



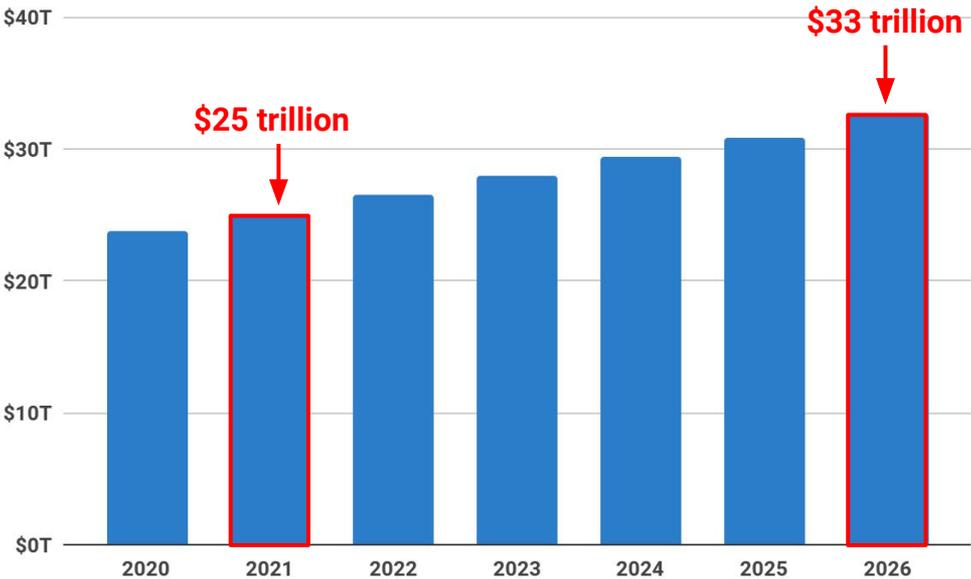
INVESTMENT DIGEST

Teaser

Longevity Industry Q3 2021

THE LONGEVITY ECONOMY ON A GLOBAL SCALE

The Longevity Economy: Scale Projections, Trillion USD



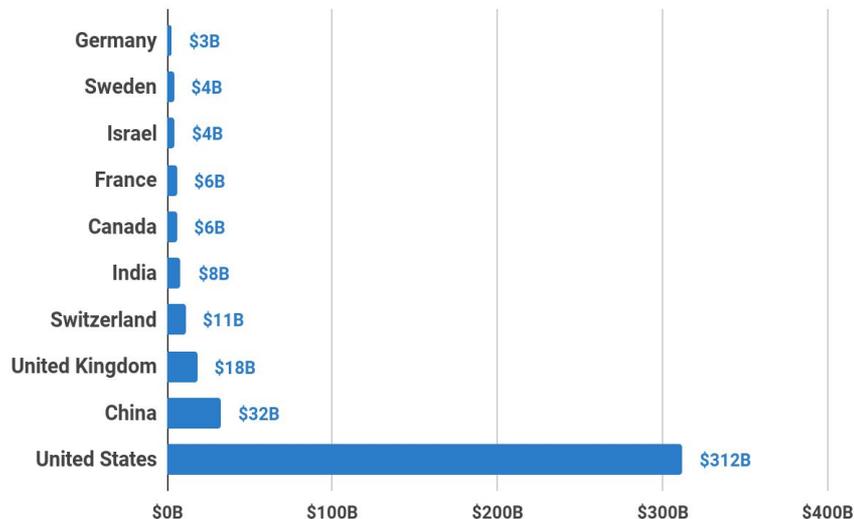
The Longevity Economy's Scale Projections contains global healthcare spending affecting Longevity, the combined capitalisation of publicly listed Longevity companies, the capitalisation of Longevity-related insurance and reinsurance companies, banks and pension funds and privately held Longevity companies.

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.

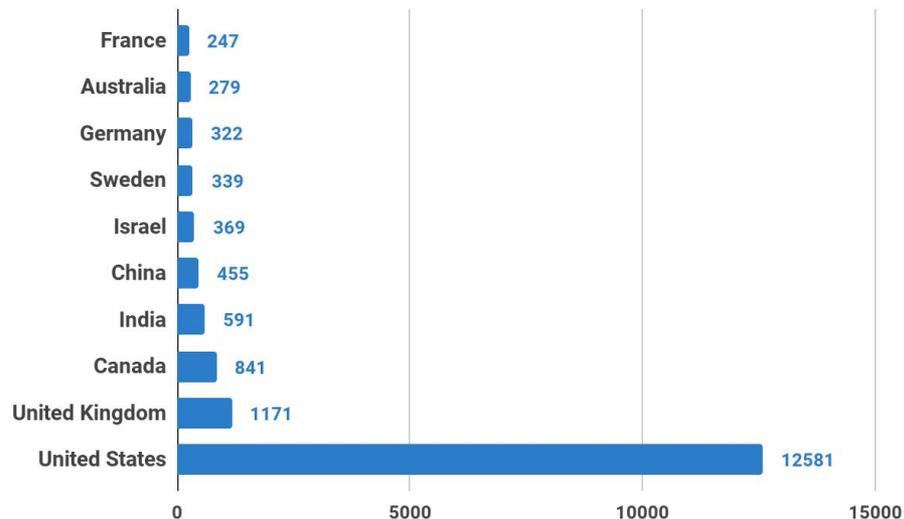
We define the Longevity Industry as a combination of aging, advanced preventive precision biomedicine, AgeTech, relevant parts of national healthcare budgets, and the global financial industry related to such sub-industries.

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.

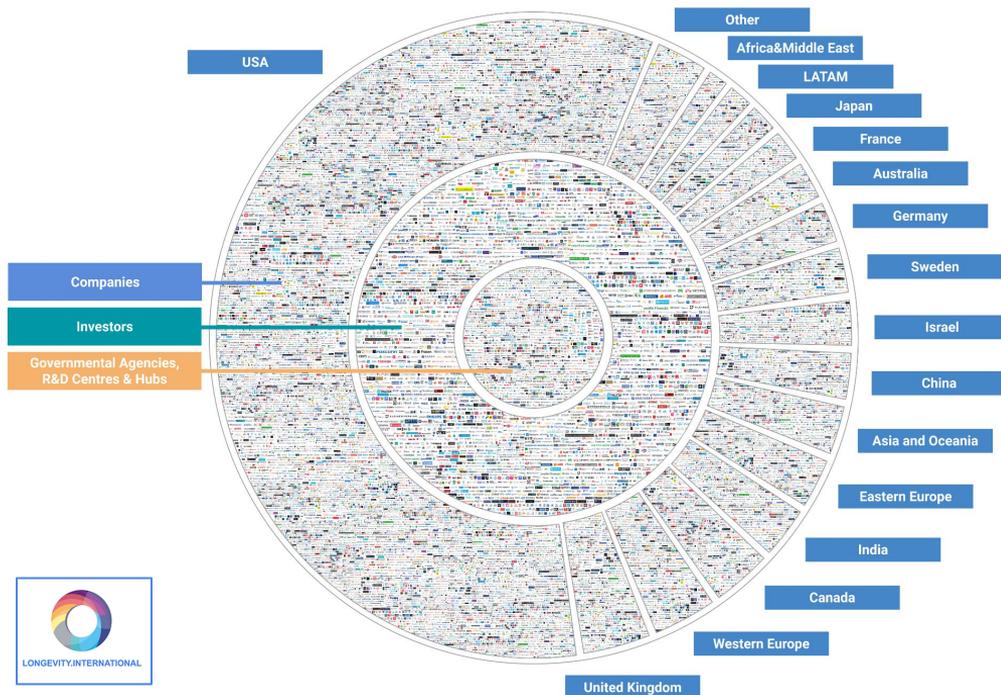
GLOBAL LONGEVITY ECOSYSTEM 2021

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

* – Central and Eastern Europe

LONGEVITY INDUSTRY: MULTI-TRILLION DOLLAR OPPORTUNITY



FINANCIAL
TIMES

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

~ Dmitry Kaminskiy, [interview 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*



LONGEVITY INDUSTRY: MULTI-TRILLION DOLLAR OPPORTUNITY

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

23,000+ companies
(incl. 490 listed companies)

1,000+ R&D hubs

9,000+ investors

1,000+ financial institutions

100+ governments

160 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.

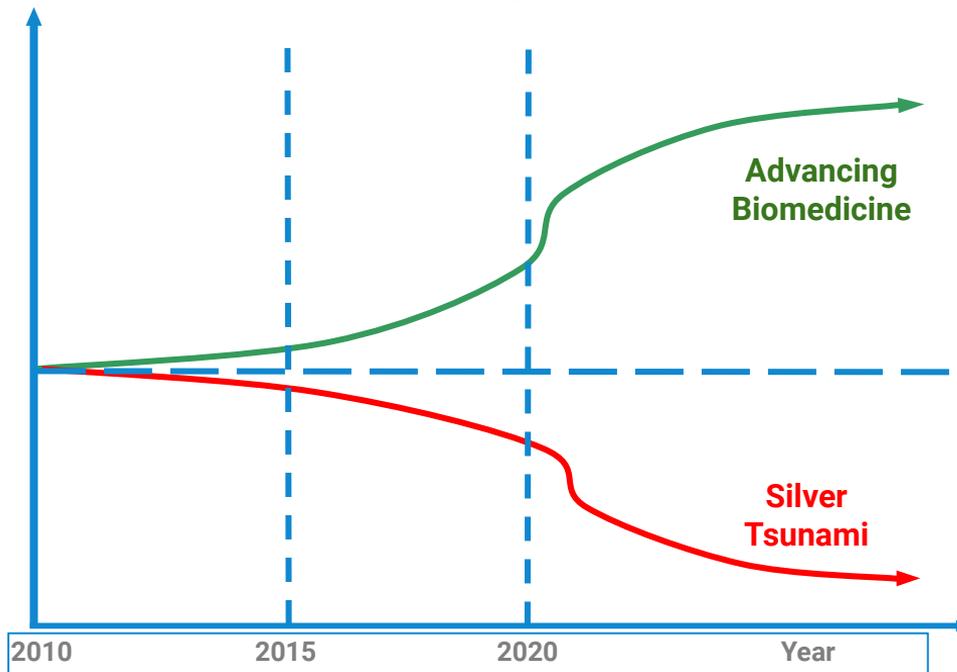
The longevity Financial Industry includes 1,000+ corporations, 15 sectors, and 50 subsectors.

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.

LONGEVITY AND SILVER TSUNAMI - COLLISION OF TWO OPPOSING MEGATRENDS

Two Opposed 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.

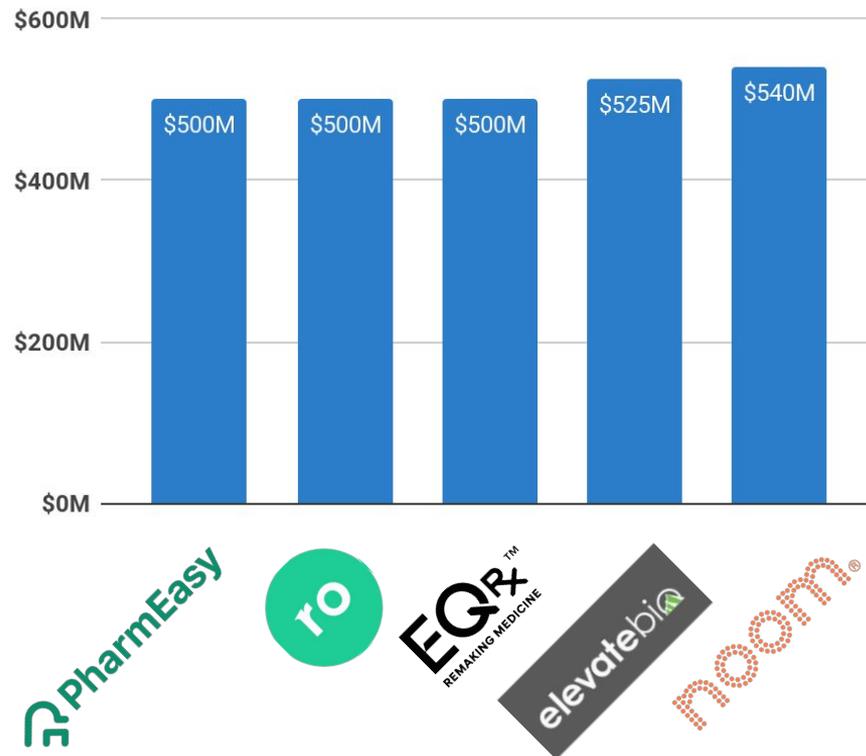
At the same time, the inevitable Silver Tsunami (demographic aging) places a major economic burden not only on the healthcare systems of developing nations, but also on major financial institutions, including pension funds, insurance companies, asset management firms and retail/private wealth banks.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

INVESTMENT LANDSCAPE IN Q3 OF 2021 AT A GLANCE

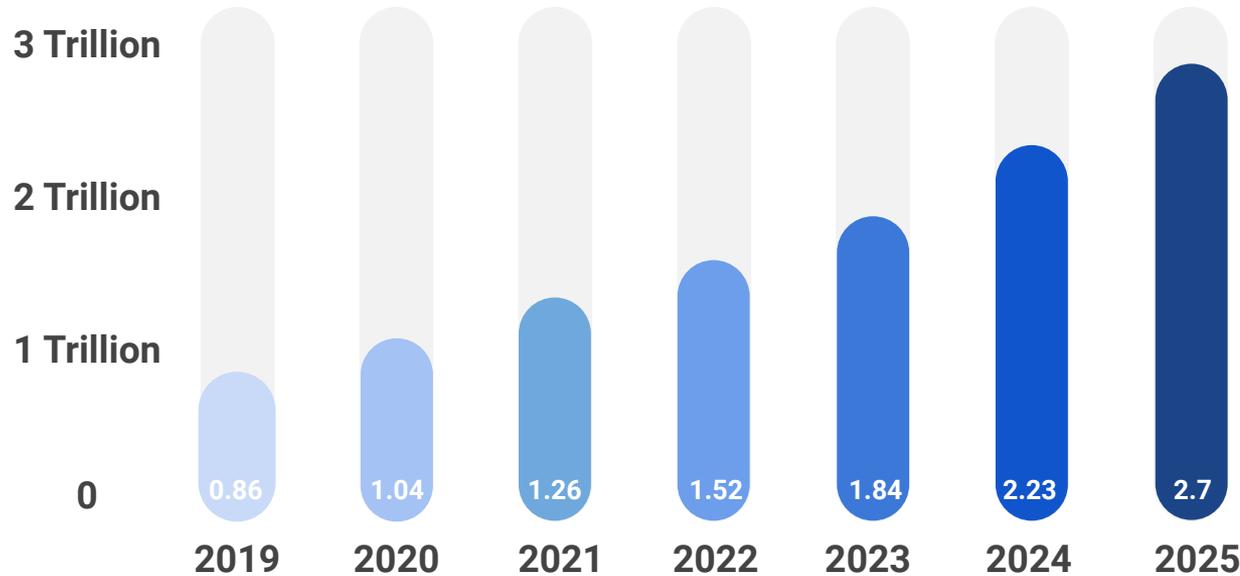
In 2021, the global investments in longevity-focused companies totalled **\$39.54B**. Some of the major deals included:

- **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;
- **ElevateBio**, company focused on cell and gene-based therapies, announced it closed on a massive \$525 million Series C led by Matrix Capital, with participation from new investors SoftBank Vision Fund 2 and Fidelity Management.
- **EQRx Inc.** raised \$500 million at the close of its series B financing. The biotechnology company's series A investors Andreessen Horowitz LLC, Arboretum Ventures LLC, Arch Venture Partners LP, Casdin Capital LLC, GV, Nextech Invest Ltd. and Section 32 participated in the fundraising activity

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

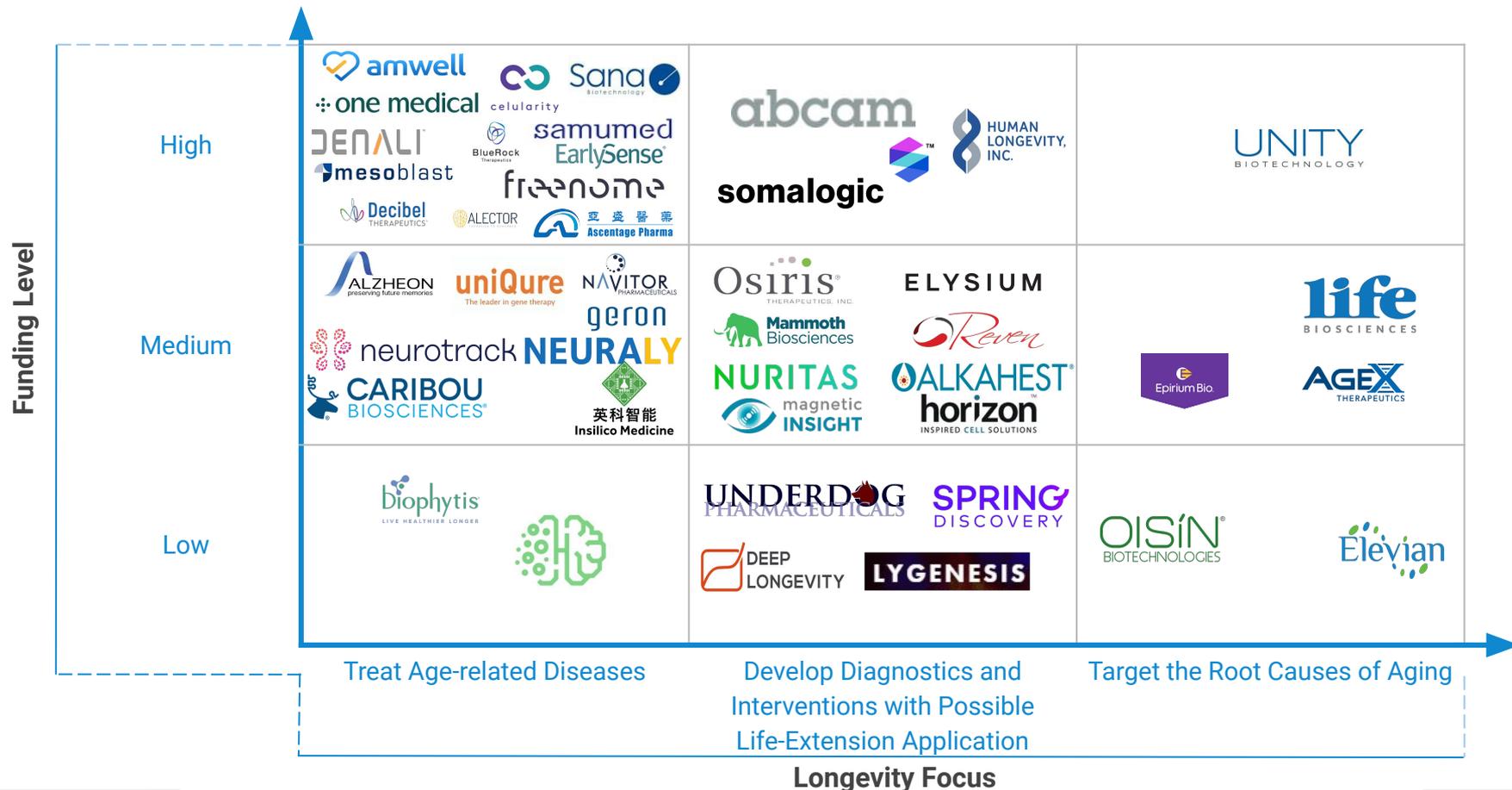
Estimated at \$25 trillion in 2021, the global longevity economy is growing steadily and expected to be worth \$33 trillion by 2026. By the most conservative estimates, it accounts for 20% of the global GDP. While the global Longevity Economy is projected to reach \$33 trillion by 2026, the Age-Tech 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.

TOP 10 LONGEVITY-FOCUSED COMPANIES BY INVESTMENTS IN 2021

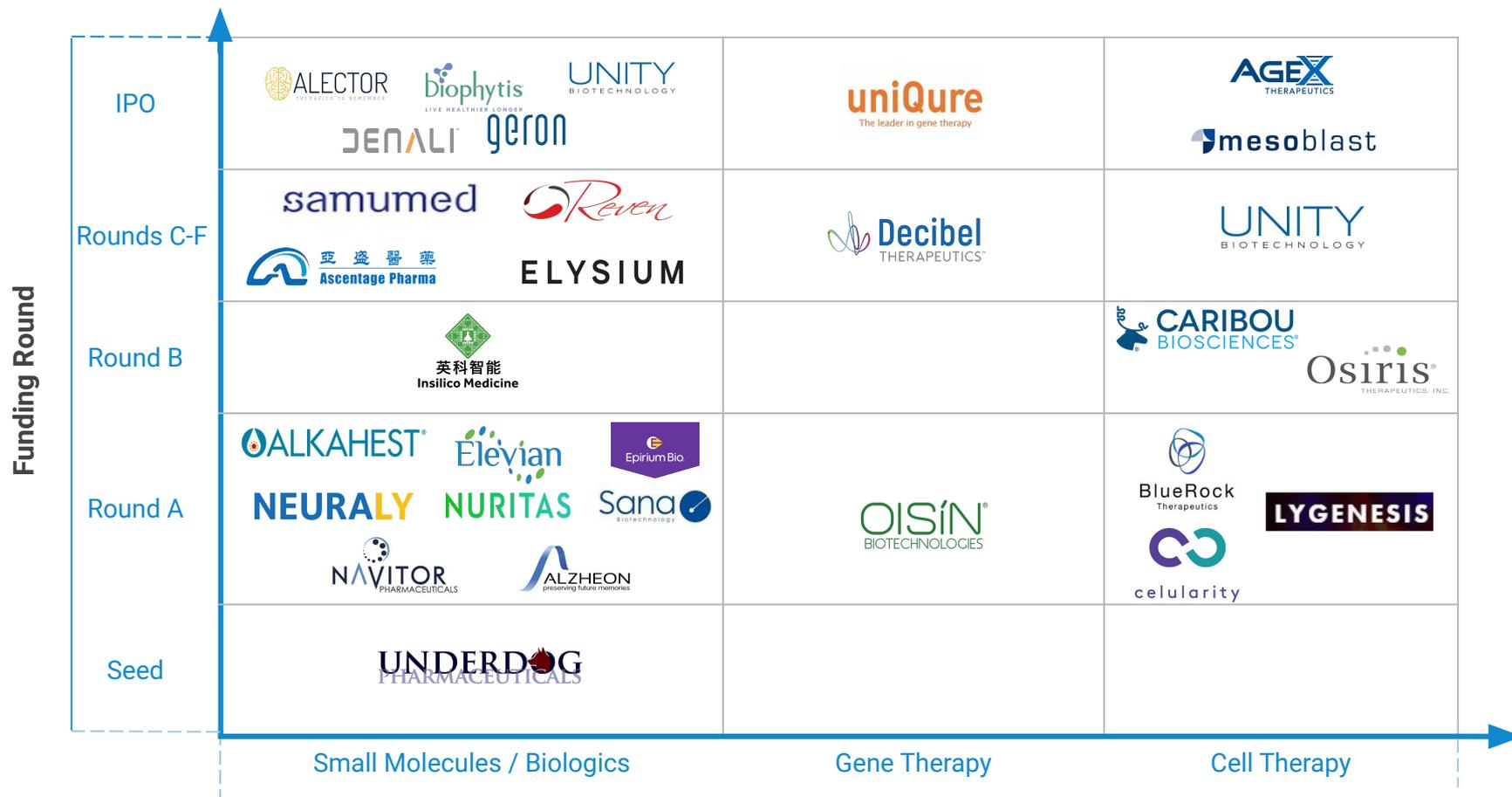


Half-year 2021 demonstrates the lasting trend of boosted growth of the biotech capital market and the development of the longevity sector. Pandemic has stimulated an increase in investments in the longevity industry, where total funding of top 10 Longevity-focused companies exceeds **\$10.78B** as of 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.

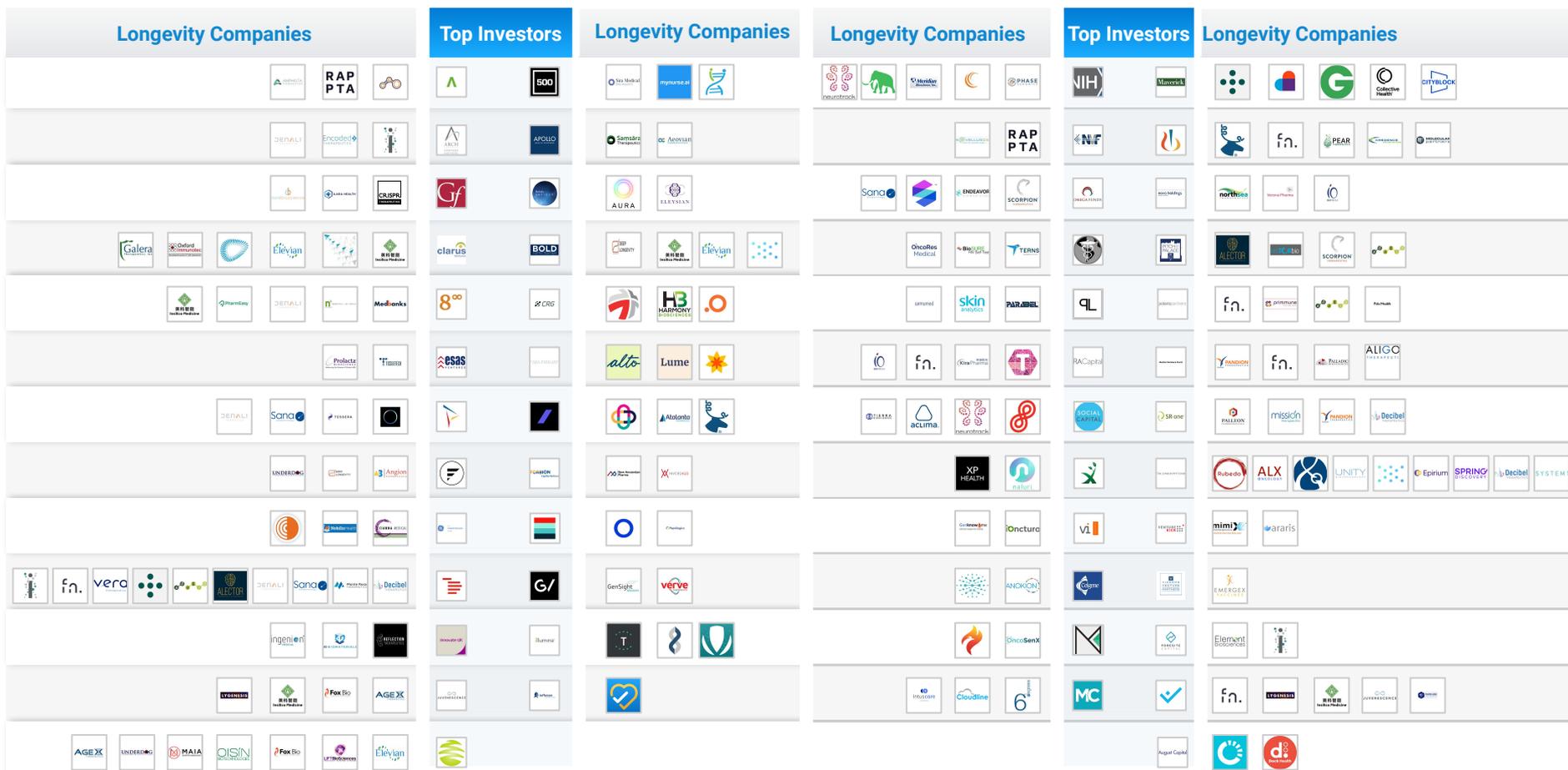
TOP LONGEVITY COMPANIES BY FUNDING LEVEL AND SPECIALIZATION



TOP LONGEVITY COMPANIES BY FUNDING ROUND AND TREATMENT TYPE



50 LEADING INVESTORS IN LONGEVITY SECTOR



LONGEVITY INDUSTRY MARKET TIMELINE

The first approaches

- 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

- 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

- 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

- 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

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

2013-2015

2016-2017

2018

2019

2020-2022

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



Longevity Investment Big Data Analytics Dashboard

Market Intelligence

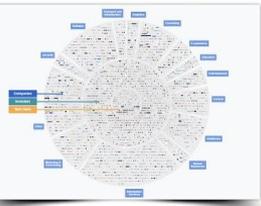
Longevity Investment Market Intelligence

Major Trends

Network Diagrams

Interactive MindMaps

Interactive Mindmaps



View More

Dashboard Parameters

DATA POINTS

814090

PERSONALITIES

16107

COMPANIES

19603

INVESTORS

9007

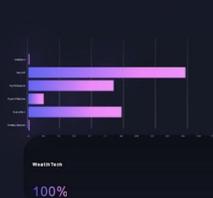
SECTORS

14

SUBSECTORS

140

Dynamic Industry Charts



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Investor Portfolio Search

Investor Competitors Search

Investor Search

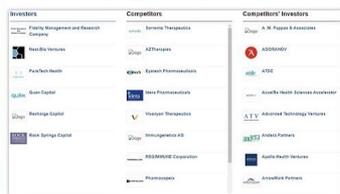
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Find Investors

Find Companies

Competitor Search



Company Competitors

Investor Competitors

Interactive Network Diagrams



View More

Longevity Investment Ecosystem Companies

Company Investor Search

Company Competitors Search

Entrepreneur Search

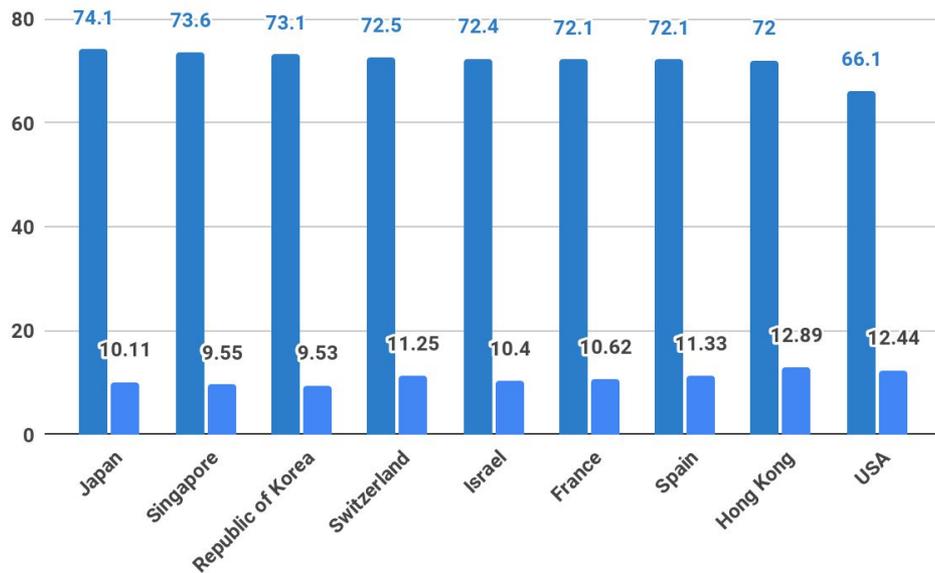
Welcome There!

LONGEVITY GOVERNANCE AND NATIONAL HEALTHCARE BUDGETS

Overview



LONGEVITY GOVERNANCE INDUSTRY: OVERVIEW



HALE, 2019



HALE/Life expectancy difference, 2019

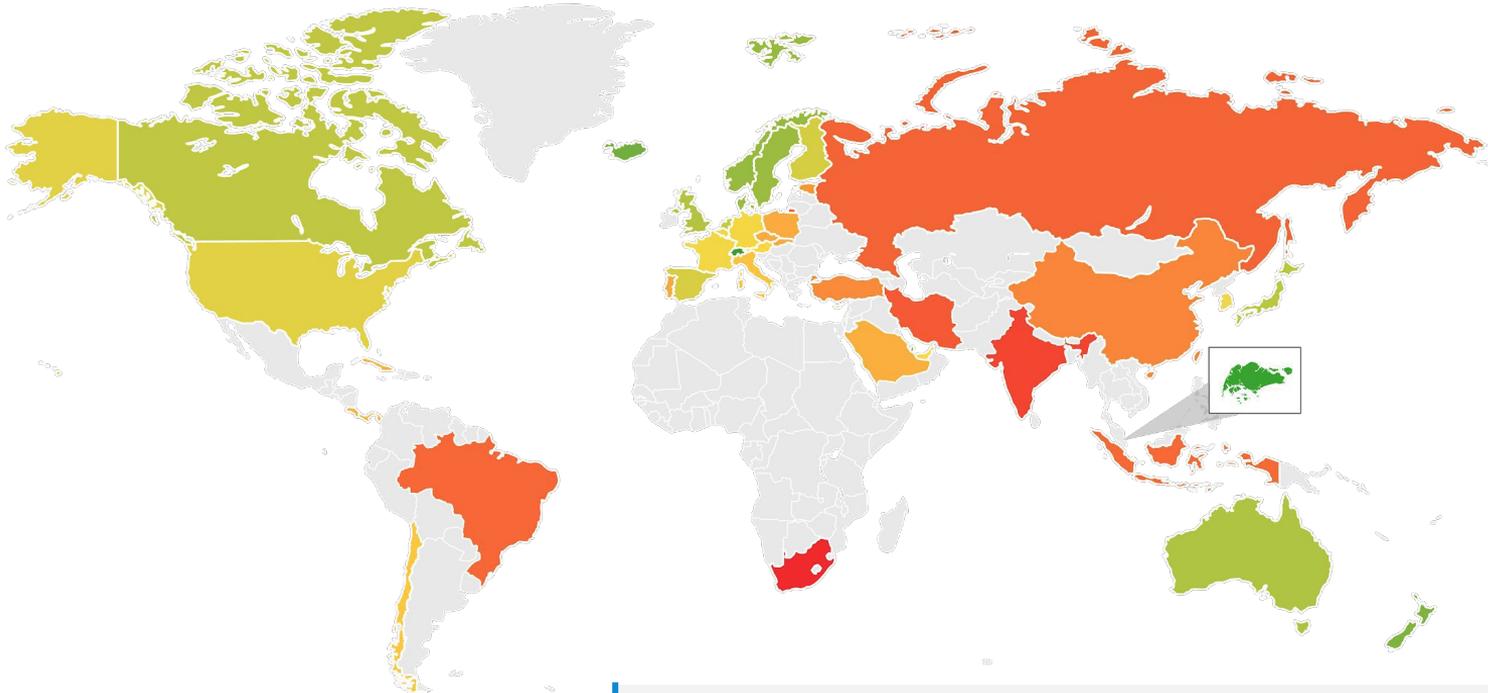
The main goal of the Longevity Governance Industry is to **reduce the gap between life expectancy and HALE** (Health-Adjusted Life Expectancy). Global Longevity Governance is a special analytical study that uses data across 50 countries to measure Healthy Longevity according to HALE. In so doing, it 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.

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		

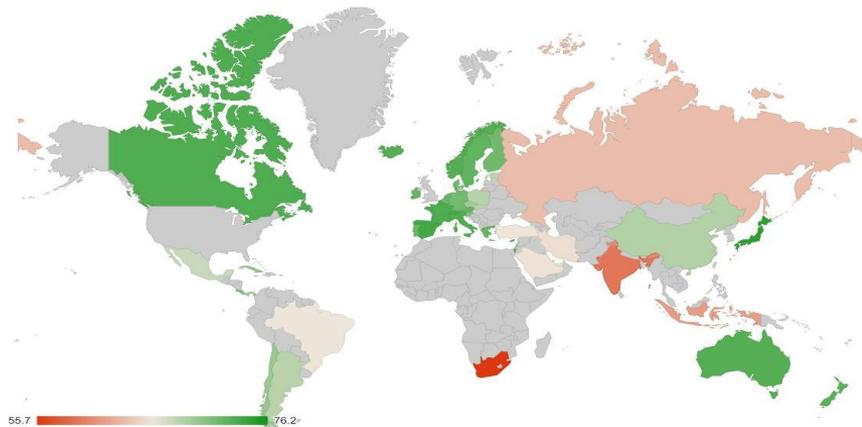
HALE RANKING AND GAP ESTIMATION



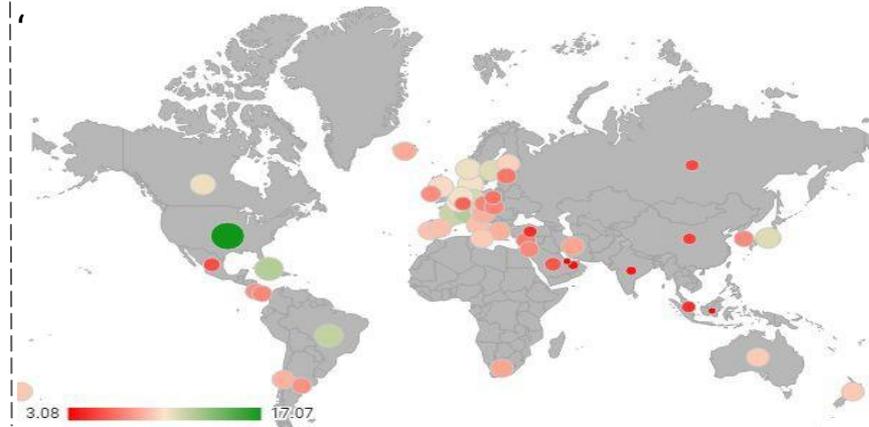
Health-Adjusted Life Expectancy (HALE), used here as a measure of Healthy Longevity, is the average number of years an individual can expect to live free of chronic age-related disease.

HALE AND LIFE EXPECTANCY: FACTORS AFFECTING HALE

Both sexes HALE



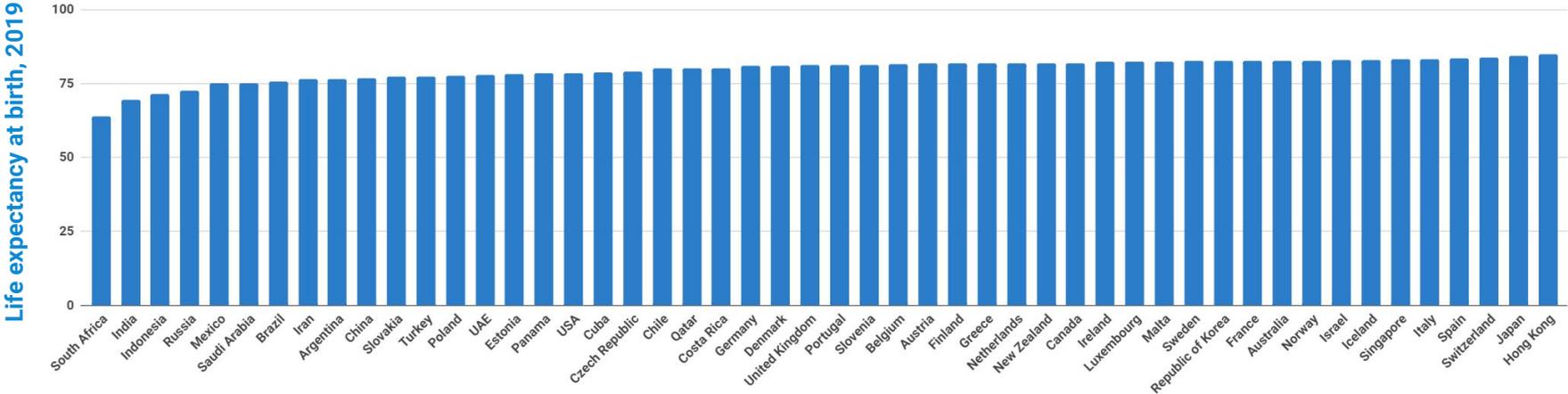
Public health expenditures (as % of GDP)



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.

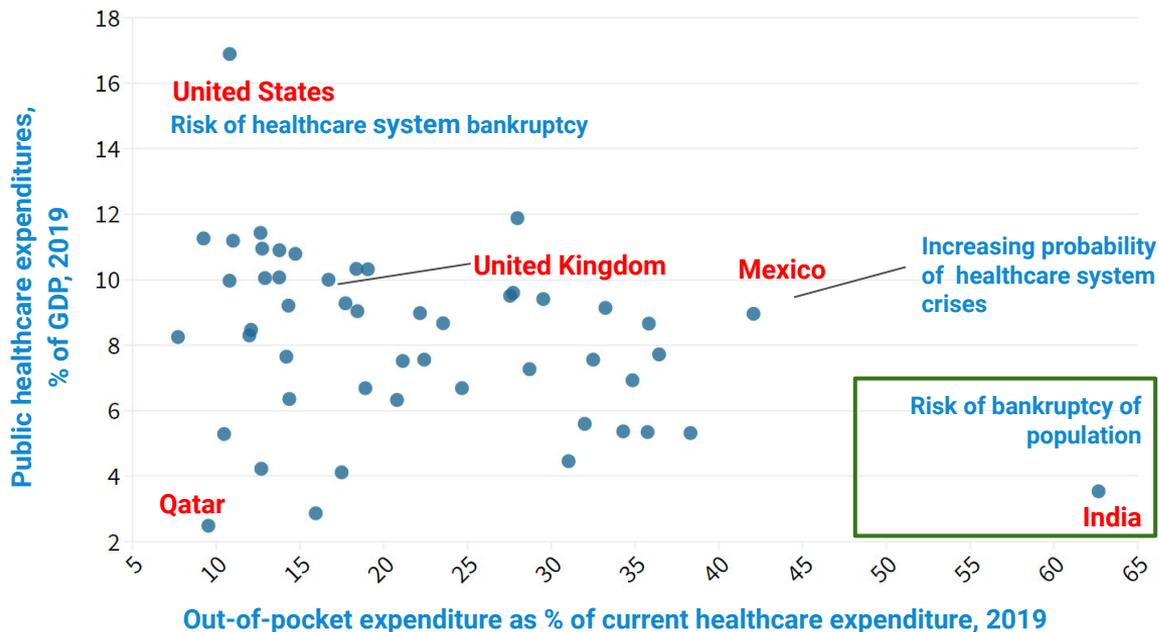
Efficiency of a healthcare system cannot be measured by health expenditure as percentage of GDP. Health expenditure involves consumption of healthcare goods and services, including personal healthcare and collective services. It is a complex indicator that varies across different countries. Healthcare 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.

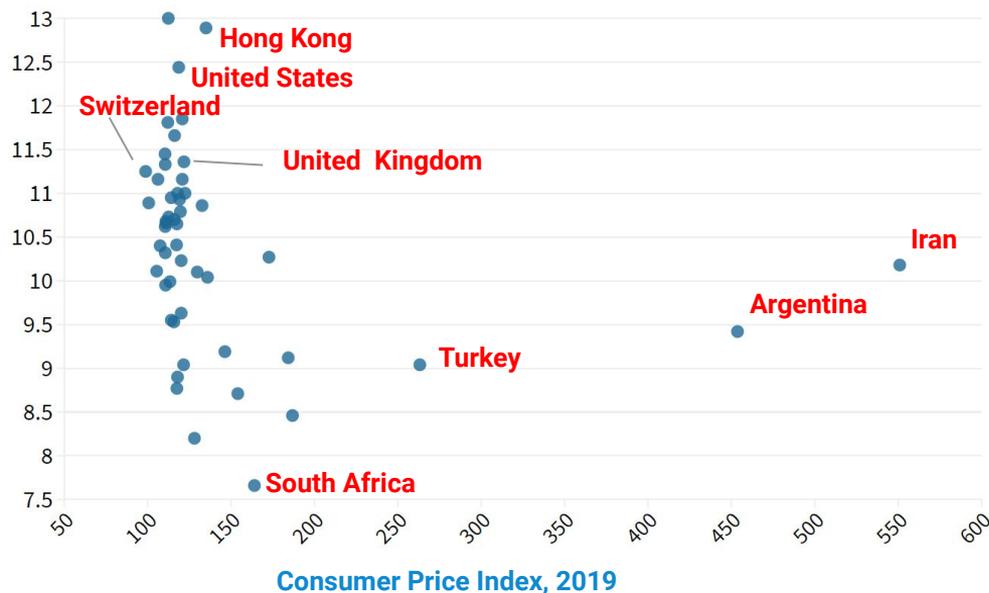
PUBLIC HEALTHCARE AND OUT-OF-POCKET EXPENDITURE



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

Gap between life expectancy at birth and health-adjusted life expectancy in years, 2019

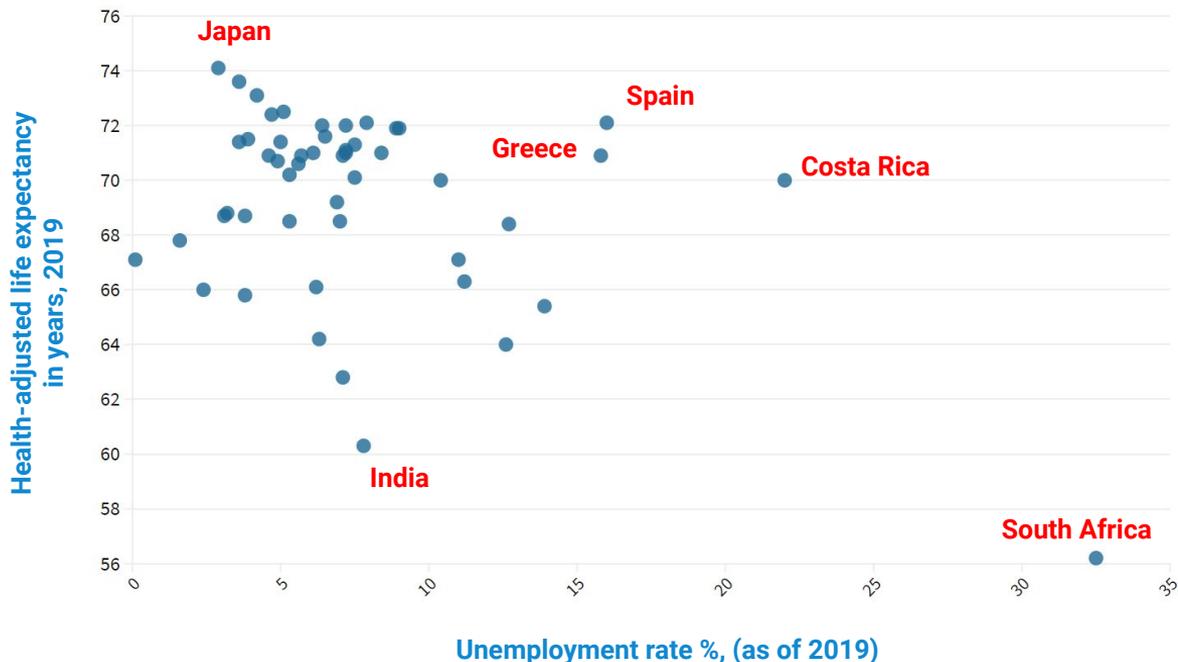


The Consumer Price Index (CPI) is used to measure the average change in prices paid by consumers for goods and services over time. CPI characterises prices' instability and economic instability, whereas inflation indicates recession or systemic crises.

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](#).

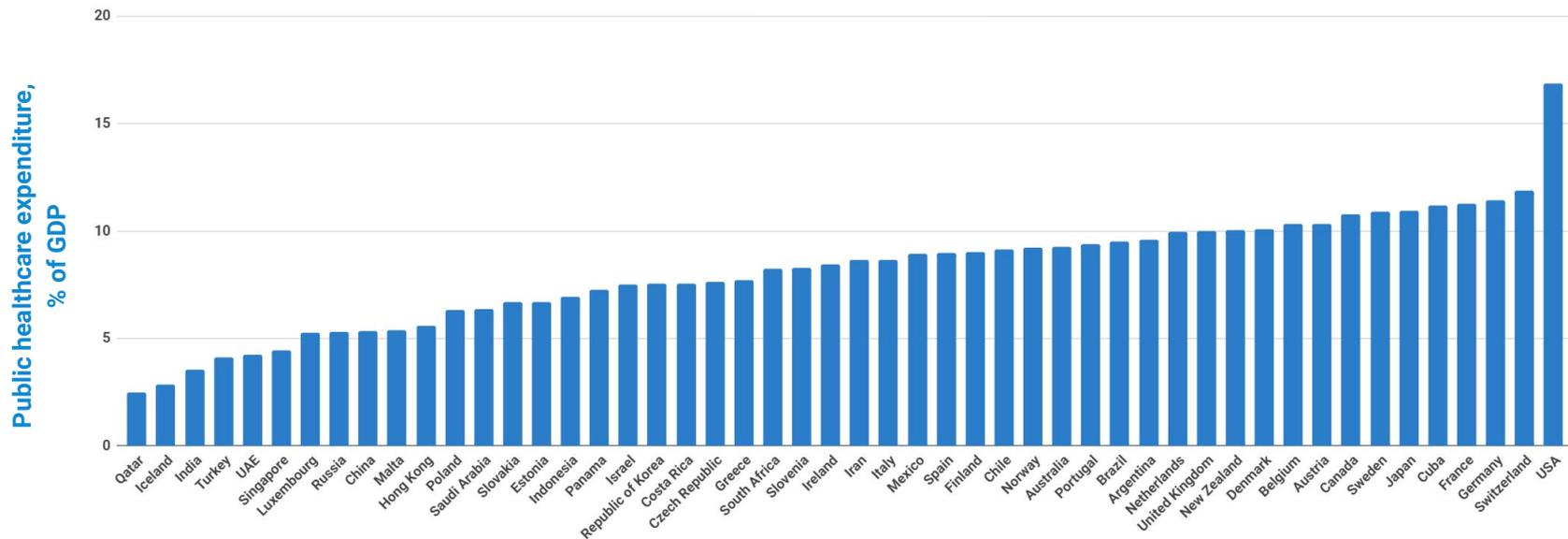
UNEMPLOYMENT AND HEALTHY LONGEVITY



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.

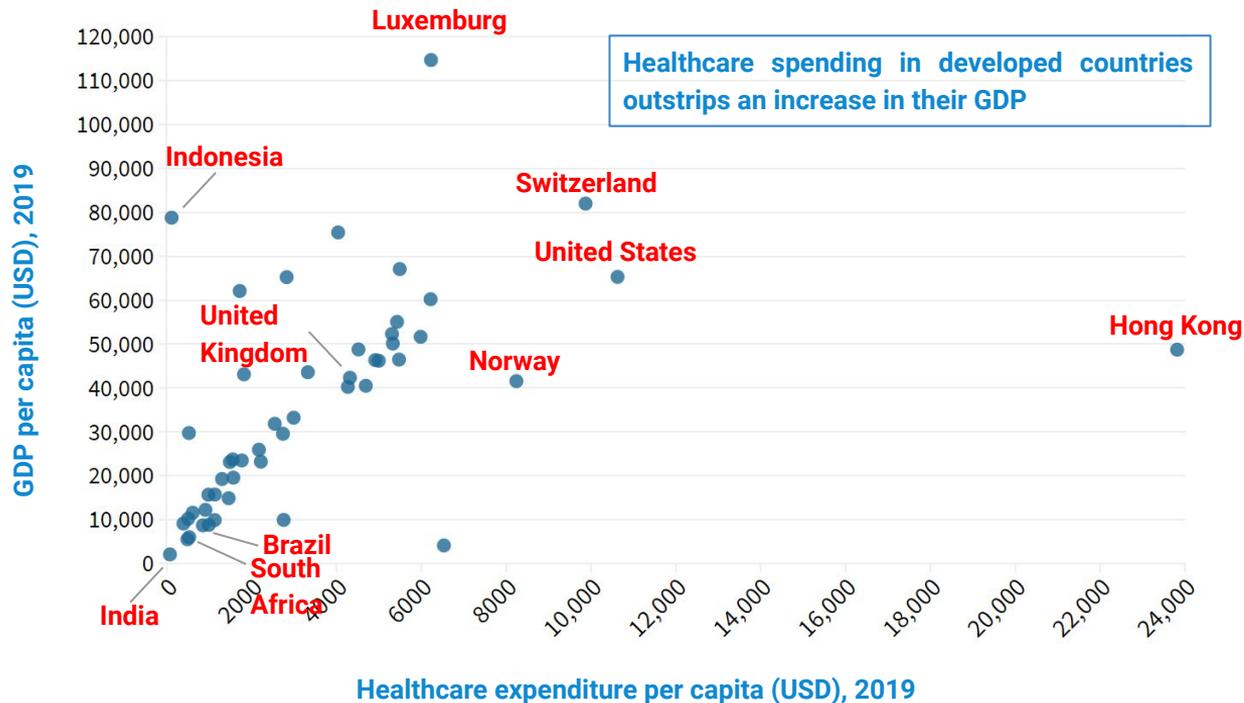
PUBLIC HEALTHCARE EXPENDITURE



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.

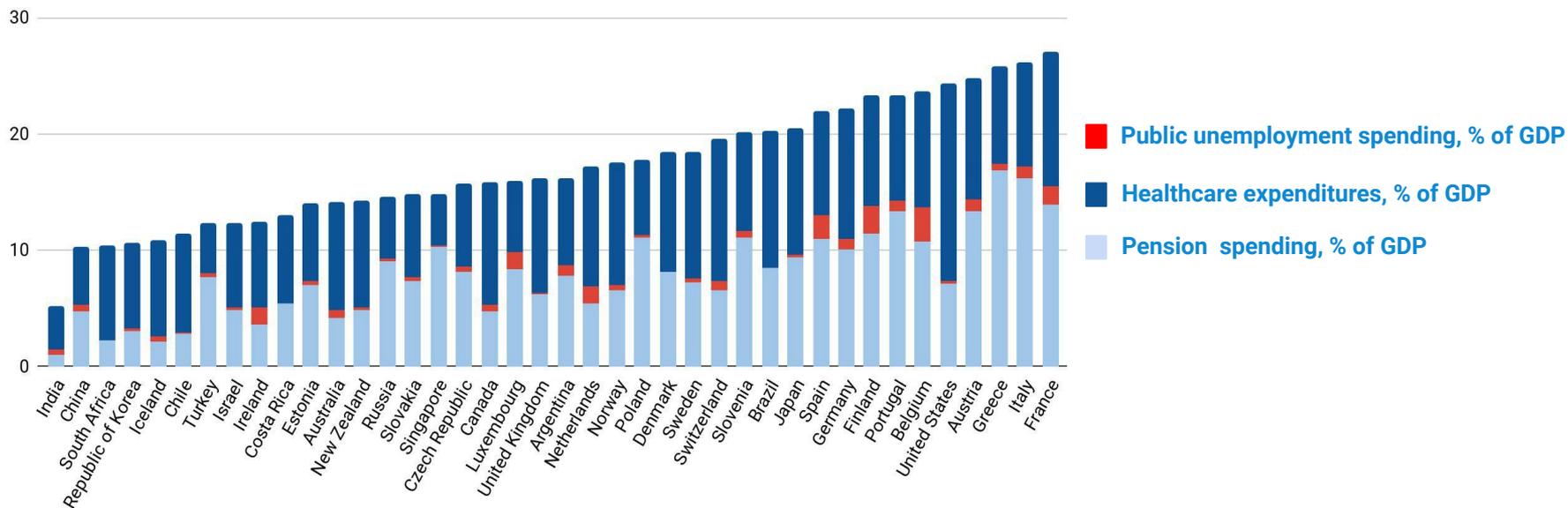
The only exception to this rule is the United States, which spends a disproportionate amount of money on health care. This, in turn, leads to increased financial burden and has very little effect on general public health.

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

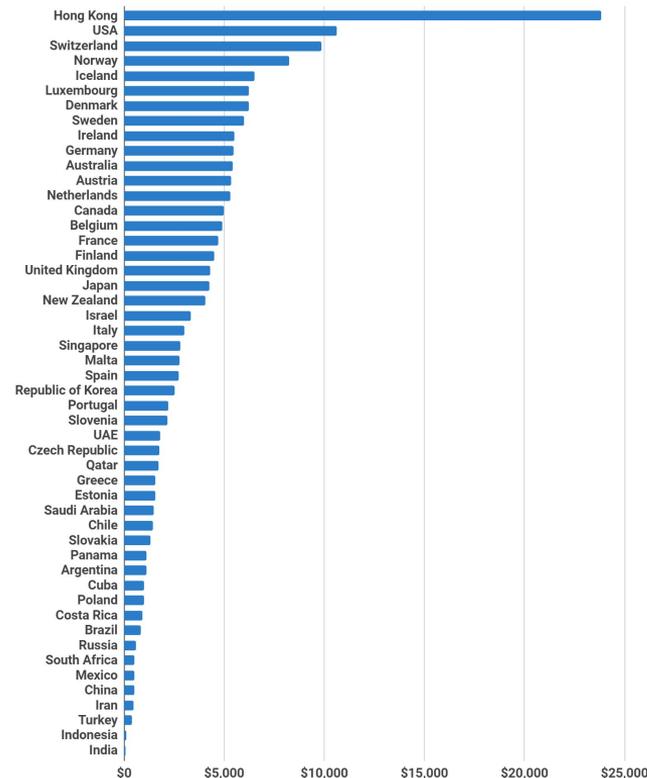
How much a country spends on its healthcare system and how its health expenditure changes over time is impacted by a number of social and economic factors, as well as the structure of a country's healthcare system.

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

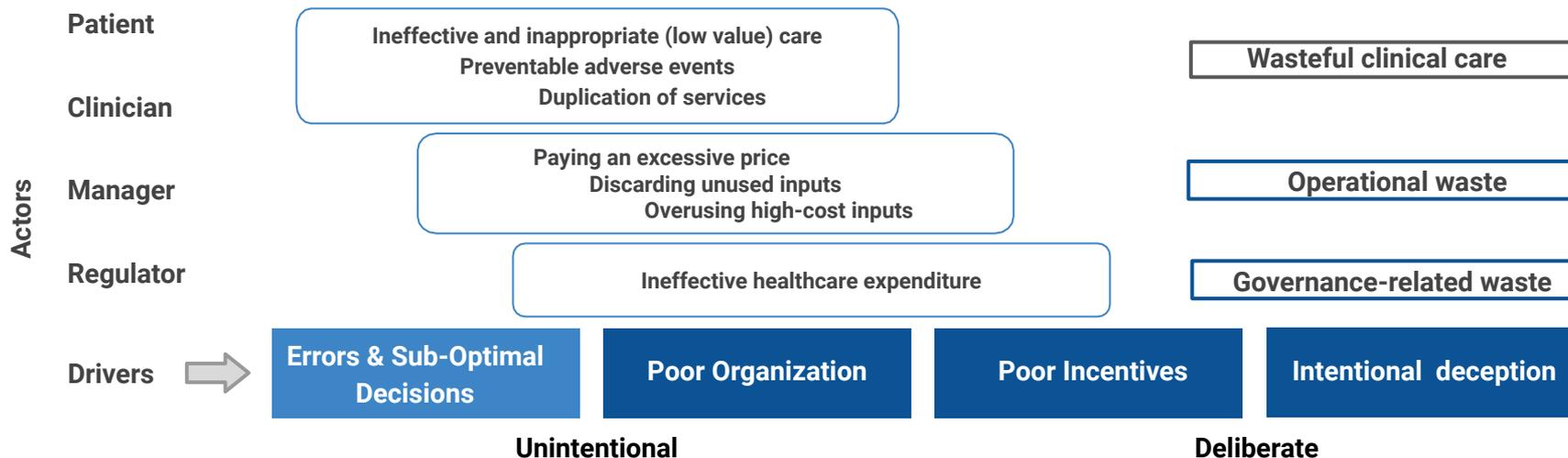


DISPROPORTIONATELY HIGH HEALTH EXPENDITURE

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.

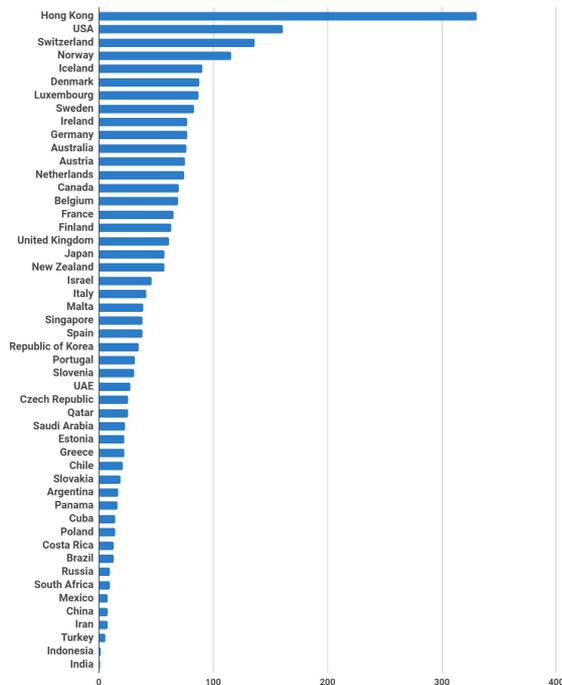
Behavioral root causes of disproportionate health expenditure include:

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



HEALTHCARE SPENDING AND HALE

Healthcare Expenditures per Capita / HALE



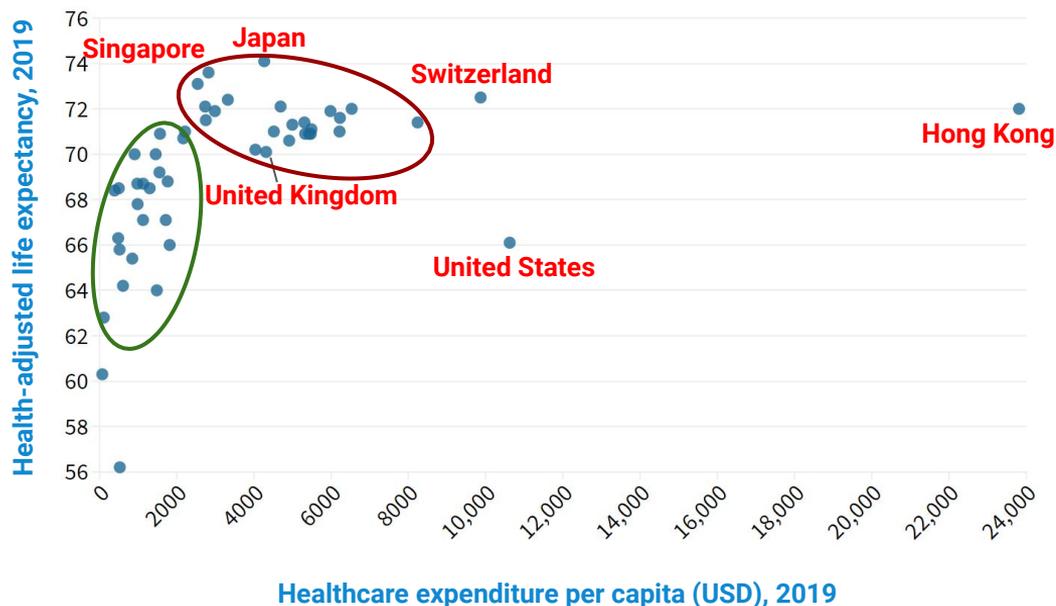
Healthcare spending per capita divided by HALE equals an efficiency ratio, i.e. a country's average health expenditure in one healthy life year.

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).

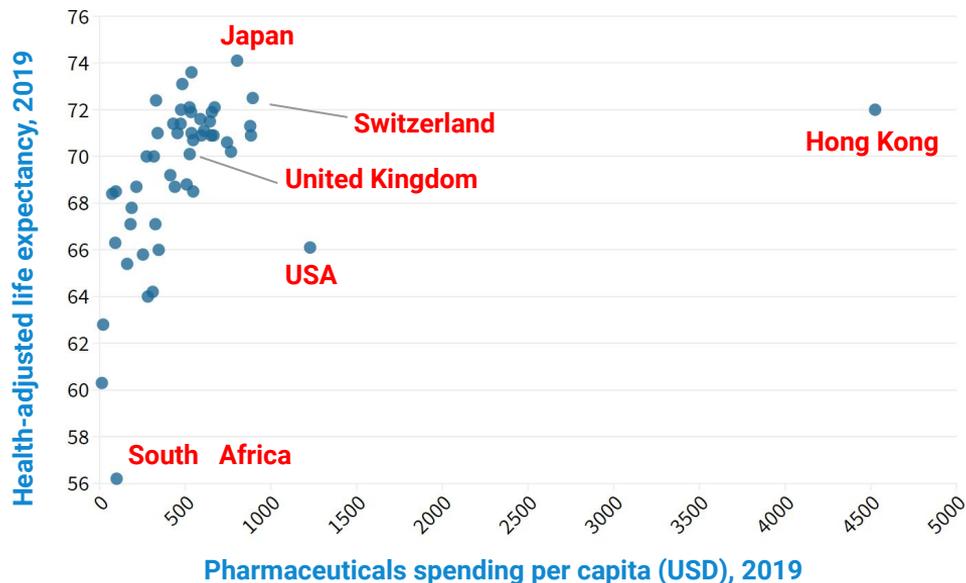
As we can see, there is no linear relationship between life expectancy and health expenditure. What it means is that increased public expenditure on healthcare does not guarantee a healthier and longer life.

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.

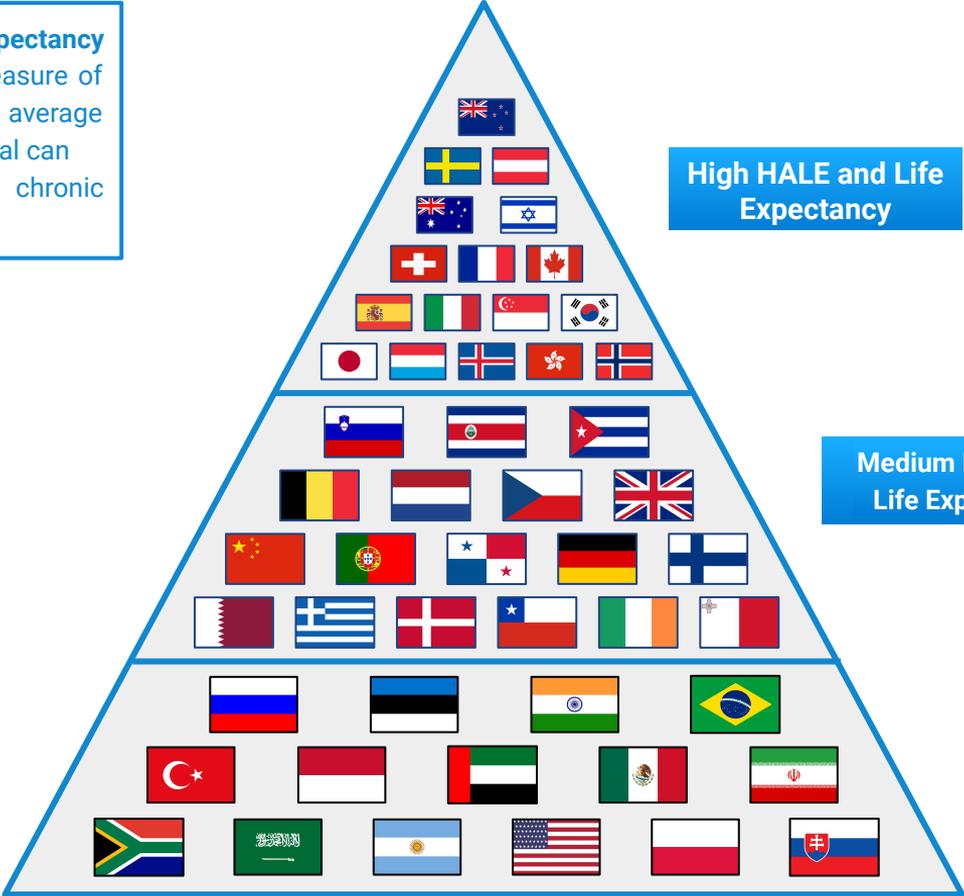
Pharmaceuticals spending is an adjusted indicator as it covers expenditure on prescription medicines and self-medication, often referred to as over-the-counter products.

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.



50 Countries:
 High HALE and Life Expectancy - 17
 Medium HALE and Life Expectancy - 18
 Low HALE and Life Expectancy - 15

BIG DATA ANALYSIS: GROWTH RATES, EFFECTIVENESS RATIOS

Ratios		Growth Rates of Rates (CAGR 6 years)	
Demography		Economy	
Population Growth Rate, %	Total Fertility Rate (per Woman)	GDP (per Capita)	Adjusted Income Inequality (Gini Coefficient)
Crude Death Rate (per 1 000 People)	Crude Birth Rate (per 1 000 People)	Healthcare Expenditure	
Total Age Dependency Ratio (per 1000 of Working-Age Population)	Population Density, Number of People/km2	Current Health Expenditure (per Capita)	Public Health Expenditure (per Capita)
Population over 65 (%)	Age Dependency Ratio	Energy Intensity	
Urban Population (% of Total)	Age Dependency Ratio, Old	Renewable Energy Intensity (per Capita)	Renewable Energy Intensity (per Capita)
Senior Poverty Ratio		Environmental Quality	
Life Expectancy and HALE, CAGR (6 years)		Economic	
Both Sexes Life Expectancy	Male Life Expectancy	Human Development Index Score	
Female Life Expectancy	Both Sexes HALE		
Male HALE	Female HALE		
Both Sexes HALE and Life Expectancy Difference	Male HALE and Life Expectancy Difference		
Female HALE and Life Expectancy Difference	Human Development Index Score		

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.



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.

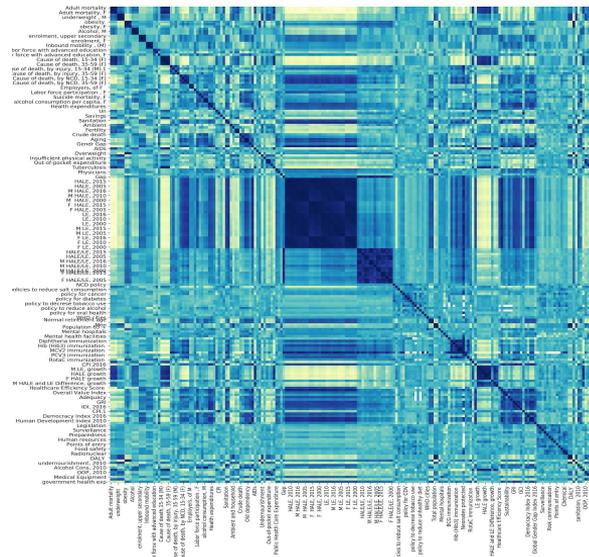
50 Countries

6 Layers and 200 Parameters

Correlations Between Parameters



Cause of death, 15-34 (M)	Improved Water	government health exp	Female HALE growth	Human Development Index 2010	Domestic health expenditure	undernourishm...	DK, 2016	Adequacy	Female LE, 2016	Male HALE growth	Female LE, 2015	
Health Status	Environment and Infrastructure	Healthcare	Healthcare	Human Capital	Healthcare	Life Style	Human Capital	Healthcare	Demography	Healthcare	Demography	
Tuberculosis	HB (HBV) immunization	Female LE, growth	Male LE, 2005	density	Male LE, growth	Public Health Care Expenditure	Health expenditures	Health retirement age	Women	Male LE, 2006	Cause of death, 15-34 (M)	
Health Status	Healthcare	Demography	Demography	PCV3 immunization	Crude birth rate	Overall Value Index	CPI 2016	Points of entry	DOF, 2010	Mental health facilities	Number rate	Female HALE and LE Difference, growth
Cause of death, 15-34 (F)	LE, 2015	Adis	Adis	Healthcare	Demography	Healthcare	Healthcare	Healthcare	Healthcare	Economy	Male HALE 2016	Male HALE 2015
Health Status	Demography	Health Status	Health Status	Education index	EPI	Male HALE, 2005	Survival	Female HALE, 2010	Out-of-pocket expenditure	Male HALE 2016	Male HALE 2015	
Health Status	HALE growth	LE, 2005	Diphtheria immunization	Economy	Male HALE, 2010	Population 65+	Cause of death, by NCD, 15-34 (M)	Female HALE, 2009	HALE 2016	Healthcare	Demography	Health Status
Cause of death, 35-59 (M)	Healthcare	Adult mortality, M	Healthcare	Normal retirement age Men	Health Status	Health Status	Health Status	Health Status	HALE 2016	Healthcare	Demography	Health Status
Health Status	Healthcare	Adult mortality, F	Environment and Infrastructure	Economy	HALE 2006	Ageing	Female HALE, 2011	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Cause of death, 35-59 (F)	Health Status	Health Status	Healthcare	GI	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Health Status	Male LE, 2010	Human Development Index 2016	HAQ (The Healthcare Access and Quality Index) 2016	Human Capital	Female HALE, 2010	Obesity, F	Cause of death, by NCD, 15-34 (F)	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Health Status	Demography	Human Capital	Demographic	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Obesity, M	Demography	Human Capital	Demographic	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Life Style	Health Status	Human Capital	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Adult mortality, F	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
GI	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare
Human Capital	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare	Healthcare



LONGEVITY GOVERNANCE: BIG DATA ANALYTICS DASHBOARD



Longevity Governance Big Data Analytics Dashboard

Market Intelligence

Longevity Governance Market Intelligence

- Full Analysis
- Interactive Mindmaps
- SWOT Analysis
- Dynamic Charts

Full Big Data Analysis

[View More](#)

Dashboard Parameters

DATA POINTS 12000	PARAMETERS 240	REGIONS 50
LAYERS OF FRAMEWORK 6	DYNAMIC CHARTS 100	SWOT ANALYSIS PROFILES 50

SWOT Analysis

[View More](#)

Longevity Governance Market Intelligence

- Pre-Subscribe for Beta
- COVID-19 Dashboard
- 3D Visualization

Search Engine

Longevity Governance Search Engine

- Benchmarking Charts
- Major Trends
- Practical Recommendations
- Big Data Framework

National Healthy Longevity Interactive MindMaps

[View More](#)

Longevity Progressiveness 3D Visualization

Longevity Progressiveness Benchmarking Charts

[View More](#)

Longevity Governance Search Engine

- Health-Adjusted Life Expectancy (HALE) Gap and Life Expectancy
- Health-Adjusted Life Expectancy (HALE) Benchmarking

LONGEVITY-FOCUSED FINANCIAL INSTITUTIONS

Overview



TOP 300 FINANCIAL INSTITUTIONS ADVANCING THE LONGEVITY INDUSTRY

105 Asset Management Firms



75 Banks



55 Insurance Companies



20 Reinsurance Companies

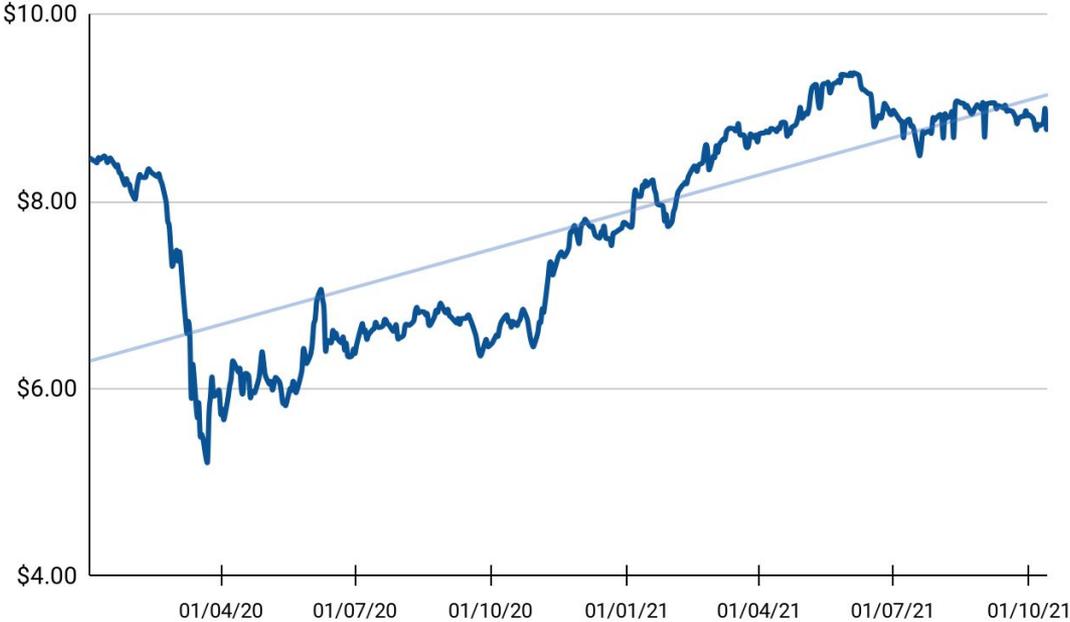


45 Pension Funds



FINANCIAL INSTITUTIONS ADVANCING THE LONGEVITY INDUSTRY

Cumulative Capitalization Dynamics in 2020-2021 in Trillions

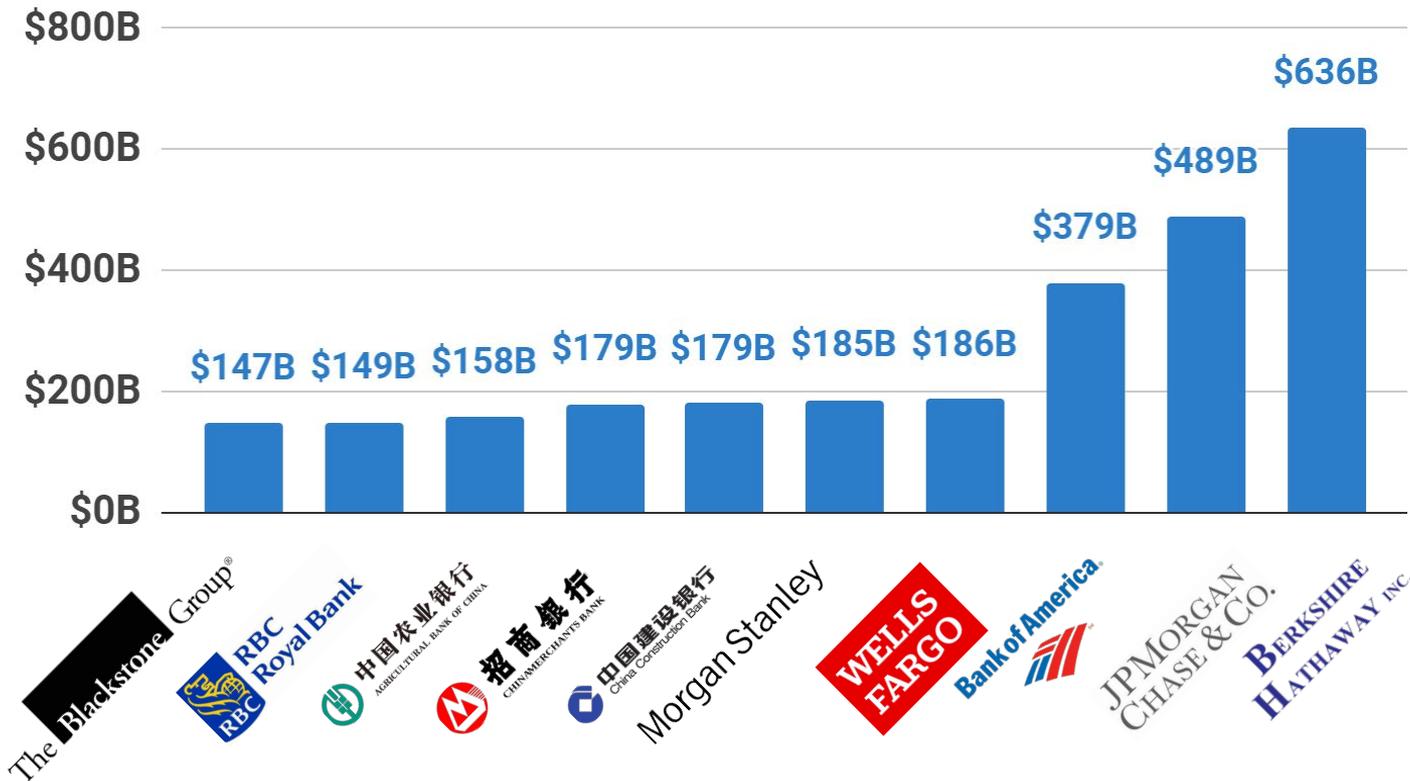


Since Q1 2020 market downturn, 194 financial institutions have fully recovered by year-end and continued to grow in 2021.

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)



LONGEVITY-FOCUSED FINANCIAL INSTITUTIONS: MARKET INDICES

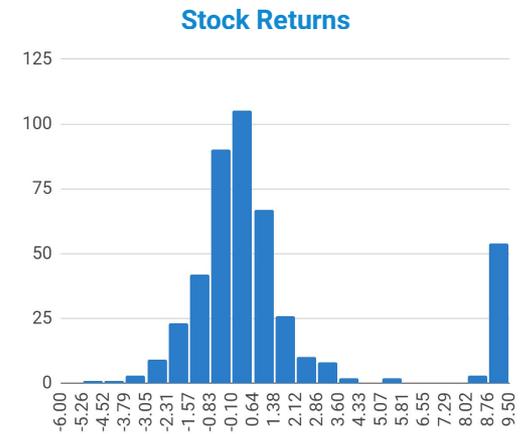
Our Financial Institutions Index includes 179 longevity-focused corporations operating in the financial sector.

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 - Q3 2021	Average daily volatility in Q3 2020 - Q3 2021	Skewness	Kurtosis
Financial Institutions Index		0.114	1.21	0.29	2.78
S&P 500	0.44	0.118	0.95	-0.69	1.11
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



LONGEVITY FINANCE BIG DATA ANALYTICS DASHBOARD



Longevity Finance Big Data Analytics Dashboard

Market
Intelligence

Longevity Finance
Market Intelligence

SWOT Analysis

Interactive Mindmaps

Market Intelligence

Interactive Mindmaps



View More

Dashboard Parameters

COMPANY
TYPES

5

COMPANIES

300

COUNTRIES

30

ASSETS
UNDER
MANAGEMENT

15

DATA POINTS

115001

SECTORS

50

Financial Institutions Digest



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Sponsorship Opportunities

Request Custom Analytics

Search
Engine

Longevity Finance
Search Engine

Interactive Database

Dynamic Network Diagrams

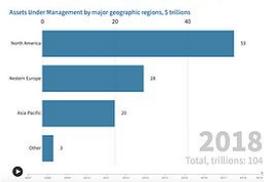
Competitor Search

Interactive Database



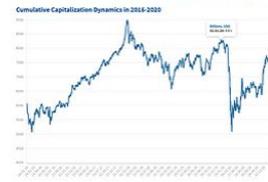
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Interactive Charts



View More

Public Financial Institutions



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Longevity Finance
Search Engine

Personalities

Corporations

Startups

Investors

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

PUBLICLY TRADED LONGEVITY-FOCUSED COMPANIES

Overview



TOP 20 PUBLICLY TRADED LONGEVITY-FOCUSED COMPANIES

NASDAQ



US-Based



Turning Point Therapeutics (TPTX)
Market Cap: \$3,363M



Fate Therapeutics (FATE)
Market Cap: \$5,692M



Arena Pharmaceuticals (ARNA)
Market Cap: \$3,661M



Gossamer Bio (GOSS)
Market Cap: \$1,065M



One Medical (ONEM)
Market Cap: \$4,239M



Tandem Diabetes Care (TNDM)
Market Cap: \$8,220M



Vertex Pharmaceuticals (VRTX)
Market Cap: \$47,273M



SAGE Therapeutics (SAGE)
Market Cap: \$2,597M



Outset Medical (OM)
Market Cap: \$2,257M



Kronos Bio (KRON)
Market Cap: \$926.5M



China-Based



BeiGene (BGNE)
Market Cap: \$33,566M



UK-Based



Abcam (ABCM)
Market Cap: \$4,910M



Freeline Therapeutics (FRLN)
Market Cap: \$114M



Orchard Therapeutics (ORTX)
Market Cap: \$260M



Autolus (AUTL)
Market Cap: \$438M

Euronext Brussel (BR)



Switzerland-Based



Biocartis (BCART)
Market Cap: \$254M



Sweden-Based



Getinge (GETI-B)
Market Cap: \$10,760M

Hong Kong (HKD)



Hong Kong-Based



Endurance RP(ex-Regent Pacific Group)
Market Cap: \$51M

Acquired



Deep Longevity
Acquired by \$4M

NYSE



US-Based



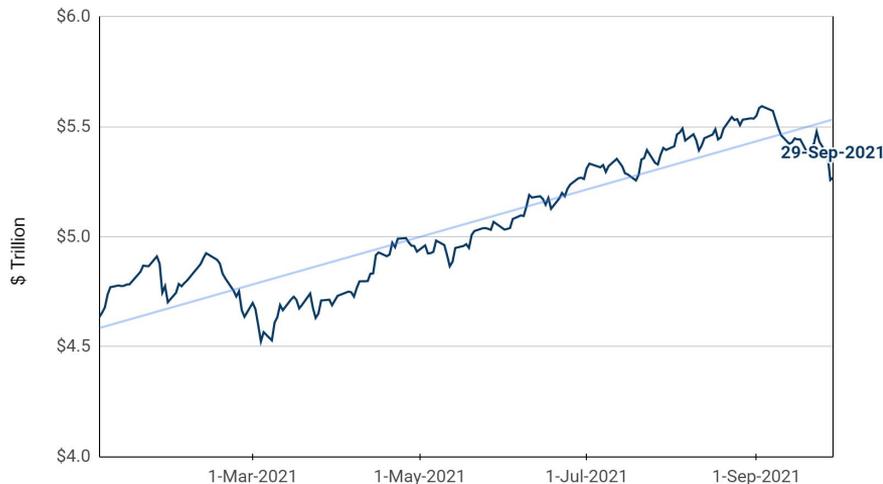
Amwell (AMWL)
Market Cap: \$2 030M



Asensus Surgical(ex-TransEnte rix) (ASXC)
Market Cap: \$553M

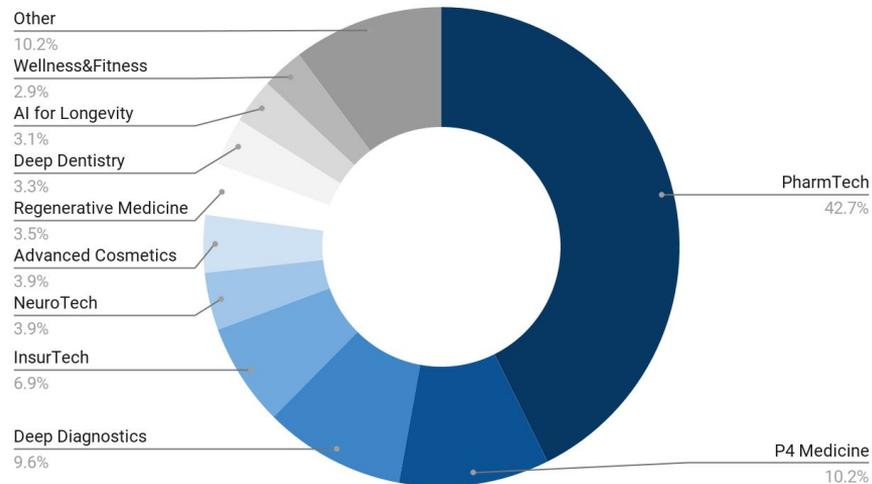
LONGEVITY PUBLICLY TRADED COMPANIES

Cumulative Capitalization Dynamics, Q1-Q3 2021



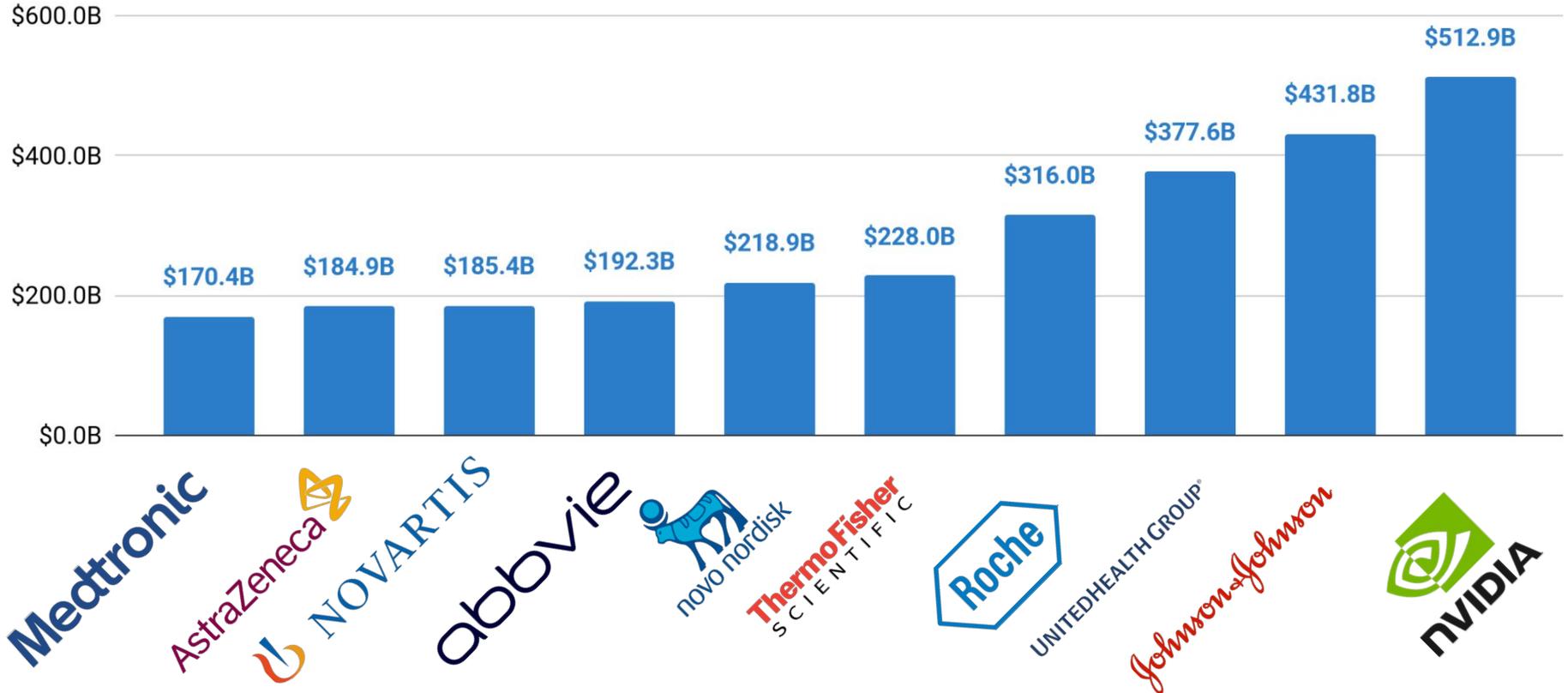
The Longevity Industry has been actively growing over the last few years and is projected to evolve in the same trend. As of end Q3 2021, the market capitalization of **490 publicly traded companies** was **5.26 trillion USD**. Technologically, publicly-traded longevity-focused companies are similar to other companies in the sector what means that their market capitalization growth can approximate the dynamics of the whole industry.

Distribution of Public Companies by Longevity Sectors



Among 490 Longevity-focused public companies, **PharmTech**, **P4 Medicine** and **Deep Diagnostics** are the most represented sectors by number of companies. As society's focus is shifting towards keeping older people healthy and active for longer, life sciences and tech-enabled solutions are key areas that are likely to attract even more investments in the near future.

TOP 10 PUBLIC LONGEVITY-FOCUSED CORPORATIONS BY MARKET CAPITALIZATION AS OF OCTOBER, 2021



LONGEVITY IPOS IN 2021

Overview

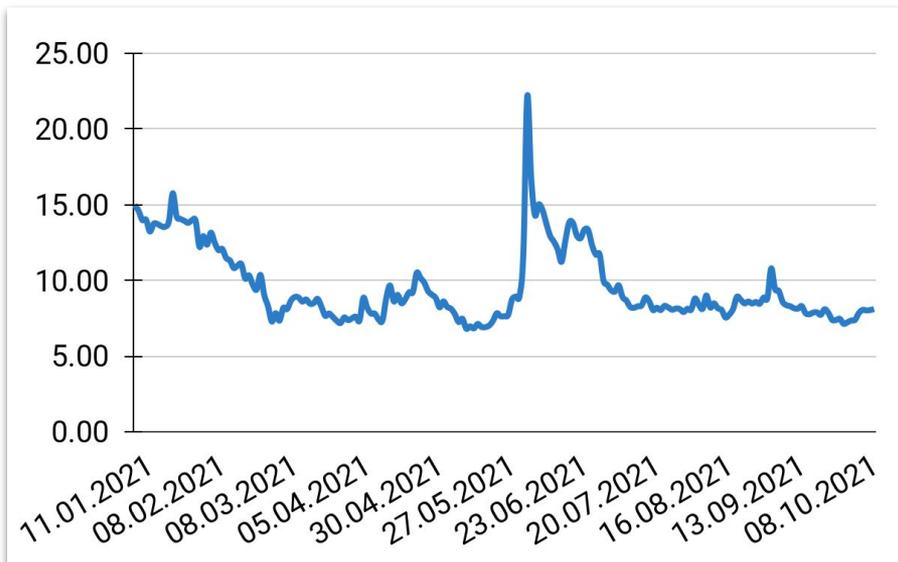


LONGEVITY IPOS IN 2021

In 2021, **15 Longevity companies** successfully closed their IPOs and raised **\$6.16B**. The largest companies by market capitalization are **Affirm Holdings, Sana Biotechnology, Clover Health, Oscar Health and Recursion Pharmaceuticals**.

Technologically speaking, publicly-traded longevity-focused companies are similar to their private peers who have reached Series B or C funding rounds, which means that their market capitalization growth can approximate the dynamics of the whole industry.

Name	Stock Exchange	Longevity Sector	Country	Total Funding Amount, M\$	Money Raised at IPO (M\$)	IPO Date	Current Capitalization (B\$)	Net income (\$M)
Affirm	NASDAQ	FinTech	USA	1,520.0	1200.0	13.01.2021	43.1	-430.92
Sana Biotechnology	NASDAQ	P4 Medicine	USA	700.0	587.5	04.02.2021	3.77	-326.56
Oscar Health	NYSE	InsurTech	USA	1,632.5	1400.0	03.03.2021	3.53	-429.44
Clover Health	NASDAQ	InsurTech	USA	1,325.0	1200.0	08.01.2021	3.21	-479.66
Recursion Pharmaceuticals	NASDAQ	AI in Pharma	USA	465.4	436.4	16.04.2021	2.99	-123.76
ATAI Life Sciences	NASDAQ	Mental Health	Germany	347.1	225.0	17.06.2021	2.36	-217.56
Hims & Hers	NYSE	Advanced Cosmetics	USA	233.2	280.0	20.01.2021	1.54	-71.66
Century Therapeutics	NASDAQ	Pharma	USA	410.0	211.0	18.06.2021	1.09	-70.22
Celularity	NASDAQ	P4 Medicine	USA	370.0	372.0	19.07.2021	0.85	-188.43
Decibel Therapeutics	NASDAQ	Deep Diagnostics	USA	189.2	127.1	11.02.2021	0.182	7.08
HCW Biologics	NASDAQ	P4 Medicine	USA	39.3	56.0	19.07.2021	0.088	-7.91
Biophytis	EPA	Geroscience	France	23.1	20.1	15.02.2021	0.078	-23.46
Longeveron	NASDAQ	Geroscience	USA	9.0	26.6	11.02.2021	0.064	-10.41
G Medical Innovations	NASDAQ	Clinical Data Management	USA	30.8	15.0	24.06.2021	0.028	-12.33M
Cloud DX Inc	CVE	Clinical Data Management	USA	20.9	4.9	15.04.2021	0.014	-8.09



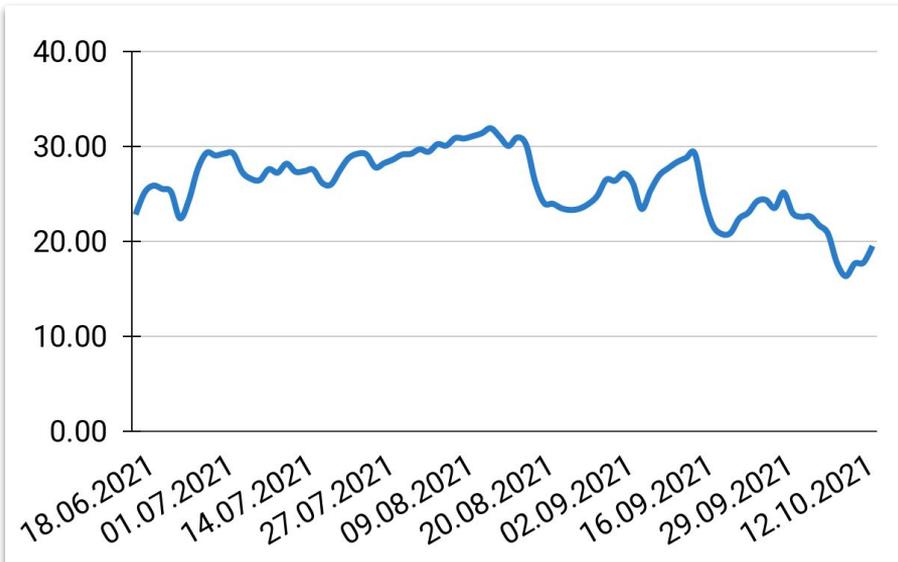
The significant spike resulted from Clover Health attracting a lot of attention from single investors, especially on the internet.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B\$)
CLOVW	-0.32%	7.8%	-45.79%	3.47

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 14.10.2021.



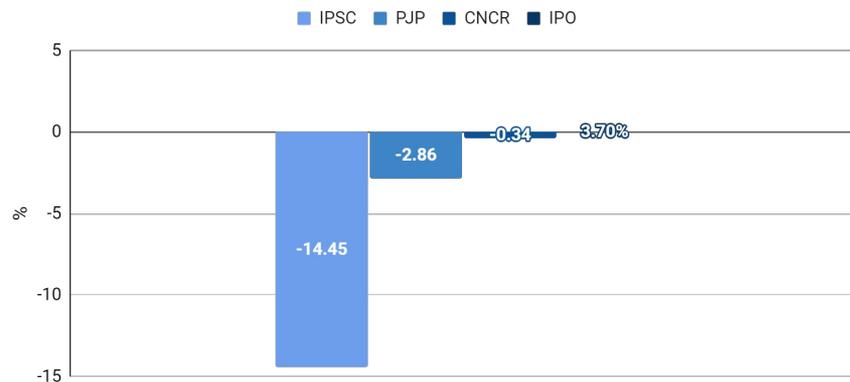


Century Therapeutics stock price declined after IPO with the consecutive increase that resulted in a 25% after-IPO growth at the ATH, but fall short afterwards.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B\$)
IPSC	-0.19%	5.58%	-14.45%	1.06

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 18.06.2021 and 14.10.2021.



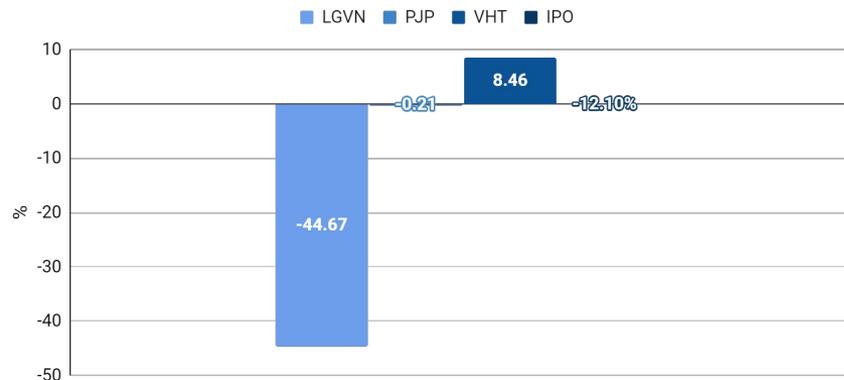


Almost 18% price increase on March 11 coincides with Longeveron's Lomecel-B™ FDA approval and the announcement of CRADA with the University of Miami on March 10.

Ticker	Mean Daily Return	Volatility of Daily Returns	Growth After IPO	Capitalization (B\$)
LGVN	-0.35%	5.32%	-44.67%	0.078

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 14.10.2021.



LONGEVITY IPO CANDIDATES

As of October 2021, over 400 longevity companies have reached late-stage financing and are expected to tap IPO markets as the next steps. Below are some examples of longevity companies who have either announced their IPO plans or viewed by market as potential IPO candidates.



Total Funding Amount: \$1.6B

Online pharmacy **PharmEasy** has closed a funding round worth nearly \$350 million ahead of filing its draft red herring prospectus (DRHP) before an Initial Public Offering (IPO)

TEMPUS

Total Funding Amount: \$1.1B

Tempus uses artificial intelligence to provide physicians with clinical data that can be used to create customized treatments for patients. Pending company release of detailed IPO plans



Total Funding Amount: \$946.7M

Pharmaceutical online retailer **Miaoshou Doctor** is considering an IPO, which could happen by the end of 2021 in Hong Kong that could fetch at least \$500M.



Total Funding Amount: \$905M

Better.com decided to take their company public earlier in 2021. Better will hit the public markets by merging with Aurora Acquisition Corp in a SPAC deal that values it at \$7.7B.



Total Funding Amount: \$876.1M

Direct-to-consumer health startup **Ro** is reportedly in talks to go public through a merger with a blank-check company. Reuters reported that the deal could value Ro at more than \$4B.



Total Funding Amount: \$845M

ElevateBio is a biotechnology company, established to create and operate a broad portfolio of cell and gene therapy companies through partnerships with leading academic researchers.



Total Funding Amount: \$2B

Devoted Health, a health insurance startup that focuses on Medicare Advantage plans, has raised up to \$1.2B in new funding at around an \$11.5B valuation



Total Funding Amount: \$1.6B

XtalPi, AI drug discovery company intends to use part of the proceeds from the latest funding round for its expansion plans. A potential listing could take place as early as in the coming quarters.

INSILICO MEDICINE INVESTMENT CASE

Overview



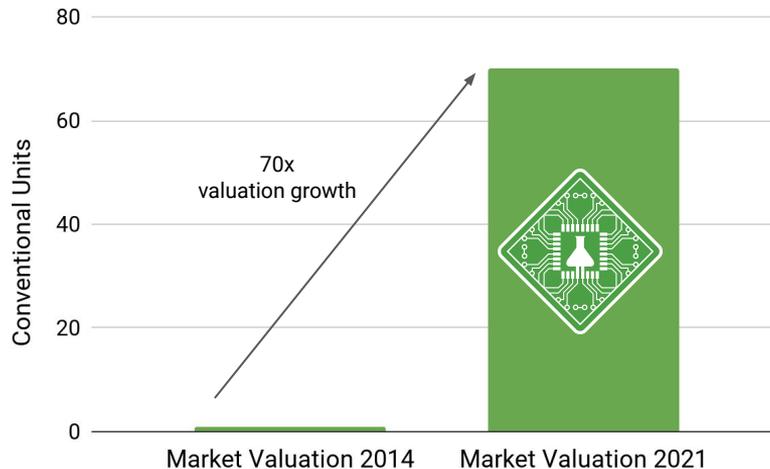
INSILICO MEDICINE VALUATION GROWTH SINCE DEEP KNOWLEDGE GROUP'S INVESTMENT

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

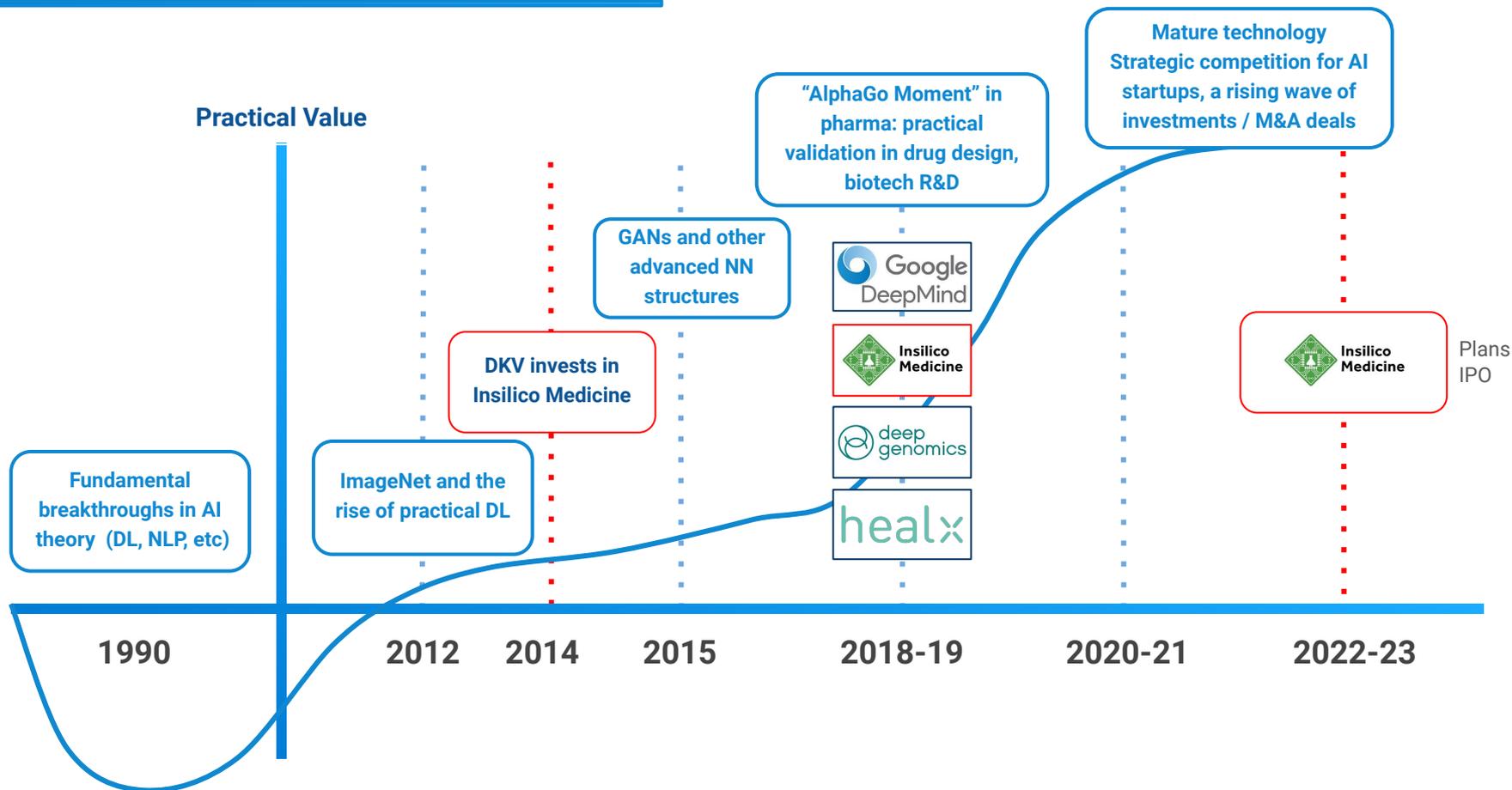


英科智能
Insilico Medicine

Deep Knowledge Group was first to invest in Insilico Medicine

2014 Seed and Convertible Notes	2018 Round A	2019 Round B	2021 Round C	2022-2023 IPO
 <p>DEEP KNOWLEDGE VENTURES</p> <p>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.</p>	<p>\$13M</p>    	<p>\$37M</p>            	<p>\$255M</p>           	<p>IPO planned for 2022</p>

AI-DRIVEN BIOTECHS CHANGE PHARMA R&D PARADIGM: LEADERS OF CHANGE

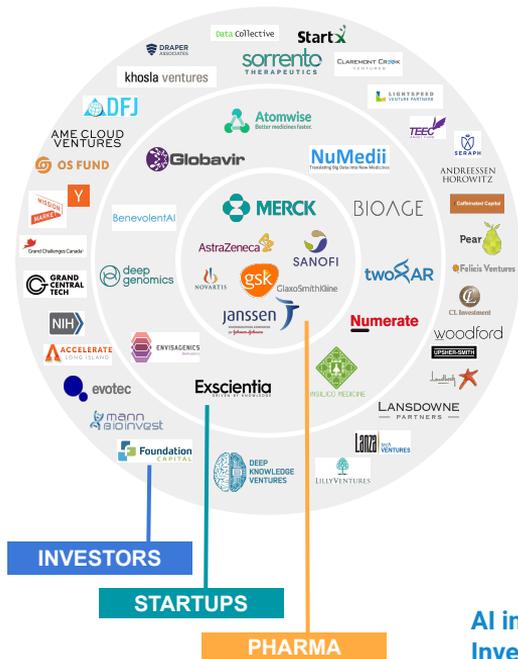


AI FOR DRUG DISCOVERY BOOM - 2017 VS. Q2 2021

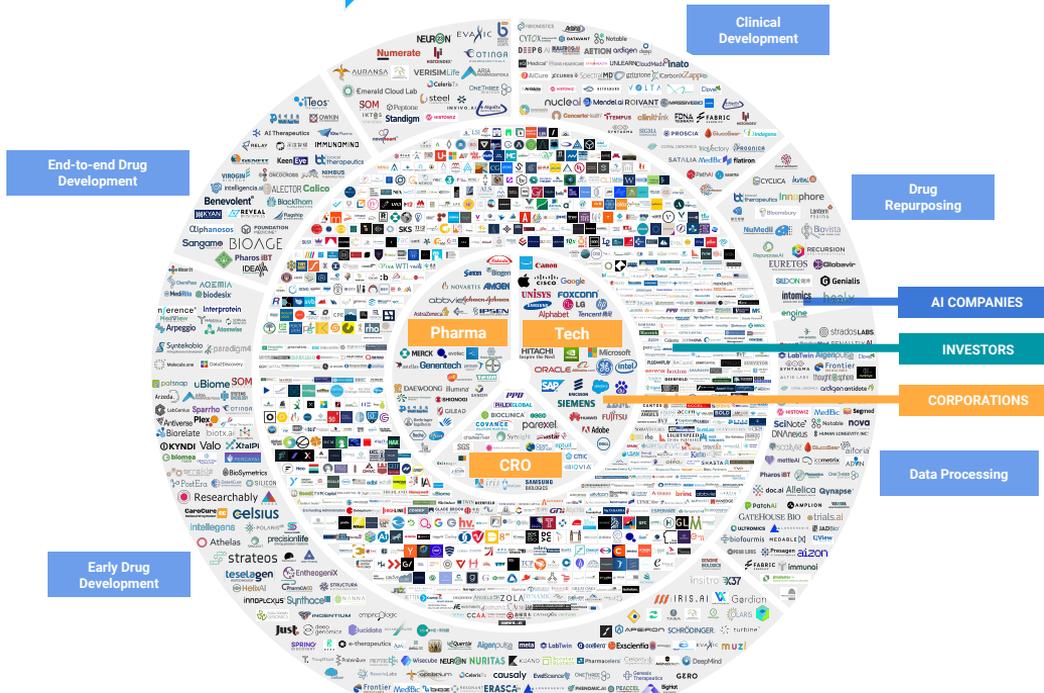
2017

20x industry growth

2021

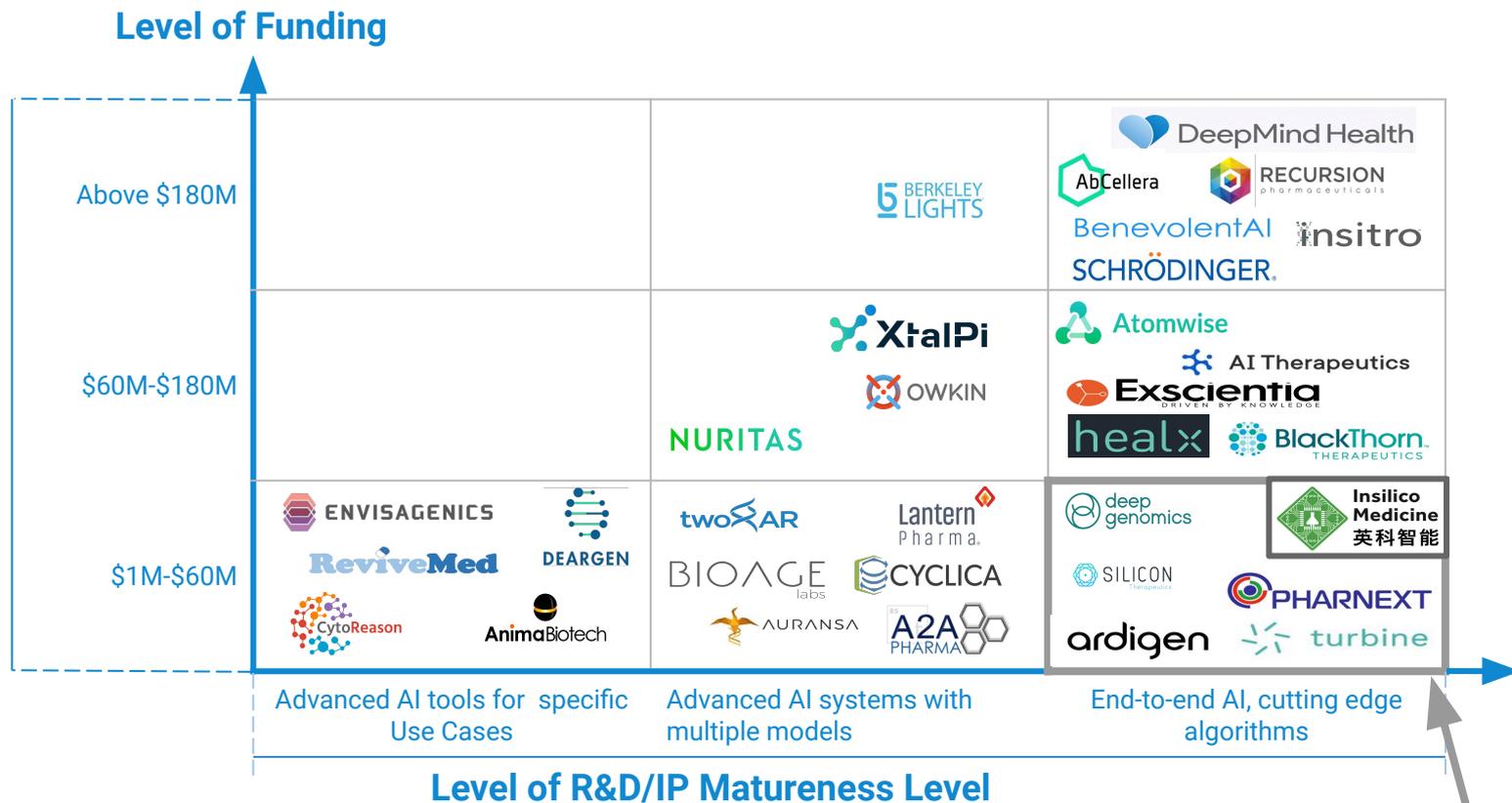


AI in Pharma Companies - 11
Investors - 30
Startups - 10



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

RATIO OF FUNDING VS. R&D MATURITY & OVERALL DEVELOPMENT STAGE



Companies that achieved significant R&D maturity with comparatively small financing

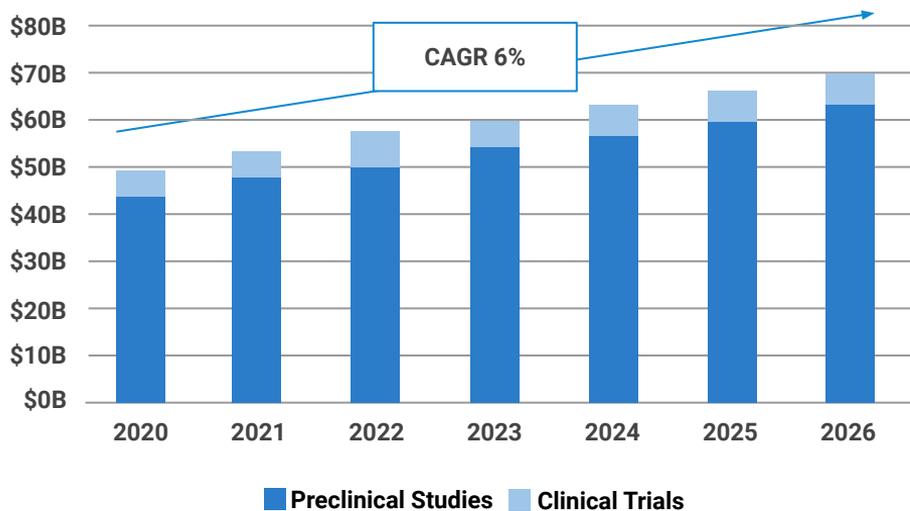
LONGEVITY CLINICAL TRIALS MARKET OVERVIEW Q3 2021

Overview



LONGEVITY CLINICAL TRIALS MARKET AT A GLANCE

Preclinical Studies and Clinical Trials Market Size, 2020-2026



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.

3.4%

Global GDP Growth
in 2021

3.7%

Global Spending Growth on
Pharma R&D in 2021

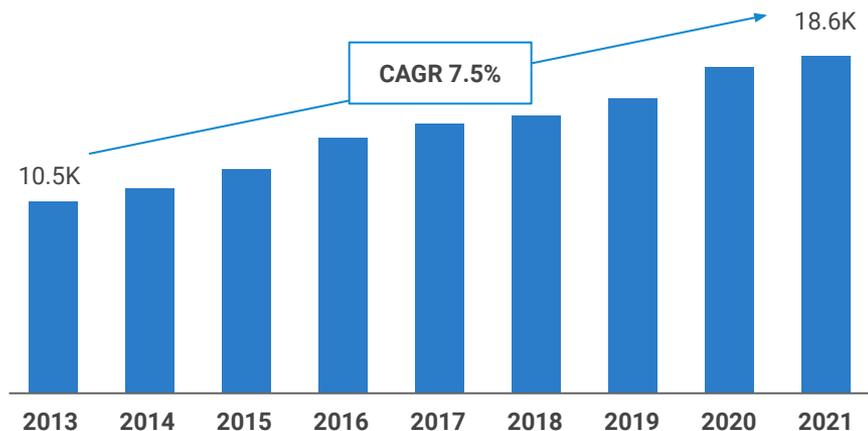
0.24%

Life Expectancy
Growth in 2021

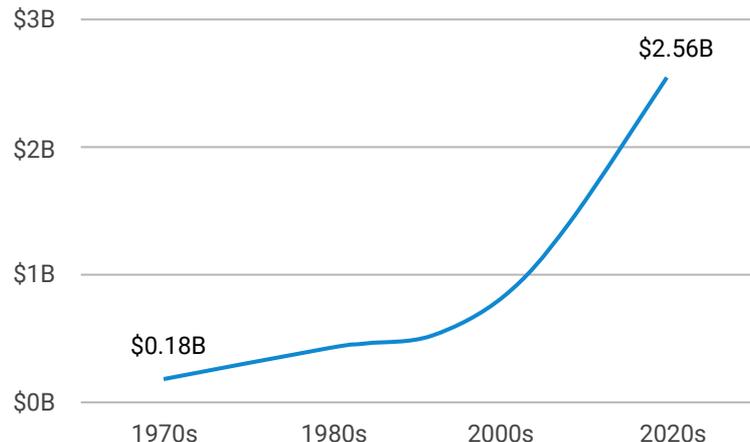
Sources: Grand View Research, Statista, IMF, Macrotrends

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

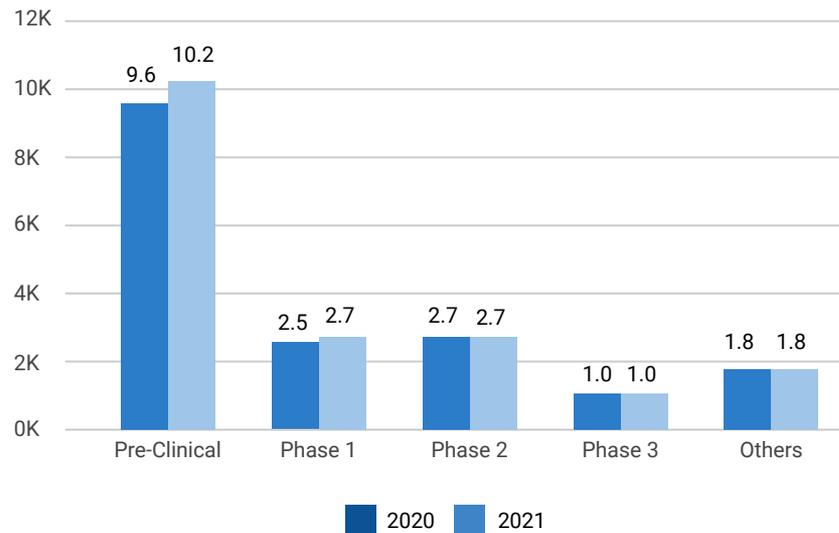
Preclinical studies involve extensive preclinical studies that yield preliminary efficacy, toxicity, pharmacokinetic, and safety information, testing by using test tubes, cell culture, or animals.

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.

Sources: Grand View Research, Statista

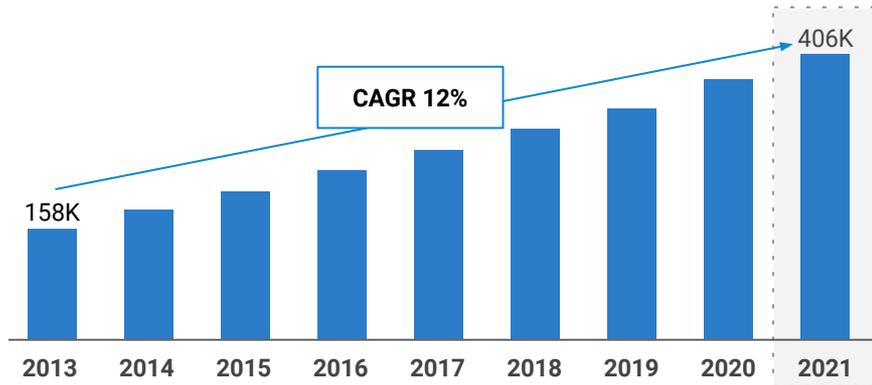
Number of Drugs in the R&D Pipeline Worldwide, 2020-2021



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

LONGEVITY CLINICAL TRIALS MARKET OVERVIEW

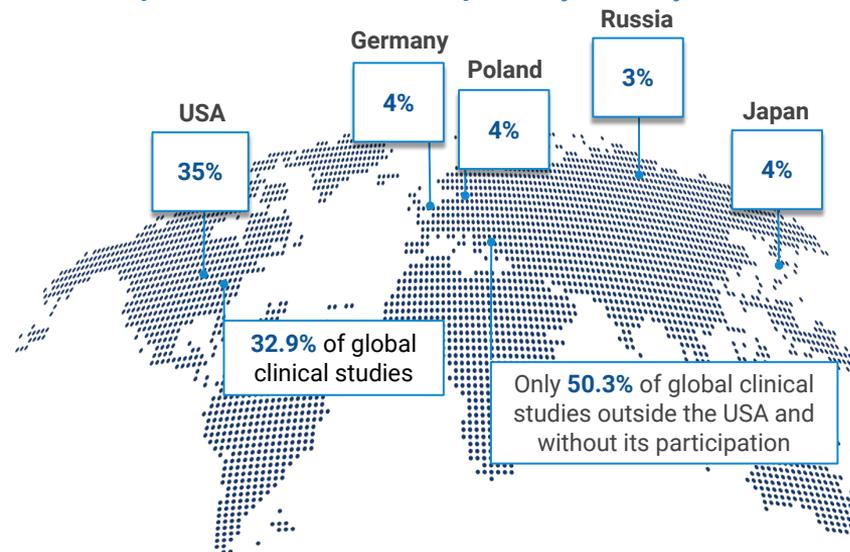
Total Number of Registered Clinical Trials Worldwide, 2013-2021



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

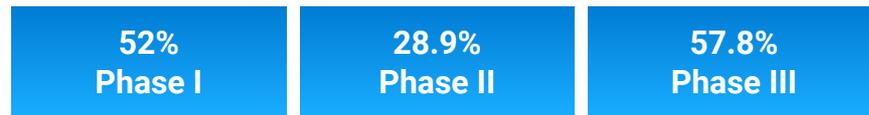
Top 5 Clinical Trials Participants by Country in 2021



32.9% of global clinical studies

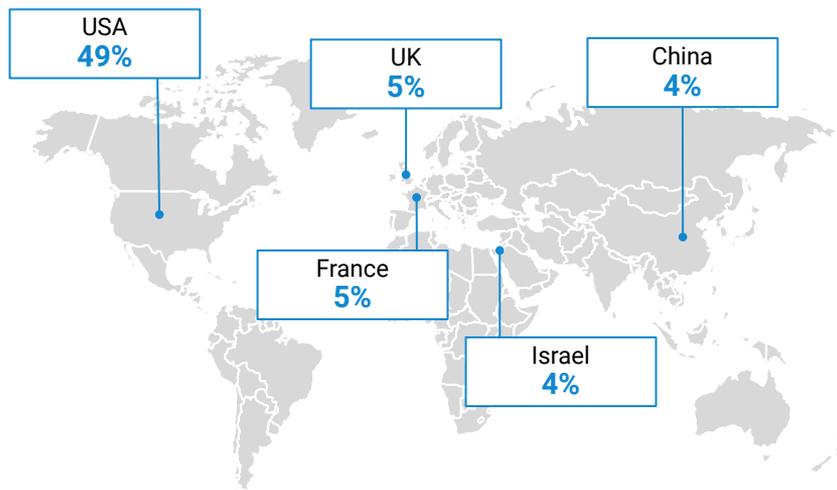
Only 50.3% of global clinical studies outside the USA and without its participation

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

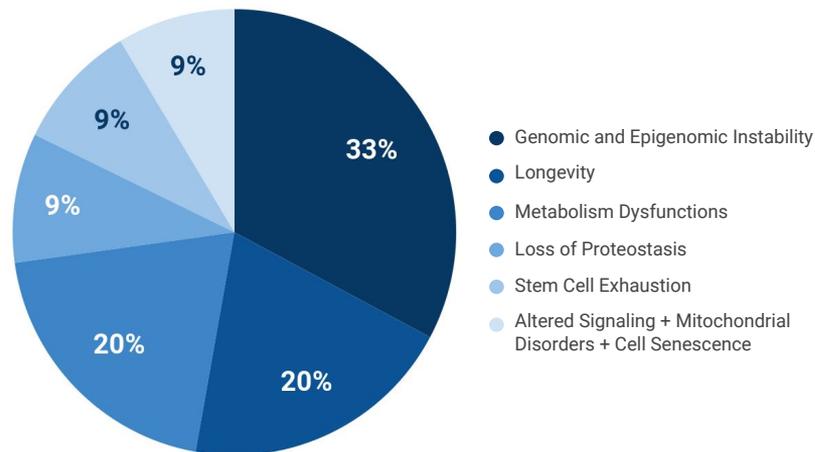


LONGEVITY CLINICAL TRIALS MARKET OVERVIEW

Distribution of Companies by Country, %



Distribution of Clinical Trials by Category, %



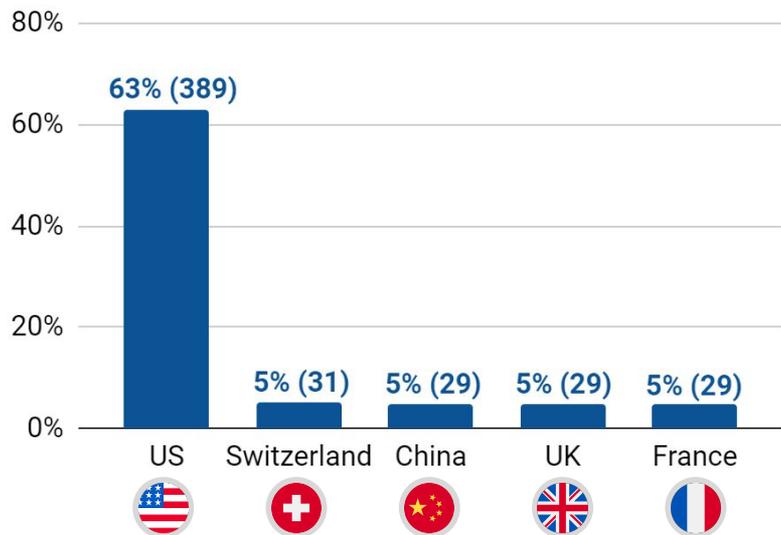
The **vast majority** of companies that conduct Clinical Trials is located in the **United States** and accounts for **49%** of the whole range of analyzed companies. The United States is followed by the **European region**, particularly by the **United Kingdom** and **France** with the total companies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

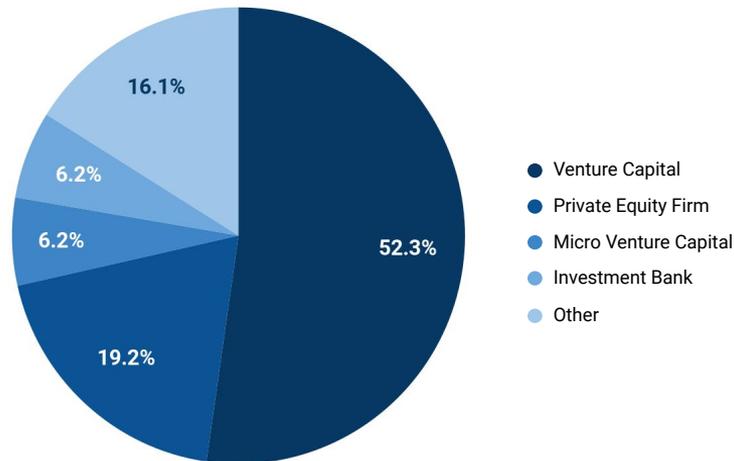
Source: Aging Analytics Agency analysis

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

MARKET TRENDS

Overview



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

Vaccine Trials on Rise

Remote Trials Increase

Clinical Trials Disruptions

New Technologies in Clinical Trials

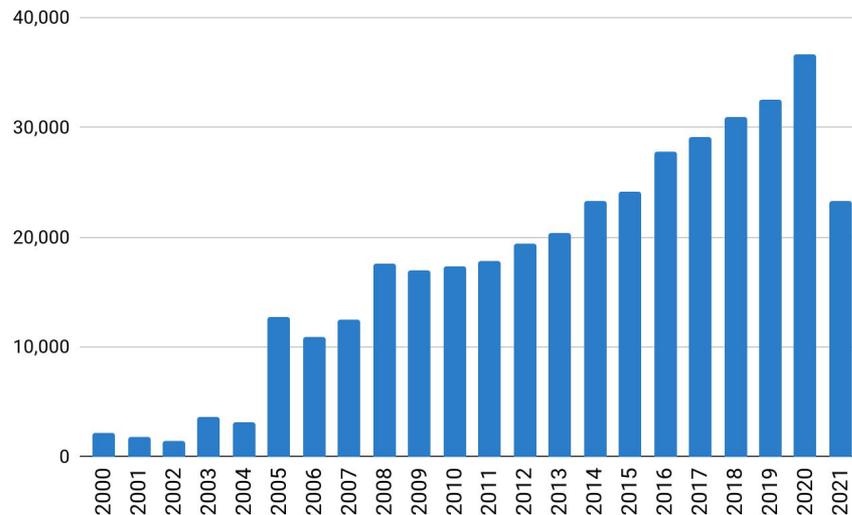
Determinant

COVID-19

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.

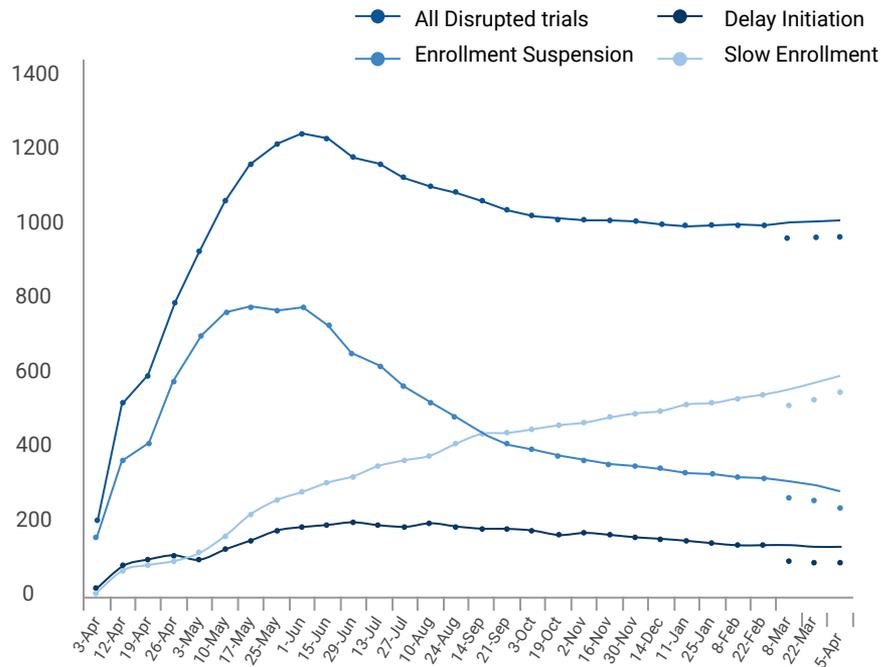
CLINICAL TRIALS DISRUPTIONS

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 the 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

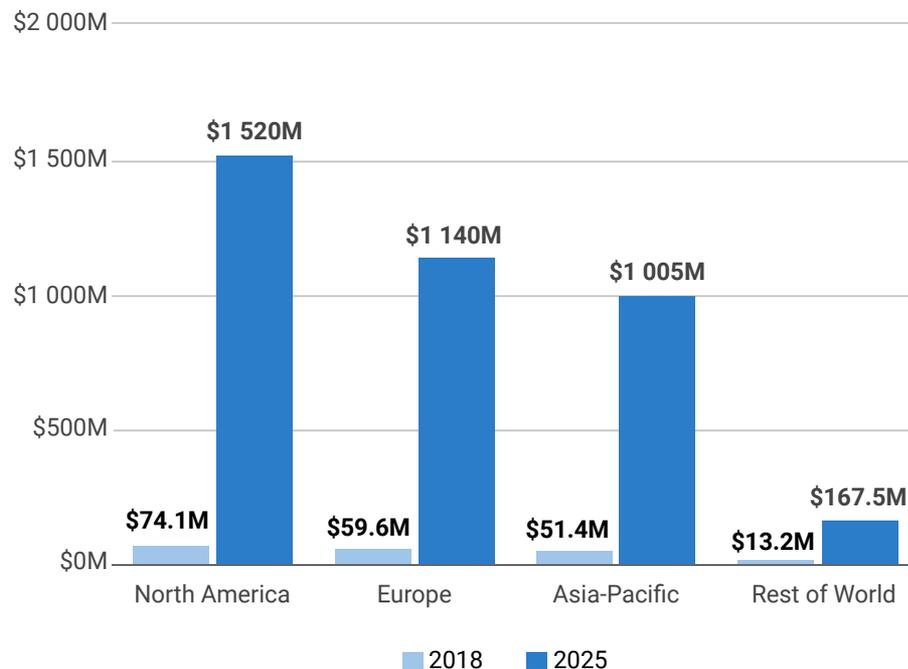
NEW TECHNOLOGIES IN CLINICAL TRIALS

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

Overview



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.
1. 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.
3. 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.
4. In 2021, 15 Longevity companies successfully closed their IPOs and **raised \$6.16B**. The largest companies by market capitalization are **Affirm Holdings, Sana Biotechnology, Clover Health, Oscar Health and Recursion Pharmaceuticals**.
5. The closing of IPOs **will attract a significant number of non-biotech investors looking to enter the Longevity sector**.
6. Publicly traded companies demonstrate rapid growth, having achieved **\$5.6 trillion** of cumulative capitalization at a **30.2%** growth rate.
7. 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.

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.

Our Value Proposition:

● Open Access and Proprietary Analytical Case Studies

Aging Analytics Agency is producing regular open-access reports covering emerging longevity markets – technologies, innovations, companies, and trends. Our clients and partners can enjoy access to proprietary reports featuring additional in-depth research conducted by our team on a regular basis.

● IT-Platform and Big Data Analytics Dashboard

Our company is building a sophisticated cloud-based engine for advanced market and business intelligence in the longevity biotech, medicine, finance, and governance industries. It includes a data mining engine, infrastructure for expert data curation, and advanced visualization dashboards, including mindmaps, knowledge graphs, and 3-dimensional visualizations.

● Strategic Consulting

Aging Analytics Agency offers a comprehensive range of consulting services, conducting customized case studies, research, and analytics for internal (organizational) use, tailored to the precise needs of specific clients.

Aging Analytics Agency is the world's premier provider of industry analytics on the topics of Longevity, Precision Preventive Medicine and Economics of Aging, and the convergence of technologies such as AI, Blockchain, Digital Health, and their impact on healthcare industry.

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.

ABOUT INVESTTECH ADVANCED SOLUTIONS

Hedge Your Risks and Understand Market Better



Use Big Data to Get Unique Market Insights



Create Your Longevity Investment Portfolio



Quantify and Optimize Your Investment Decisions



Who We Are

InvestTech Advanced Solutions provides modern investment analytics and data management tools and algorithms.

Our products are **sophisticated data-driven quantifiable investment recommendations** generated to conduct tangible, fast, comprehensive, and inexpensive **analysis and due diligence for deep tech startups, companies, and corporations**, represented in investment reports.

In addition, InvestTech Advanced Solutions provides proprietary **real-time financial analytics and consulting** for publicly traded corporations in deep tech sectors, which includes 3 stages: data parsing, AI-driven data analysis, and user-friendly data visualization.

InvestTech Advanced Solutions also specializes in **advanced financial engineering**, including **financial derivatives construction and de-risking methods and tools development**.

INVESTTECH ADVANCED SOLUTIONS: ANALYTICAL REPORTS

InvestTech Advanced Solutions in cooperation with analytical subsidiaries of Deep Knowledge Group produces regular open access reports covering emerging technologies, innovations, companies, and trends across the variety of DeepTech domains.

These reports focus on major areas of high-potential industries, maintaining ratings of market players based on their innovation potential and business activity.

The scope of analytical reports accounts for over 10 investment digests that are subject to periodic updates. The elements comprised in every report are as follows:

Industry Trends	Investors	Investment Rounds	R&D Trends
Venture capital ecosystem	Private Companies	Public Companies	M&A Landscape

Explore the entire scope of analytical reports at:

www.invest-solutions.tech/reports

Longevity Investment Digest

This landmark report outlines major investment rounds, relevant R&D trends, illustrates the traction of the Longevity Industry and delivers the comparison of market players. The information in the digest covers key industry trends, 23,000 Longevity companies, 50 leading investors, and more than 600 Longevity-focused publicly traded corporations.



INVESTTECH ADVANCED SOLUTIONS: PROPRIETARY ANALYTICS

Some of the more in-depth research is only available to our clients and strategic partners as proprietary analytics. As a rule, this analytics covers the topics that are of great interest to parties concerned and delivers the extensive scope of information on particular topics.

Proprietary Analytics delivers practical answers to certain questions in order to optimize the short and long-term strategies of companies related to the industry. Proprietary reports are supported by our rapidly developing data mining engine and analytics dashboards.

Ready-to-use
proprietary
reports

Custom
Consulting
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Investment
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M&A
Prospects

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Growth Ideas

Trends
Profiling

Niche
Industries
Overviews

Case Studies

Access our website to learn more:

www.invest-solutions.tech

Proprietary Version of Longevity Derivatives and Financial Instruments Report

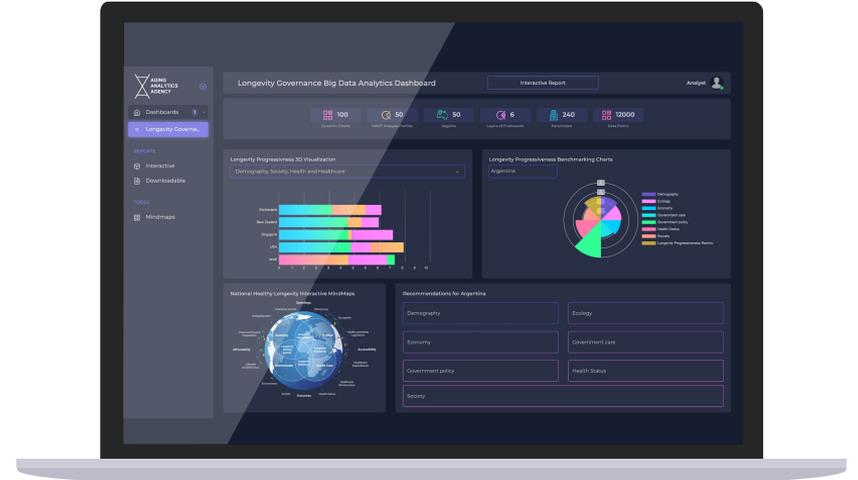
This report thoughtfully explores Longevity-derived financial instruments. The study includes derivatives explanation and analysis, including the comparison to other financial instruments. The proprietary version delivers an exhaustive overview of the biomarkers-based Longevity assessment solutions.



LONGEVITY GOVERNANCE BIG DATA ANALYTICS DASHBOARD

The Longevity Governance Dashboard brings access to continuous monitoring of the specific governmental policy activities directly impacting both National Healthy Longevity and Longevity Industrialization, and to consistently track and analyze data points related to government-led Longevity Development initiatives.

Its aim is to deliver strategic decision makers across the private sector, global investment community, financial industry, and governance access to Big Data analytics and visualization, market intelligence, competitive analysis, technology and company benchmarking, SWOT analysis, practical recommendations and other strategic toolset capable of handling the unprecedented complexity and multidimensionality of the full-scope Global Longevity public and private sector ecosystem.



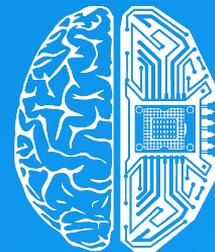
The analytics provided herein identify factors with the greatest effect on the gap between life expectancy and Health-Adjusted Life Expectancy

Government Agencies, Healthcare, Economy & Industrial Development Ministries, & International Policy Organizations

- Features region-specific recommendation packs
- Provides tangible and practical recommendations tuned to the specifics of individual countries
- Precision Health



**AGING
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AGENCY**



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