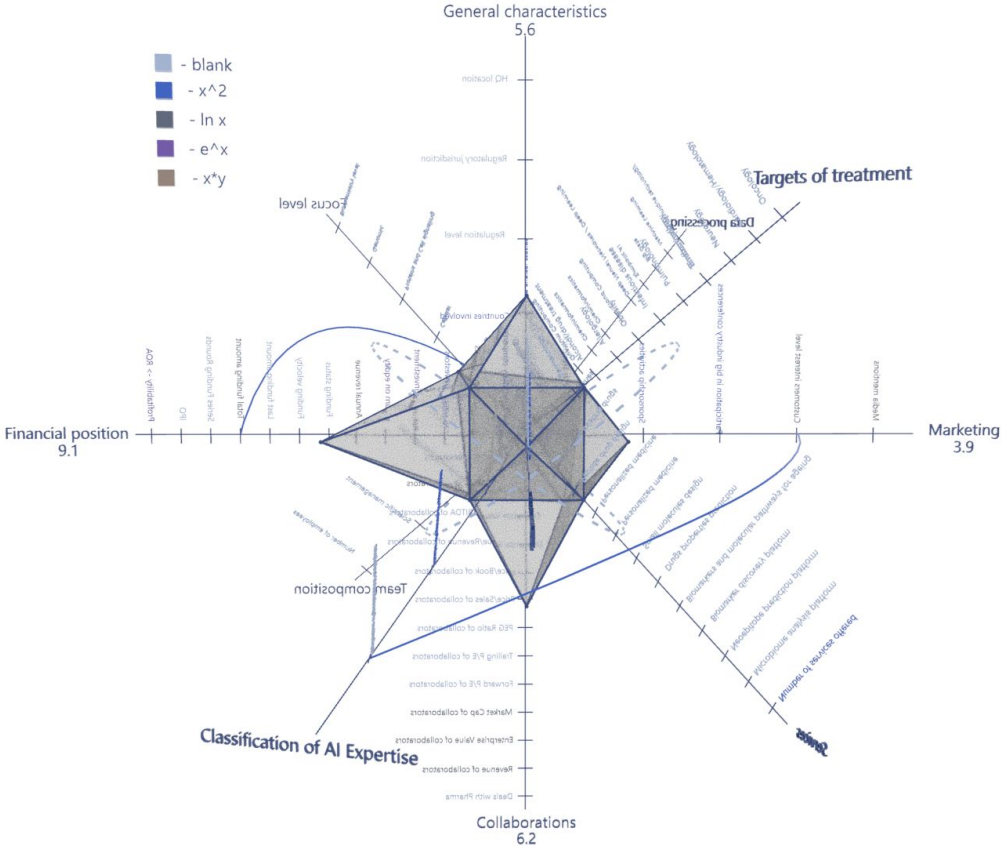
Multiparametric Assessment Analysis (Using Big Data Analytics Platform)



www.aginganalytics.com/big-data-analytics-dashboard

Longevity Industry Big Data Analytical Dashboards

Dashboard Overview

Aging Analytics Agency is working on a sophisticated cloud-based engine designed for advanced market and business intelligence in various segments of the longevity industry. It includes a data mining engine, infrastructure for expert data curation, and advanced visualization dashboards, including mindmaps, knowledge graphs, and 3D visualizations. It also offers data-driven insights into the trends and companies in the longevity industry, SWOT analysis of the most promising entities and technologies, investment advisory, business and technical due-diligence.

Matching tool	Machine learning for database extrapolation	Dynamic SWOT analysis representing evolution of a company
Companies database	Machine learning and deep neural networks for companies clusterization	Interactive industry mindmaps
Investors database	Machine learning for financial indicators predictions	Real-time financial data analytics platform for AI in pharma corporations
SWOT analysis	Interactive AI-based scenario analysis and financial planning	AI in pharma financial instruments analytics

Database, AI and ML algorithms overview	
Parameters	400 parameters with appropriate weights combined into 20 vectors
Data points	8 000 000 data points which are being updated permanently
Algorithms	Deep neural networks, polynomial formulas with mathematical transformations, regression models
Data aggregation	Automatized parsing, extrapolation using machine learning, feedback from companies

Who Can Benefit

- Investment institutions, funds, investment banks, family offices;
- Private and public companies in pharma/biotech space
- Research institutions, universities
- Technology vendors and contract research organizations
- Startup hubs, accelerators
- Consulting companies and agencies

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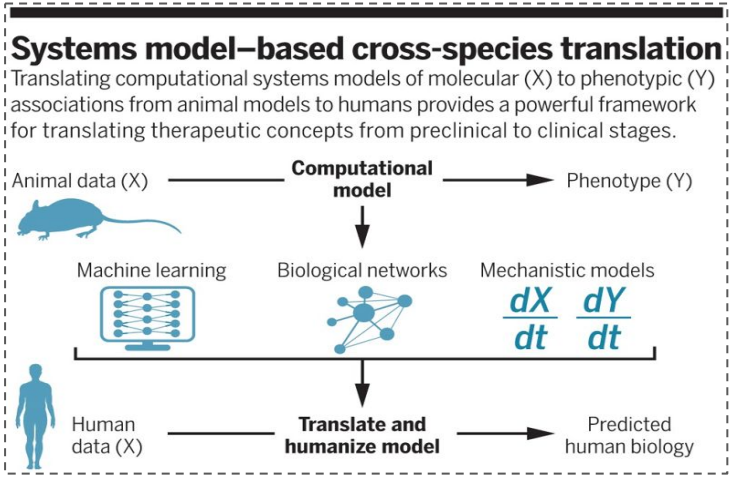
Tangible Metrics to De-Risk Investments in Longevity Startups

Investment decisions practices in the longevity industry can be essentially enhanced through the application of the biomarkers of aging. Concrete and precise metrics of human aging can assist investors in differentiating between overvalued hype-driven startups without any proofs of success in fighting human aging and promising businesses which are producing tangible anti-aging results applicable for humans.

Given the enormous differences between the biology of humans and the biology of common model organisms like mice, combined with the higher degree of biological complexity as it pertains to ageing vs. single diseases, we can expect the clinical translation failure rate in the Longevity Industry to be much higher than the already-enormous failure rate in traditional BioTech.

New approaches to scientific due diligence and the validation of results for longevity-focused companies are needed to ensure protection against company and industry devaluation. However, there are a number of existing approaches that can be used by investors to de-risk longevity investments.

The use of biomarkers of aging and longevity constitutes the most market-ready and validated means of proving efficacy in humans. It can also serve as a basis for demonstrating human-validated results by longevity companies and startups. A wide array of single biomarkers and panels of biomarkers of Longevity exists in a market-ready form, and should be adopted by longevity investors for due-diligence in order to create a more modern, sophisticated and robust method of preliminary validation of therapeutic safety and efficacy.



In addition to biomarkers, there is also a large number of other modern approaches capable of providing preliminary indicators of human validation. They can be used to create a coordinated framework which will provide investors with greater confidence in the likelihood of clinical translatability. These include:

- In silico human modeling
- In vitro tests using human cells and tissues
- Human-animal chimeras (e.g., human-mouse chimeras) for safety, toxicity and efficacy testing. This approach is already common in immuno-oncology research, and a wide array of validated approaches can be applied for testing of aging-focused interventions.
- In vivo administration of sub-therapeutic doses using microfluidic chips (i.e., in vitro “skin-on-a-chip” testing).

www.longevity.international/biomarkers

Biomarkers of Longevity

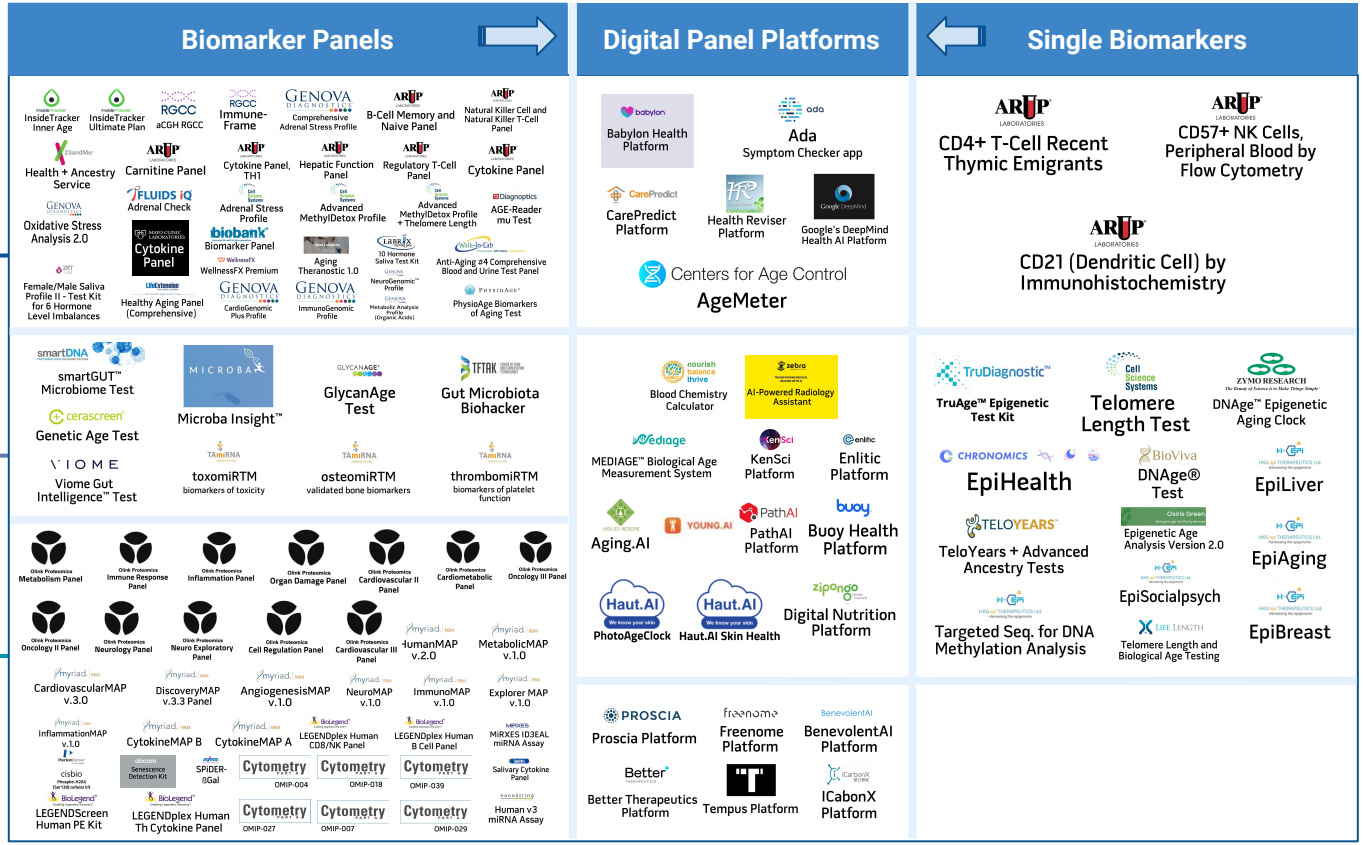
Approved for Clinical Use - 41
Research Use Only - 45
Healthcare-Ready - 33

2nd edition.
Current Status, 2021

Approved for Clinical Use

Healthcare-Ready
(waiting for clinical approval)

Research Use Only



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www.longevity.international/biomarkers

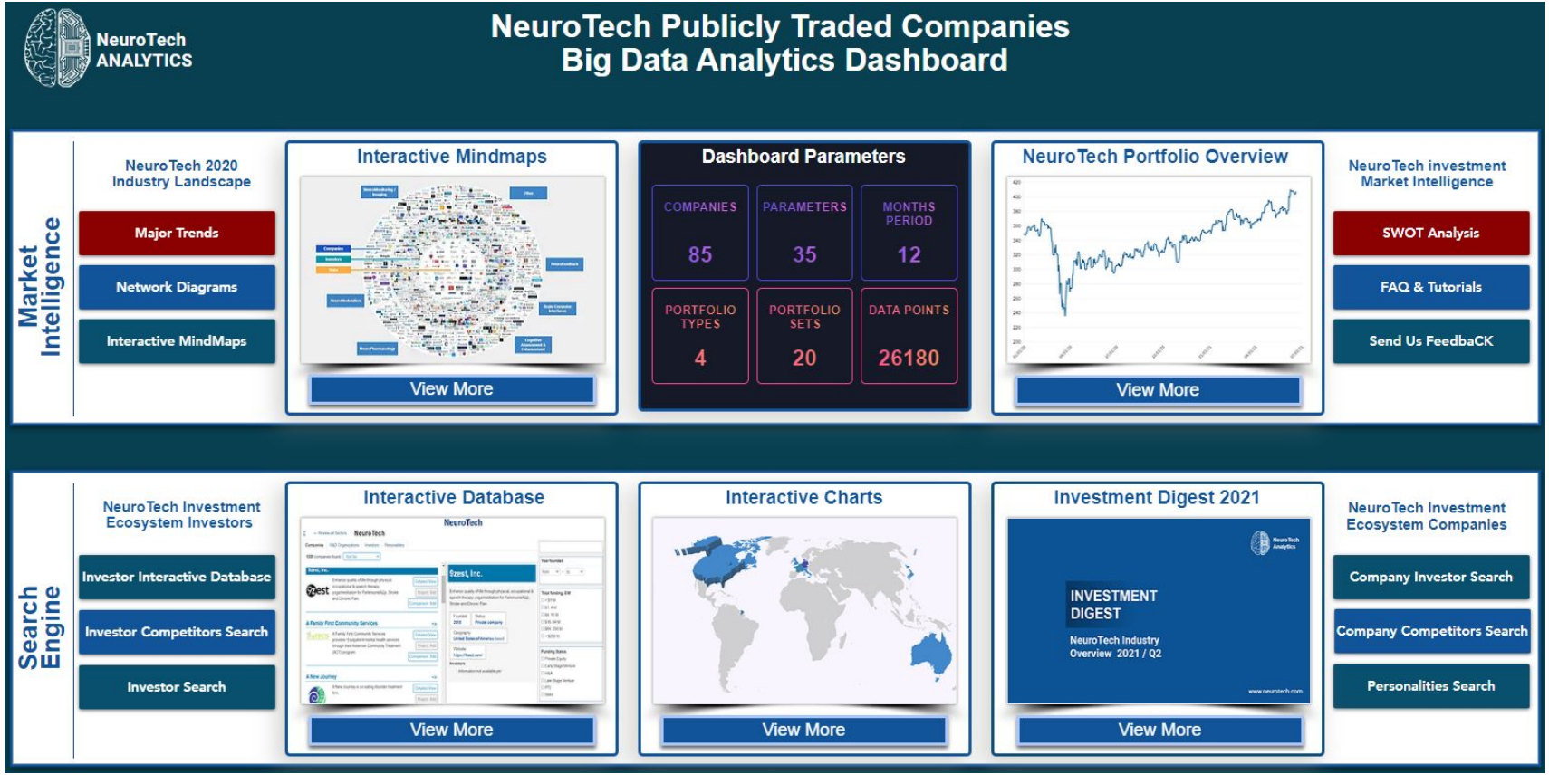
Longevity Finance: Big Data Analytics Dashboard

https://www.aginganalytics.com/finance-dashboard

Longevity Governance: Big Data Analytics Dashboard

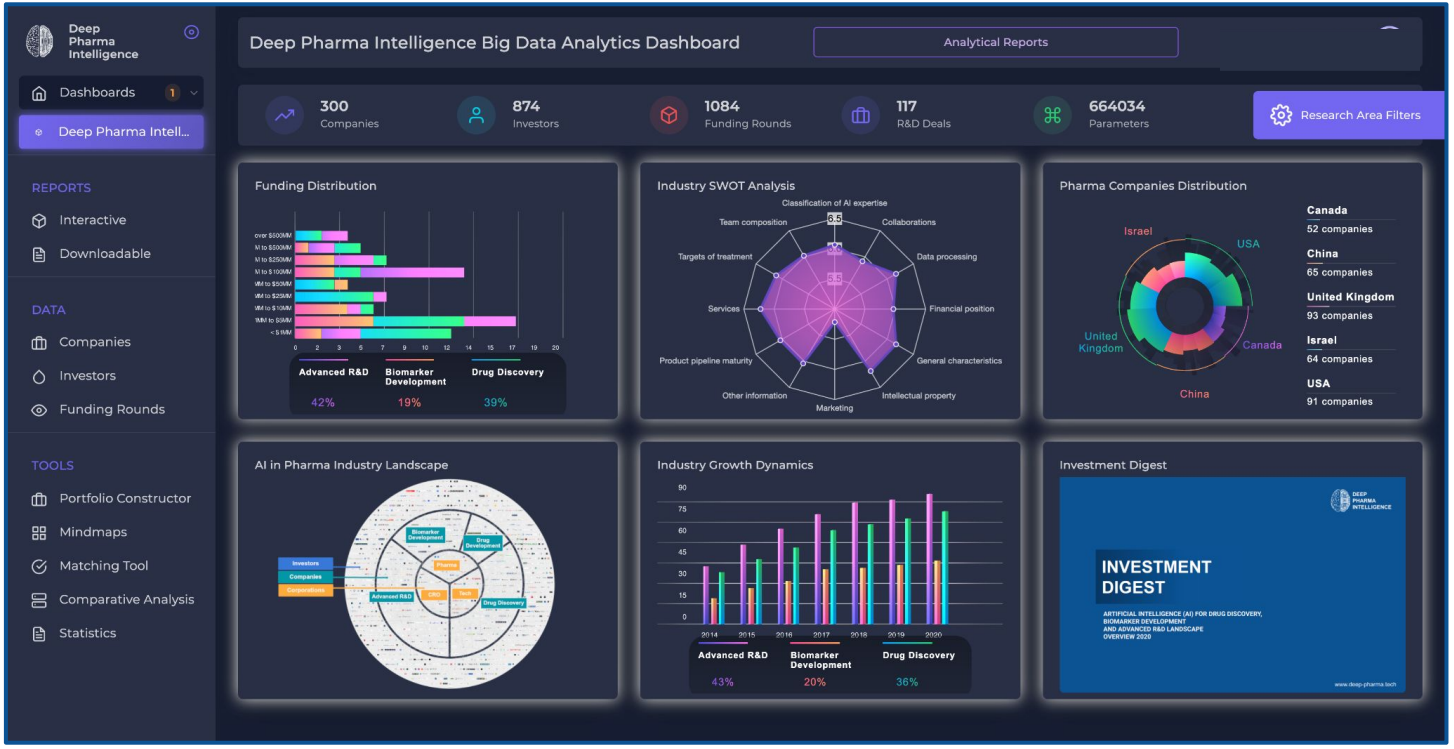
https://www.aginganalytics.com/longevity/governance-dashboard

NeuroTech Publicly Traded Companies: Big Data Analytics Dashboard



https://www.neurotech.com/dashboard

Deep Pharma Big Data Analytics Dashboard



Deep Pharma Intelligence Big Data Analytics Dashboard is one of the analytical platforms developed by Deep Knowledge Group.

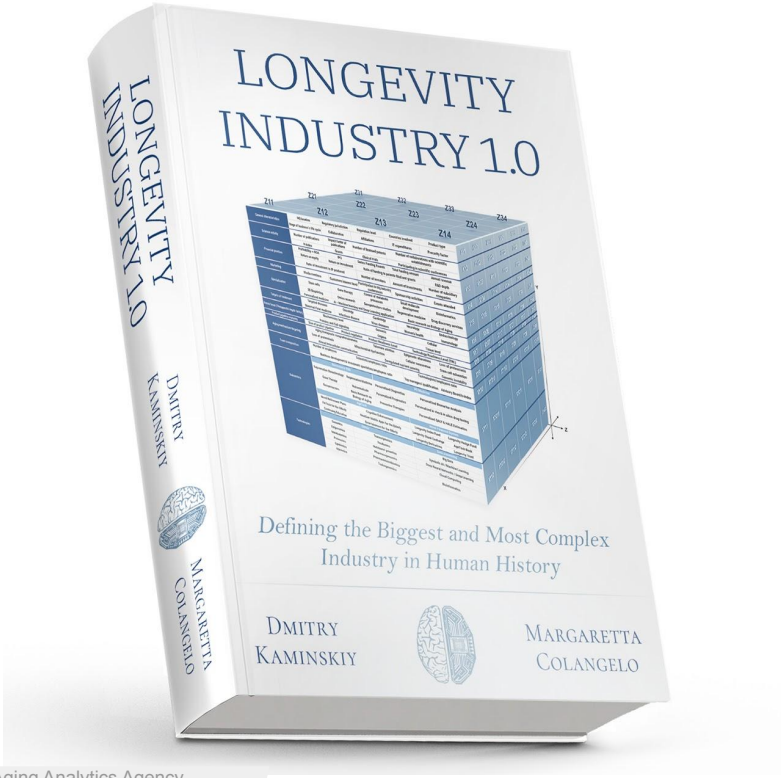
Its main goal is to provide Big Data-based analytical insights, as well as being a Longevity-focused database for institutional and non-institutional investors. It also allows creation of different types of investment portfolios and assesses them with built-in tools provided by the platform.

www.platform.dkv.global/dashboards/ai-for-drug-discovery

Longevity Investment: Big Data Analytics Dashboard

https://www.aginganalytics.com/longevity-investment-dashboard

www.longevity-book.com



Longevity Industry 1.0
Defining the Biggest and Most Complex Industry in Human History

PART I. Longevity Industry Mega-Complexity

PART II. Longevity Policy and Governance

PART III: The Longevity Financial Industry

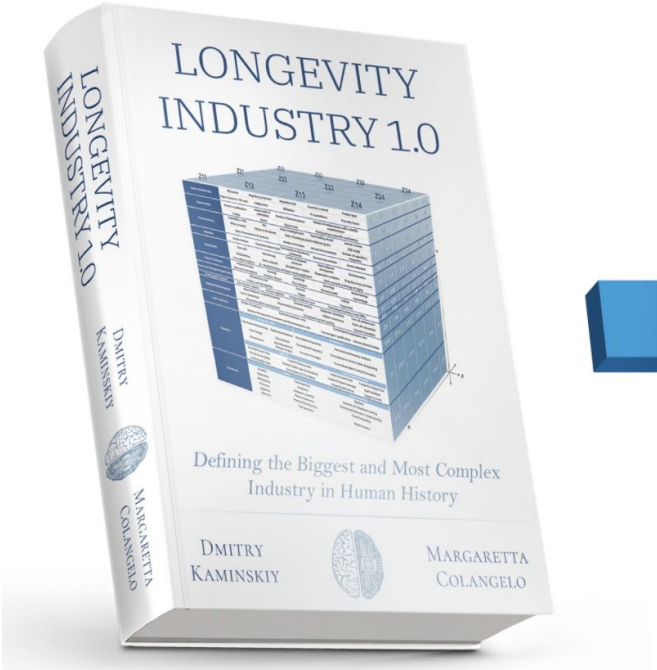
Novel Longevity Derivatives and Health as New Wealth

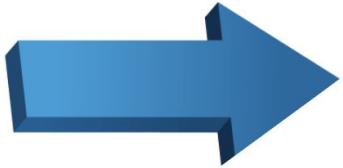
- **The Increasing Role of Longevity in Global Finance**
- Longevity Embraced by the World's Biggest Financial Corporations: Investment Banks, Insurance Companies, Asset Management Firms
- Longevity Derivatives: New Business Models and Novel Financial Instruments Tied to the Rising Longevity Industry
- AgeTech, WealthTech, FinTech
- Why Traditional BioTech Analytics Fails Against the Longevity Industry's Extreme Complexity

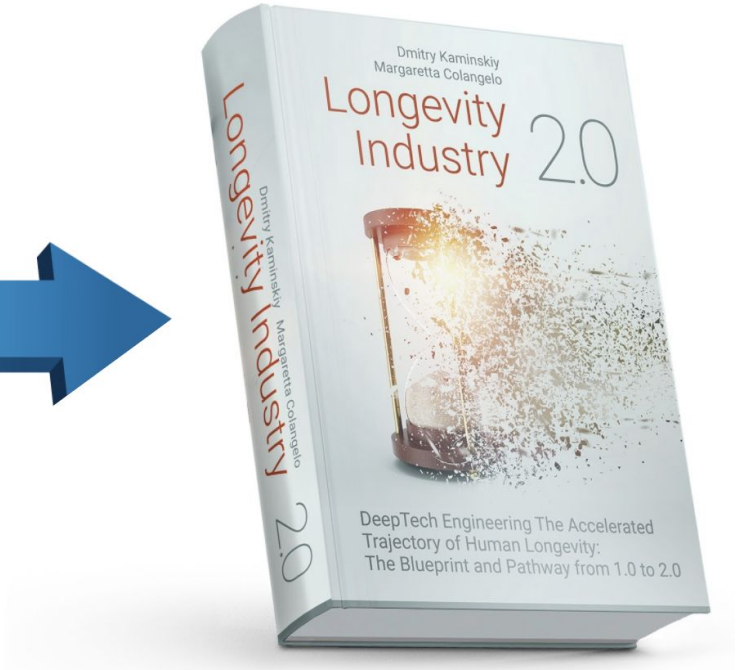
PART IV. Longevity Industry (Science and Biomedicine)

Global Industrialization of Longevity

www.longevity-book.com







Longevity Industry 1.0
Defining the Biggest and Most Complex Industry in Human History

Longevity Industry 2.0
DeepTech Engineering The Accelerated Trajectory of Human Longevity
The Blueprint and Pathway from 1.0 to 2.0

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