Advancing Financial Industry
Longevity / AgeTech / WealthTech

Teaser

**Exploring the Multi-Trillion Market of
1 Billion People in Retirement**

Advancing Financial Industry Longevity / AgeTech / WealthTech

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Top-150 Financial Institutions
Advancing Financial Industry
Longevity / AgeTech / WealthTech

Asset Management Firms - 30
Pension Funds - 40
Reinsurance Companies - 15
Insurance Companies - 25
Banks - 40

Asset Management Firms

Pension Funds

Banks

Reinsurance Companies

Insurance Companies

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Top-150 Financial Institutions Advancing the Financial Industry Longevity / AgeTech / WealthTech

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30 Asset Management Firms

accenture, 4BIO CAPITAL, Aberdeen Asset management, Alpha Longevity Management Ltd., Artex, Barnett Waddingham, BlackRock, Close Brothers Modern Merchant Banking, Club Vita, Cowen Group, cpr, Global X, Insight Investment, Janus Henderson Investors, Lazard, octopus ventures, Juno, Nomura, Old Mutual, Mesirow Financial, Invesco, BNY Mellon, Rothschild & Co, Sun Life Financial, KKR, Willis Towers Watson, Odey Asset Management, Amundi

40 Banks

Standard Chartered, Bank of Communications, BNP Paribas, Barclays, BMO, Rabobank, Jefferies, J.P.Morgan, EFG, Lloyds Bank, RBC, Wells Fargo, BACB, Crown Agents Bank, M&S Bank, RBS, JB, citi, Morgan Stanley, Societe Generale, HSBC, Bank of Ireland, CaixaBank, Bank of America, one Savings Bank, Natixis, Goldman Sachs, Clydesdale Bank

15 Reinsurance Companies

SCOR, Canada Life Reinsurance, Scottish Re, Argo Group, Munich RE, Prudential, Swiss Re, Chubb, Berkshire Hathaway Reinsurance, PartnerRe, MNK, hannover re, Pacific Life Re, Aon Empower Results, RGA

25 Insurance Companies

Admiral Group plc, Ecclesiastical, Zurich, Aegon, AIG, Aviva, B&CE, Hodge, Generali, LV=, Discovery, Aspen, RSA, NN, Manulife, Prudential, Royal London, Phoenix Group, AXA, Legal & General, MetLife, Securis Investment Partners, Rothesay life

40 Pension Funds

British Airways, EMI, AstraZeneca, AXA, AJBell, BAE Systems, AkzoNobel, Babcock, Ford, Cobham, Barclays, BBC Pension Scheme, IBM, gmpf, Essex Pension Fund, Fidelity, Lafarge, Iccaria Insurance, MNOPF, ITV, Hargreaves Lansdown, nationalgrid, Nationwide, Marsh & McLennan Companies, Philips, PensionBee, Total UK Pension Plan, Pilkington, RBS, West Midlands Pension Fund, Tyne and Wear Pension Fund, Heineken, West Yorkshire Pension Fund, Rolls-Royce, Berkshire Pension Fund

1 Billion People in Retirement Globally - a New Multi-Trillion Opportunity

Longevity, AgeTech & WealthTech Market

Globally
1 Billion in Retirement

In the UK
10 Million in Retirement

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

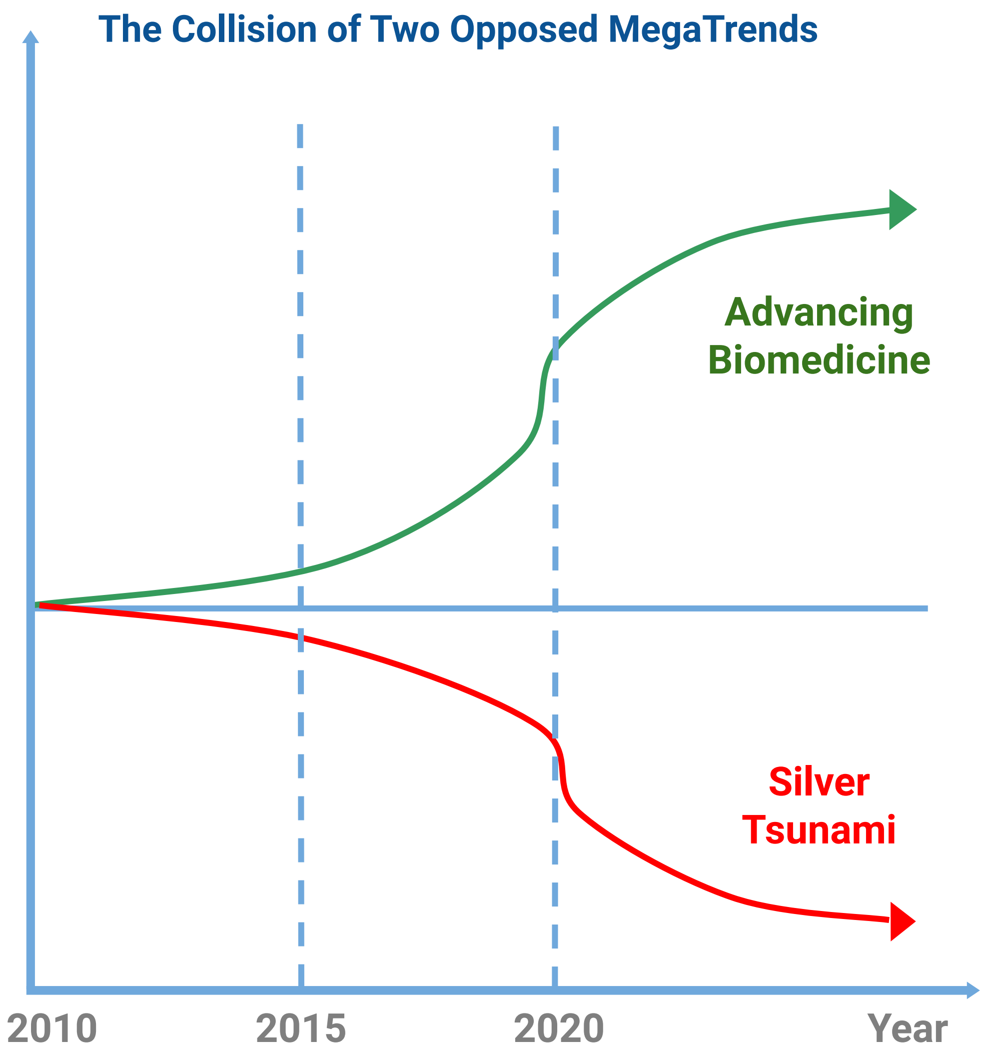
~ Dmitry Kaminskiy interview in the Financial Times.

“ The global spending power of those age 60 and over will reach $15 trillion annually by 2020 “

~ Bank of America Merrill Lynch.

Source ft.com

Introduction: Longevity, Aging, and the Advancing Financial Industry: The Collision of Two Opposed MegaTrends



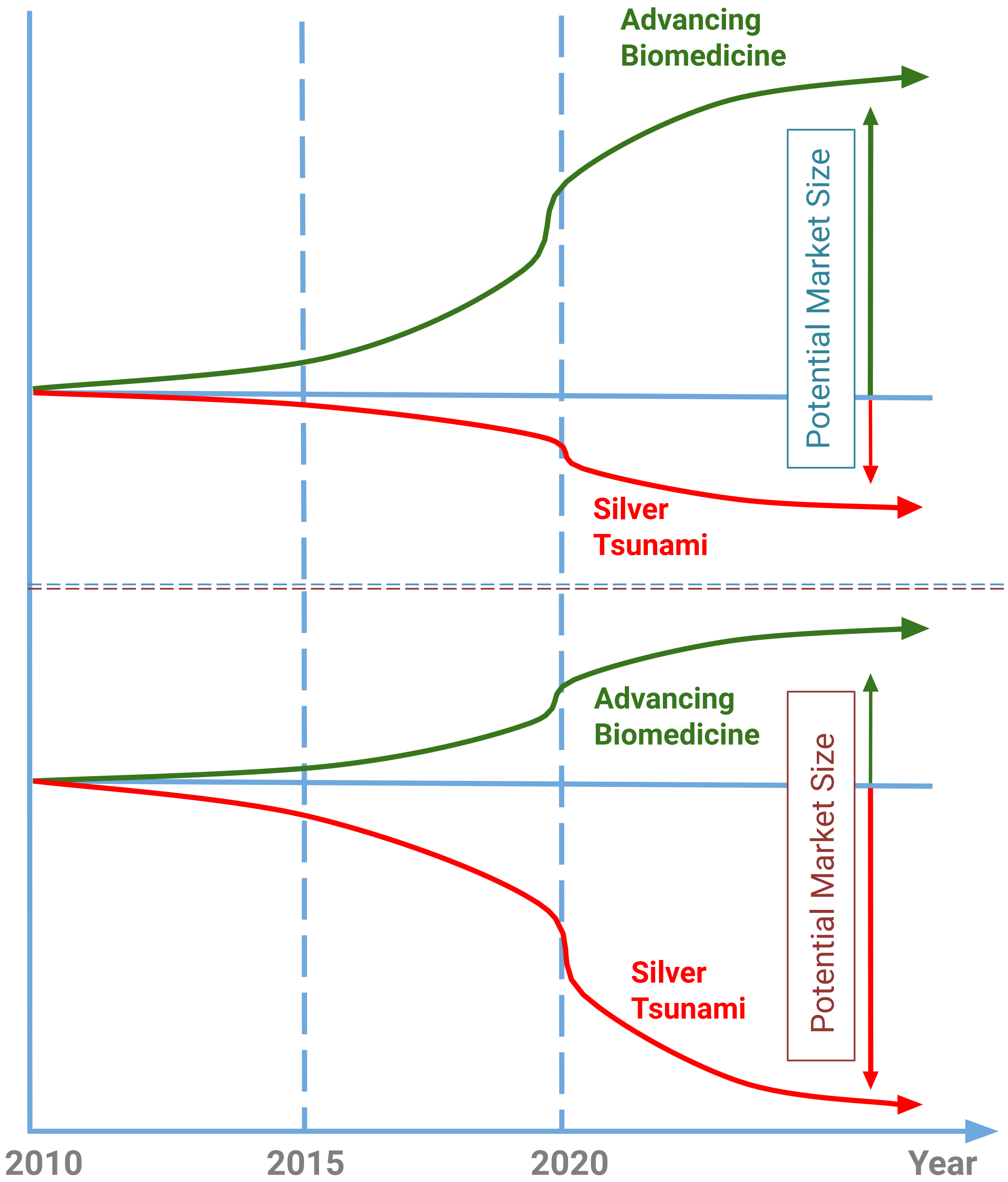
The present moment in history is marked by the impending collision of two opposed megatrends:

- exponential development in advanced biomedicine and the science of aging, which is creating a rapidly growing Longevity Industry capable of expanding healthspan, delaying age-related diseases and compressing age-related loss of function into the last few years of life;
- the oncoming Silver Tsunami (demographic aging), which poses major economic burdens not just for the healthcare systems of developing nations, but also for major financial institutions including pension funds, insurance companies, asset management firms and retail / private wealth banks.

All these classes of financial institutions will either gain or lose from the collision of these two opposed megatrends.

Those institutions that will be able to reinvent their business models to (1) reduce the economic burden caused by demographic aging through specific products and policies, and (2) tap into the rising AgeTech, WealthTech and Longevity Finance markets that are emerging as a result of the 1 billion people on retirement globally that can not only survive the oncoming collision of these megatrends, but can actually thrive and prosper as a result, maintaining their existing sources of revenue, while opening doors to an untapped ocean of the new ones. Those institutions that fail to recognize the oncoming collision of these two opposed megatrends and to reinvent their business models accordingly, will stagnate and be washed away.

Two Possible Scenarios of Longevity MegaTrends



Positive Scenario

Most progressive and technocracy-driven countries will work proactively to address these issues and implement a positive scenario. Financial institutions operating in those regions should have sophisticated long-term forecasting to reformulate their business models in order to minimize the challenges and to maximize the utilization of opportunities associated with these two opposed megatrends.

Pessimistic Scenario

In reality, most countries will fail to address these challenges in advance due to a lack of will and technological capability, missing their window of opportunity to benefit from the progress in biomedicine, and to neutralize the worst effects of population ageing. Financial institutions operating in those regions should utilize pragmatic forecasting, and to adjust and optimize their business models accordingly.

Blackrock Capital, Vanguard, SoftBank and Vision Fund on the Rising Longevity Industry

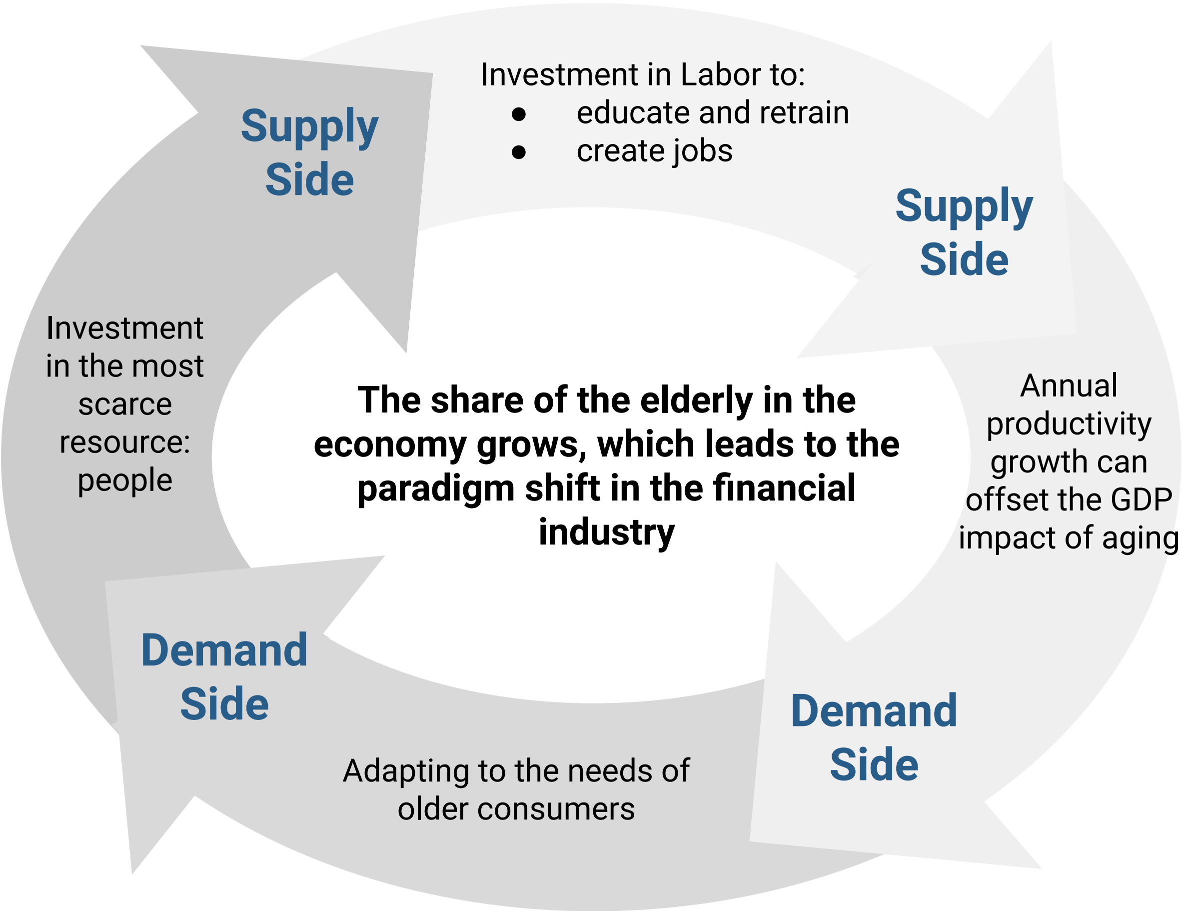
*“**Longevity is a blessing. And as an investor, it provides you opportunities to benefit from compounding and to have a longer investment horizon.** But if you don’t prepare for it, you are left with two options: Work longer in life, perhaps much longer than you’d like, or hope you’ve been good to your children and that they’ll be willing to care for you in your old age. And, second, I hope you’ll speak out. Longevity is an issue of social justice that will have a more profound impact on your generation than on any generation before. If we don't start to address it – not just in this country but globally – we're going to see fewer job prospects for young people, higher unemployment, lower growth and many older people – maybe your parents – left without the means to support themselves.”*

- **Larry Fink, Chairman of Blackrock Capital**

*“I’m actually pretty optimistic about the U.S. economy. But **Europe’s got real challenges. A lot of that is due to the demographics in Europe.** China has been the engine of growth for the world for the last 20 years, or the last 10 years in particular, but that’s not sustainable. So you’re looking at a world where growth is going to be more challenged than it’s been, unless you see some really big jumps in productivity.”*

- **Bill McNabb, Chair of Vanguard**

Longevity Offers Opportunities Only to Those Who Can Adapt



"Longevity is the economic opportunity of our lifetime"

~ MarketWatch

"The major demographic shifts to come do not call for gloom and doom but simply for a different, fresh, and fully informed perspective."
~ Boston Consulting Group Study.

"Global businesses have positioned ageing as a lever for attracting and retaining top talent, as well as building out frameworks of sustainability and shared value"
~ McKinsey Institute's "No Ordinary Disruption.

"Giving provides retirees with added purpose. They are generous with their time, experience, and money. Their collective financial and volunteering contributions over the next twenty years are projected to create an $8 trillion "Longevity Bonus" for the nation"
~ Bank of America Merrill Lynch Study.

Sources: Global Aging Report | World Economic Forum | Finances in Retirement

Longevity Financial Landscape Framework

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PENSION FUNDS

- Population ageing may increase cost
- Dependant on policy regulations
- Higher mortality uncertainty

INSURANCE COMPANIES

- Leveraging longevity risk on macro and micro level
- Intersection with banks and asset management firms
- Longevity derivatives as a form of insurance

ASSET MANAGEMENT FIRMS

- Product diversification for different age groups
- Advanced trading strategies with longevity derivatives
- Population aging may make conservative investment strategies more popular

RETAIL AND PRIVATE WEALTH BANKS

- Providing services to other financial institutions
- Savings growth = additional pressure on interest rates
- Banks can substitute services of retirement planning

Top-150 Financial Institutions Advancing Financial Industry Longevity / AgeTech / WealthTech

BANKS	
Bank of America	Julius Baer
Bank of Communications	Lloyds Banking Group
Bank of Ireland	Marks & Spencer Financial Services Plc
Barclays	Morgan Stanley
BMO Financial Group	natixis
BNP Paribas	One Savings Bank
Bradford & Bingley	Paragon Banking Group
British Arab Commercial Bank Plc	Rabobank
CaixaBank	Royal Bank of Canada
Citi Bank	Royal Bank of Scotland
Clydesdale Bank	Santander UK
Commerzbank	Schroders
Credit Suisse	Scotiabank
Crown Agents Bank Limited	Société Générale Corporate & Investment Banking
Deutsche Bank	Standard Chartered
EFG Private Bank Limited	Sumitomo Mitsui Banking Corporation
Goldman Sachs	The Bank of New York Mellon
HSBC Holdings plc	UBS
Jefferies Group	Weatherbys Private Bank
JPMorgan	Wells Fargo

ASSET MANAGEMENT	
4bio Capital	Invesco
Aberdeen Asset Management	Janus Henderson Investors
Accenture	Juno Capital
Alpha Growth	Lazard
Amundi	KKR&Co
Artex	Mesirow Financial
Barnett Waddigham	Nomura Holdings
Black Rock	Octopus Ventures
BNY Mellon Investments	Odey Asset Management
Close Brothers Group	Old Mutual Wealth Life & Pension
Club Vita	Rothschild & Co
Cowen Group	Sun Life Financial Inc
CPR AM	T.Rowe Price
Global X	Vanguard
Insight Investment	Wills Tower Watson

Top-150 Financial Institutions Advancing Financial Industry Longevity / AgeTech / WealthTech

INSURANCE & REINSURANCE	
Admiral Group	Rothesay Life
Aegon	Royal London Group
AIG	RSA
Allianz	Securis Investment Partners
Aspen	Zurich Insurance
Aviva	Aon plc.
Axa	Argo Group
B&CE Insurance Limited	Berkshire Hathaway Reinsurance Group
China life	Canada Life Reinsurance
Discovery Ltd	Chubb Tempest Life Re
Ecclesiastical Insurance Group PLC	Everest Re Group
Generali	Hannover Re
Hodge Life Assurance Company Limited	MNK Re
Legal & General Group Plc	MunichRe
LV Insurance Management Limited	Pacific Life Re
Manulife	PartnerRe
Metlife UK	RGA Life
NN Group	SCOR Global Life SE
Phoenix Life Limited	Scottish Re
Prudential	Swiss Re

PENSION FUNDS	
Airways Pension Scheme	Iccaria Insurance ICC Limited
AJ Bell Youinvest	ICI Pension Fund
Akzo Nobel UK Pension Scheme	ITV pension scheme
AstraZeneca pension fund	Lafarge UK Pension Plan
AXA UK Group Pension Scheme	Merchant Navy Officers Pension Fund
Babcock International Group Pension Scheme	MMC UK Pension Fund
BAE Systems Pensions	National Grid UK Pension Scheme
Bank of England Pension Fund	Nationwide Pension Fund
Barclays Bank Retirement Fund	Pension Corporation
BBC Pension Trust	Pensionbee
BT Pension Scheme	Philips UK Pension Fund
Cobham Pension Plan	Pilkington Superannuation Scheme
EMI group pension scheme	RBS Group Pension Fund
Essex Pension Fund	Rolls-Royce Pension
Fidelity Pension	Royal County of Berkshire Pension Fund
Ford Pension Fund	Strathclyde Pension Fund
Greater Manchester Pension Fund	Total UK Pension Plan
Hargreaves Lansdown	Tyne & Wear Pension Fund
Heineken UK	West Midlands Pension Fund
IBM United Kingdom Pensions Trust	West Yorkshire Pension Fund

Top-Tier Finance and Business Media Conferences on Longevity

Longevity is now regularly embraced 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*.

FINANCIAL TIMES LIVE

12:10pm **Aging and Longevity**

Dmitry Kaminskly, Co-Founder and Senior Partner, *Deep Knowledge Ventures*

Alex Zhavoronkov, CEO, *Insilico Medicine*

Joseph Antoun, Chairman & CEO, *L-Nutra* ; Chairman, *Global Healthspan Policy Institute*

Aubrey de Grey, Vice President of New Technology Discovery, *AgeX Therapeutics*

A GLOBAL NETWORK OF INNOVATORS

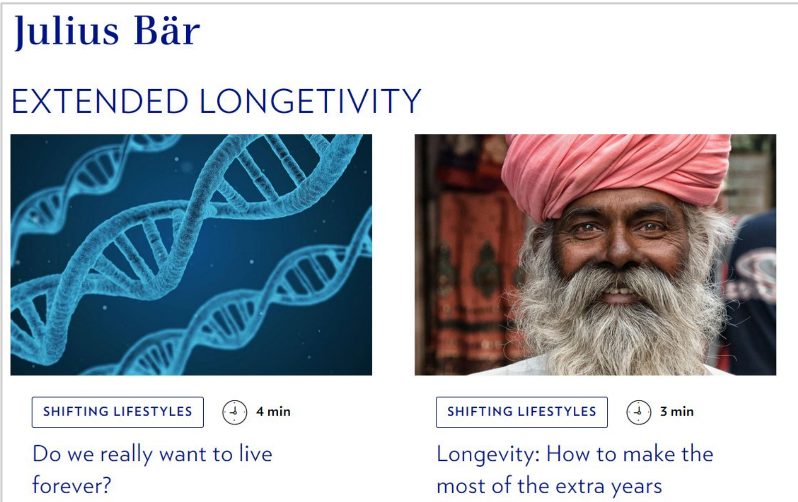
AGING2.0

Top-Tier Financial Institutions and Business Analytics Firms Show Interest in Longevity Through Conferences and Reports

CREDIT SUISSE

Credit Suisse featured Health and Aging as one of four main themes in their 2018 Global MegaTrends Conference

Julius Baer held a major forum on the topic of "Investing in Longevity" featuring a keynote presentation by Aging Analytics Agency Founder Dmitry Kaminskiy



UBS featured "Living to 150" as one of six major topics in their 2018 Healthcare Summit, featuring a keynote presentation by prominent Longevity entrepreneur Alex Zhavoronkov

UBS also issued a report on the "largest survey of wealth investors in the world to date", concluding: ""Don't let skepticism about living to 100 keep you from planning for it. Life expectancies are rising, and it's a real possibility. In fact globally, nine in 10 investors are already adjusting how they are planning for their life and their legacy."

CitiBank released a landmark report detailing the rise of the Longevity Industry, and highlighting it as one of the quickest-rising sectors being driven by disruptive innovation today.

FROST & SULLIVAN

Frost and Sullivan also released two prominent reports on the emerging Longevity Industry, and in 2018 created the "Award for Innovation in Artificial Intelligence for Aging Research and Drug Development"

Banks Interested in Longevity

EIB, PartnerRe, and **BNP Paribas** create first longevity hedge

Bank of America Merrill Lynch introduces groundbreaking initiative to empower companies with a deeper understanding of the Longevity Revolution and its impact on employees

Goldman Sachs launches tradeable index for longevity and mortality risks

Sources: euromoney.com | newsroom.bankofamerica.com | businesswire.com

Banks Interested in Longevity

JPMorgan has created an international index designed to benchmark and trade longevity risk.

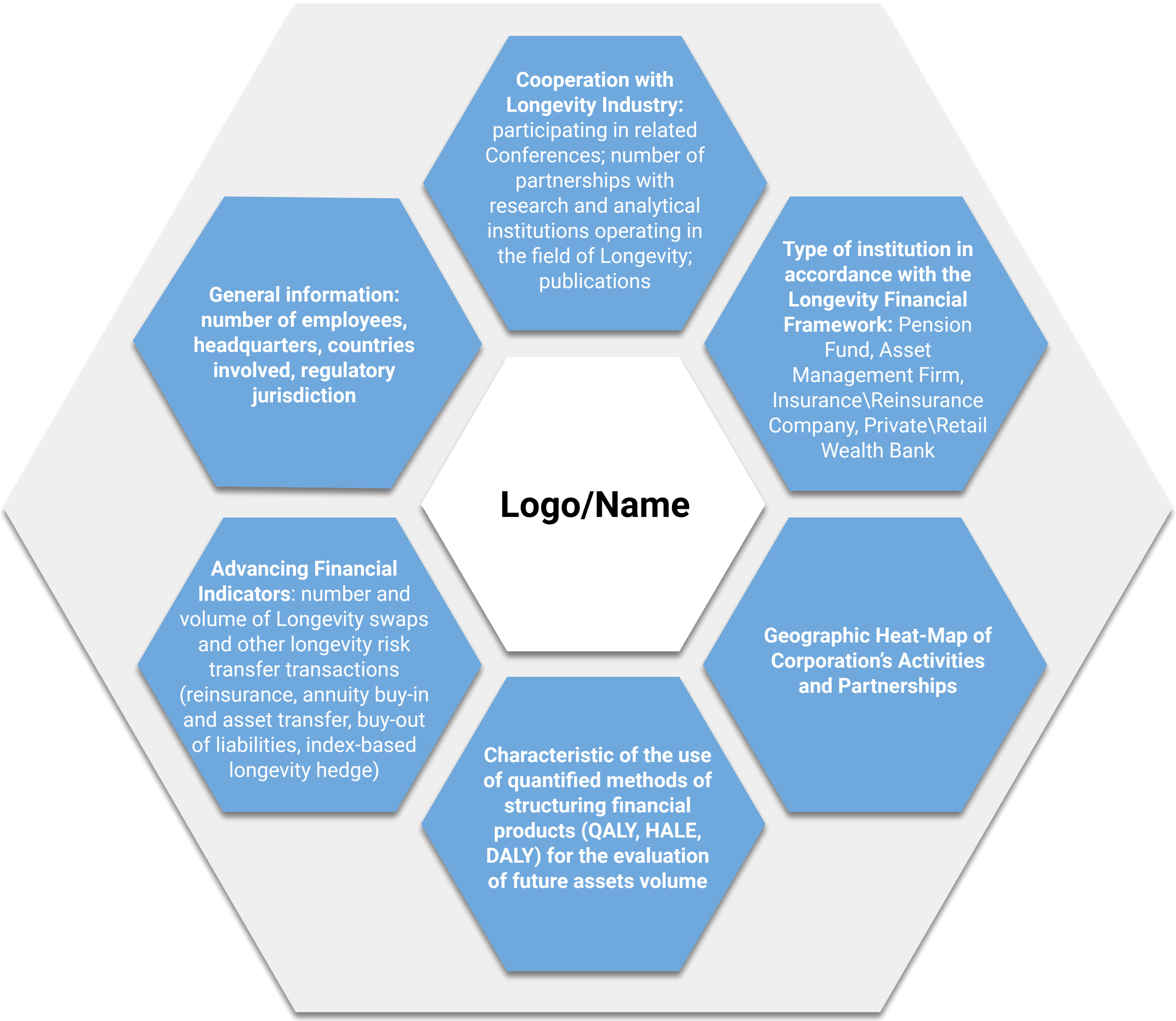
In the report Beyond 100 **Barclays Private Bank** has brought together viewpoints from specialist and leading experts in longevity research and biotechnology, work, housing and the economy.

Deutsche Bank has entered into a longevity swap with the Trustees of the Rolls-Royce Pension Fund. Under the agreement, Deutsche Bank will hedge the longevity exposures of the scheme

Sources professionalpensions.com https://privatebank.barclays.com https://www.next-finance.net

Financial Institutions’ Profiles Template

The profile template below illustrates a brief picture of the analysis of a company’s current position in the Longevity Financial Sector. Each profile serves as a visual comparative executive summary of the company’s activities in this sphere, and will be accompanied by a deeper analysis of these metrics.



Financial Highlights

$N Revenue

$N Net Profit

N% ROE

N% ROA

Strengths

- Existing Activities to Hedge Longevity Risk, but not yet to Proactively Leverage Longevity Opportunity
- Strong Long-Term Forecasting Division, which could be re-focused for Longevity Finance Forecasting
- Active in Regions with Large Retirement Population, Large Opportunities to Enter AgeTech / Wealth Market

Weaknesses

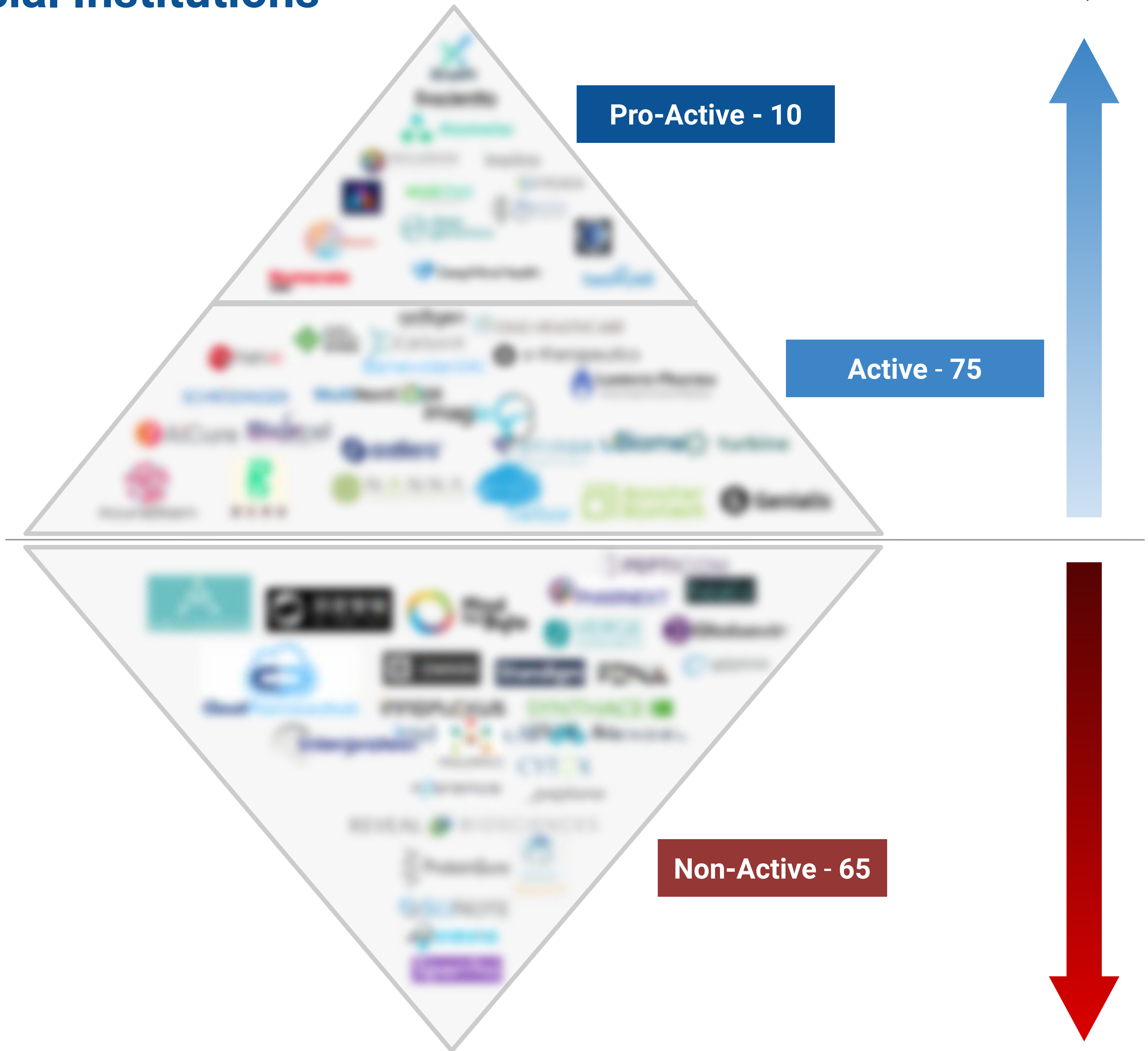
- Lack of Participation in Conferences on Longevity and Financial Industry
- Lack of Analytical Reports on the Topics of Ageing and Longevity
- Lack of Task-Force Dedicated to the Topic of Longevity Forecasting

Level of Longevity Finance Activity and Prospects of 150 Leading Financial Institutions

Aging Analytics Agency's classification framework set up the ranking of 150 leading financial institutions according to their levels of activity in the Advancing Longevity Financial Industry.

Quantitative, tangible metrics are used for the comparative analysis to deliver three tiers: anti-ranking (non-active), medium ranking (active), and positive ranking (proactive).

This three-tiered system allows companies to be quantified not only the activity and future prospects of these companies, but also the lack of activity and assets that could be converted into future prospects.



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Longevity, AgeTech and WealthTech

The two opposed Longevity MegaTrends mentioned throughout this report - **advancing biomedicine and ageing population** - are serving to drive the growth of the rising Longevity, AgeTech and WealthTech industries.

The term **AgeTech** encompasses all products and services that enable the elderly to remain functional members of society, capable to executing the day-to-day activities of life. These most typically consist of IT-related products and services, such as smartphones, tablets and computers optimized for ease-of-use for those aged 60 and over, or novel banking interfaces and services that enable the elderly to conduct their daily banking with less difficulty, and which protect them from financial fraud. Meanwhile, the WealthTech industry comprises any product or service (again, almost invariably IT-based) that either simplified or enhances the creation and maintenance of Wealth - from savings to investment - for all ages of society.

Over the next few years, it is likely that AgeTech and WealthTech will be features as complimentary functions within a single product or service. The financial industry is likely to see the emergence of what can be referred to as AgeTech banks, a novel type of institution focused on simplifying banking for people over 60 years of age. Furthermore, we can expect to see the WealthTech industry become more old-age-oriented, offering an increasing number of products and services to those aged over 60 as the proportion of citizens in retirement continues to grow.

Furthermore, the creation of novel investment strategies targeted to elderly individuals is anticipated. In tandem, we can expect to see the rise of novel investment strategies emerge for various kinds of institutional investors interested in becoming active in the growing Longevity Financial Industry, from small venture funds up to national sovereign funds.

These three industries are expanding in a synergetic and coordinated manner. **Longevity enables AgeTech, AgeTech merges with WealthTech, WealthTech supports Longevity.** This makes their ongoing emergence and growth almost inevitable.

Longevity Industry

Main effects (financial influence)

Long-term securities demand

Financial professionals will see greater demand for relatively safe long-term securities that are easy to use. Longevity will also emerge as an asset class.

Healthy life expectancy

It will be important for governments to focus on "healthy life expectancy," a measure which implies fewer costs for the social system as well as individuals.

Government spendings

Government expenditures are going to increase dramatically due to age-related causes. Governments will also have to begin inter-temporal budgeting of natural resources and oil, and should mark this as a security concern.

Annuities

Annuity contracts will become more efficient for individuals unsure of how long they will live. However, the market for annuities remains small, based on difficulties in calculating the price of the contracts and lack of instruments to head against Longevity Risk.

So, ageing is a positive for the Financial Services industry as there will be a greater need for financial products over the longer term, but of newer types and kinds - newer asset classes, newer investment strategies and longer-dated bonds/securities will need to be developed. This will require participation and collaboration across both the public and private sectors to have a positive effect for all longer-lived citizens.

Forecasts & Perspectives

In a broad sense, Longevity is related to the organisations and economic activities around life extension research. According to the Transparency Market Research report, anti-ageing services market is projected to grow at a 5% CAGR over the forecast period of 2013 to 2019. So, the overall anti-ageing market is predicted to be worth $191.7 billion globally by 2019.

AgeTech - Digitally Enabling the Longevity Economy

Services purchased by older people

Example: Pill-Pack, a company recently acquired by Amazon for $1 Billion that assembles all your medications and delivers them in a package designed to avoid errors.

Services purchased by behalf of older people

Example: home care, which can be improved by remote sessions, using of home sensors and improved scheduling algorithms.

Services traded between older and younger people

Example: ways in which different generations could barter and even bank services – someone could "bank" care hours baby-sitting, to be "spent" for their spouse's own care needs.

Services delivered to future older people

Example: preparing for a healthy old age begins very early in life: healthcare services which prevent issues such as childhood obesity.

> *"Global GDP in 2018 is estimated at $87 Trillion. If we take the most conservative estimate of the ageing economy of 20% of GDP, this implies that the global ageing Economy is $17 Trillion. Based on IMF data, the global digital economy is around 8% of global GDP. Digitization lags with older customers, as they are slower to adopt platforms such as smart-phones, wearables or apps. If we assume older people' level of digitization is one-half the average level (or 4% of the ageing Economy), this would imply that global Age-Tech spend is in the order of $700 B per year."*
>
> \- **Dominic Endicott, General Partner at Nauta Capital**

Top Countries Embracing AgeTech

- Japan
- US
- Netherlands
- UK

Forecast & Perspectives

- The global ageing Economy will reach $27 Trillion in 2025, with digitization at 10%;
- Age-Tech potential will be approximately $2.7 Trillion by 2025;
- 21% annual growth in the global Age-Tech market.

WealthTech Industry

The 'WealthTech industry' refers to a new generation of financial technology companies that create digital solutions to transform the investment and asset management industry. New companies have arrived on the scene offering advice based on artificial intelligence and big data, micro-investment platforms, or trading solutions based on social networks.

Robo-advisors

The issue is related to automated services that use machine-learning algorithms to offer users advice based on the most profitable investment options, yield targets, the user's risk aversion profile and other variables.

Robo-retirement

This is another version of robo-advisors that is especially popular in the United States. Companies in this category specialize in managing retirement savings.

Micro-investments

That's the idea behind the micro-investment platforms, which make it possible to invest small amounts of money with no commission.

Digital brokers

Digital brokers include online platforms and software tools that put stock market information and the possibility of investing within anyone's reach.

Top Countries Embracing WealthTech

Japan	US
UK	France

Forecasts & Perspectives

- Data security must become the number one priority for wealthtech providers in order to prevent breaches;
- Predictive analytics technology is critical to wealthtech company survival because it helps to win insights into client behavior and their needs so they can improve services and products;
- Cloud computing will remain a major trend in wealth technology because it provides for sustainable growth.

Challenges Facing Financial Institutions Entering the Longevity / AgeTech / WealthTech Market

Longevity Risk is a risk to which a pension fund or life insurance company could be exposed as a result of higher-than-expected payout ratios. It exists due to the increasing life expectancy trends among **policyholders** and **pensioners**, and can result in **payout levels** that are higher than what a company or fund originally accounted for. The types of plans exposed to the greatest levels of Longevity Risk are **defined-benefit pension plans** and **annuities**, which guarantee lifetime benefits for policy or plan holders. Only those financial institutions which can deal with longevity risk will survive and flourish.

Longevity Risk affects governments in that they must fund promises to retired individuals through pensions and healthcare, and they must do so despite a shrinking tax base. Corporate sponsors who fund **retirement** and **health insurance obligations** must deal with the Longevity Risk related to their retired employees. In addition, individuals, who may have reduced or no ability to rely on governments or corporate sponsors to fund retirement, have to deal with the risks to their own finances presented by their own Longevity. Average life expectancy figures are on the rise, and even a very small change in life expectancies can create severe **solvency issues** for pension plans and insurance companies. Precise measurements of Longevity Risk are still unattainable because of the limitations of medicine and its impact on life expectancies has not been quantified.

The parts of the industry left standing will be those in which the only measure of success is **QALY (quality-adjusted life years), DALY (disability-adjusted life years)** and **HALE (health-adjusted life years)**.
There will be a period of crisis following the tsunami landfall, and preceding the completion of first “flood defences” in the form of healthy life-extending biomedicine.

But for many, these intervening years will be a **window of opportunity** to become captains of an entirely new industry and chart a new course for humanity.

Longevity Risks and Fiscal Challenge in Selected Countries

In many countries, the private sector does not have sufficient financial assets to deal with ageing-related costs, let alone with Longevity Risk. The estimated present discounted value of required retirement income under current Longevity assumptions for 2010–2050, exceeds household total financial assets.

Although some of the gaps in the table would be covered by social security, housing equity, and further asset accumulation by households, it is unlikely that current household wealth is sufficient to provide for the necessary retirement income in selected countries.

With the private sector ill-prepared for even the expected effects of ageing, it is not unreasonable to suppose that the financial burden of an unexpected increase in Longevity will ultimately fall on the public sector. The contingent liabilities from Longevity Risk could add to already-stretched debt-to-GDP ratios in these countries. If the risk of an extra three years of Longevity were indeed to fall on the government, debt-to-GDP ratios could significantly rise in selected countries.

Table 1. Longevity Risk and Fiscal Challenges in Selected Countries

Country	Household financial assets (2016), % of GDP	Present Discounted Values of Needed Retirement Income (2010-2050)	General Government Gross Debt (2016), % of GDP
Japan	309	499 to 665	237
Spain	185	277 to 370	116
Italy	248	242 to 322	157
USA	339	272 to 363	137
France	229,3	295 to 393	121

Table 2. Longevity Trends 2010-2050

Country	Projected change in life expectancy at birth, 2010-2050	Projected change in life expectancy at age 60, 2010-2050
United States and Canada	4,3	3,1
Advanced Europe	4,7	3,7
Emerging Europe	6,8	3,8
Australia	4,9	3,7
Japan	4,6	3,7

It is obvious that indicators in both tables correlate with each other: these regions and countries are the most ‘risky’ in aspect of the Longevity effects.

The purpose of preventive medicine for the elderly, using advanced biomedical technologies, is to preserve the health of an ageing individual so as to prevent functional decline. *Governments should ensure the creation and implementation of the following policies to promote research into the biology of ageing and ageing-related diseases, for improving the health of the global elderly population:*

FUNDING	INCENTIVES	INSTITUTIONS
Ensuring a significant increase of governmental and non-governmental funding for goal-directed research in preventing the degenerative ageing processes, and the associated chronic non-communicable diseases and disabilities, and for extending healthy and productive life, during the entire life course.	Developing and adopting legal and regulatory frameworks that give incentives for goal-directed research and development designed to specifically address the development, registration, administration and accessibility of drugs, medical technologies and other therapies that will ameliorate the ageing processes and associated diseases and extend healthy life.	Establishing and expanding national and international coordination and consultation structures, programs and institutions to steer promotion of research, development and education on the biology of ageing and associated diseases and the development of clinical guidelines to modulate the ageing processes and associated ageing-related diseases and to extend the healthy and productive lifespan for the population.

These measures are designed to reduce the burden of the ageing process on the economy and to alleviate the suffering of the aged and the grief of their loved ones. On the positive side, if granted sufficient support, these measures can increase the healthy life expectancy for the elderly, extend their period of productivity and their interaction with society, and enhance their sense of enjoyment, purpose, equality and valuation of life.

Ageing and Novel Financial Industry

One of the foremost issues accelerating the decline and stagnation of the global financial system is the **Big Gap between life expectancy and QALY (Quality-Adjusted Life Years), HALE (Health-Adjusted Life Expectancy) and DALY (Disability-Adjusted Life Years)**. Due to advancements made by healthcare systems and BioPharma, people are now living longer, but not healthier, and without a corresponding increase in their QALY and DALY. Development of AgeTech, WealthTech and Longevity industries can significantly help resolve this problem.

One novel trend that we can expect to see emerge in the next 3-5 years horizon is **the use of HALE, QALY, DALY metrics, biomarkers of ageing and ageing clocks** as measures for the development of novel financial derivatives. Whereas today life expectancy is hedged, in the future citizens will be able to hedge their QALY and DALY.

Synergetic advancements in health data science and financial science, empowered by AI, can enable the creation of **novel business models and new types of financial entities** that harness the enhancement of QALY and HALY in order to generate profit by tying the health of their clients to their wealth as well, through the creation of novel financial derivatives whose value is tied to the increasing gap between clients' biological and chronological age, and the declining gap between their Life Expectancy and their Health-Adjusted Life Expectancy.

Wealth is routinely regarded as an asset without question, and we are increasingly finding among wealthy investors that health should be similarly regarded as an asset. Indeed, a recent survey conducted by UBS (the largest-ever survey conducted among wealthy investors around the world) found that **9 out of 10 respondents valued their health more than their wealth**, and were already taking measures in order to preserve and maintain their wealth up to and past the age of 100.

We can envision a number of such novel financial instruments that take into account a number of factors relating to both ends of the opposed Longevity MegaTrends mentions in those report (advancing biomedicine and ageing population), including:

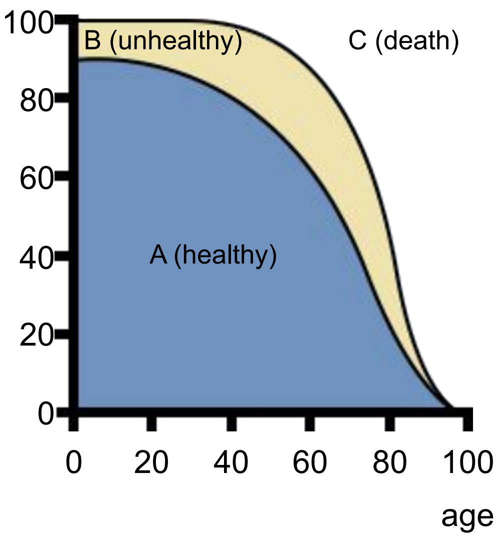
- Regarding health as an asset
- Understanding the nuance between precision medicine and precision health. If financial instruments are tied to the slowing of biological ageing, they can be secured as special financial instruments and transformed into derivatives. This can serve as a definition of precision health as well as health as an asset. This makes it a separate concept to precision medicine.
- Measuring the number of active retirees: elderly people who are active investors rather than passive deposit-holders for instance
- Measuring the number of people who were converted from active members of society to active elderly entrepreneurs
- Monitoring the improvement of the ratio of workers contributing to social services, like medicare, against the number of elderly dependents.

HALE, QALY and DALY - Quantifiable Metrics

A useful way to talk about the quality and quantity of life experienced by individuals and populations around the globe is to quantify and systematise their meaning.

The terms **QALY** (quality-adjusted life years) and **HALE** (health-adjusted life years) enable this. **QALY** specifically refers to the balance between the length of time someone lives and the quality of life in terms of the absence of disease.

HALE refers specifically to the healthy number of years someone is expected to live at birth, that is their life expectancy minus the number of years expected to be lived in a state of illness or disability.
Therefore, **HALE** is a more useful and revealing metric compared with average life expectancy.



A = time lived in good health
C = time lost due to premature mortality
Life expectancy = A + B
Health expectancy indicators (e.g. healthy life expectancy and HALE) = A + f(B)
Health gaps indicators (e.g. DALYs) = C + g(B)

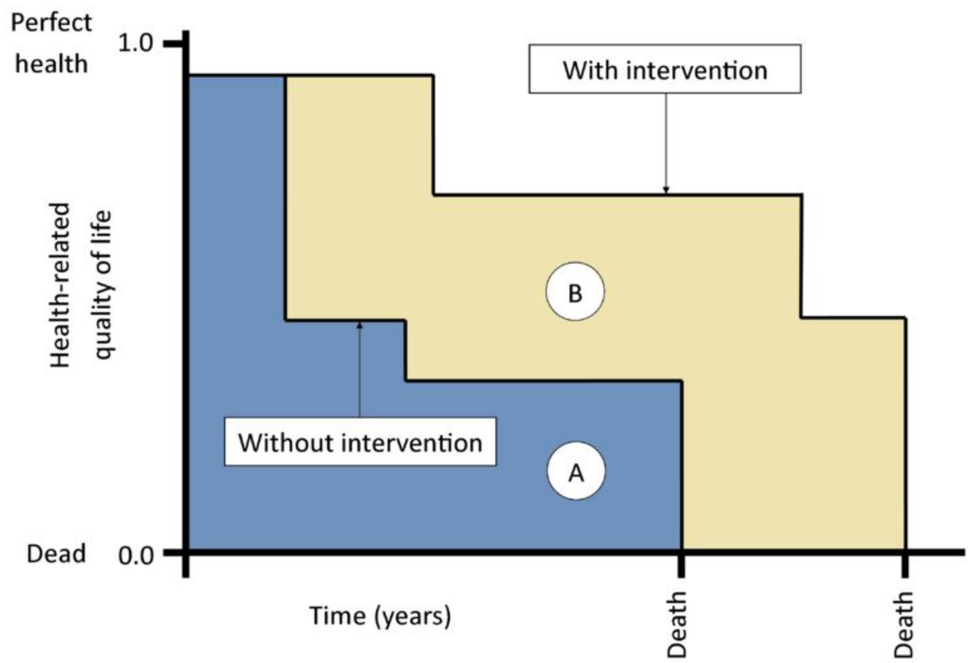
Health Adjusted Life Expectancy (HALE)

The number of years that a person can expect to live in good health

Health gap indicator = **Disability-Adjusted Life-Years (DALY)**

Number of years spent in ill health and the number of years lost due to premature mortality

Quality Adjusted Life Years (QALY)



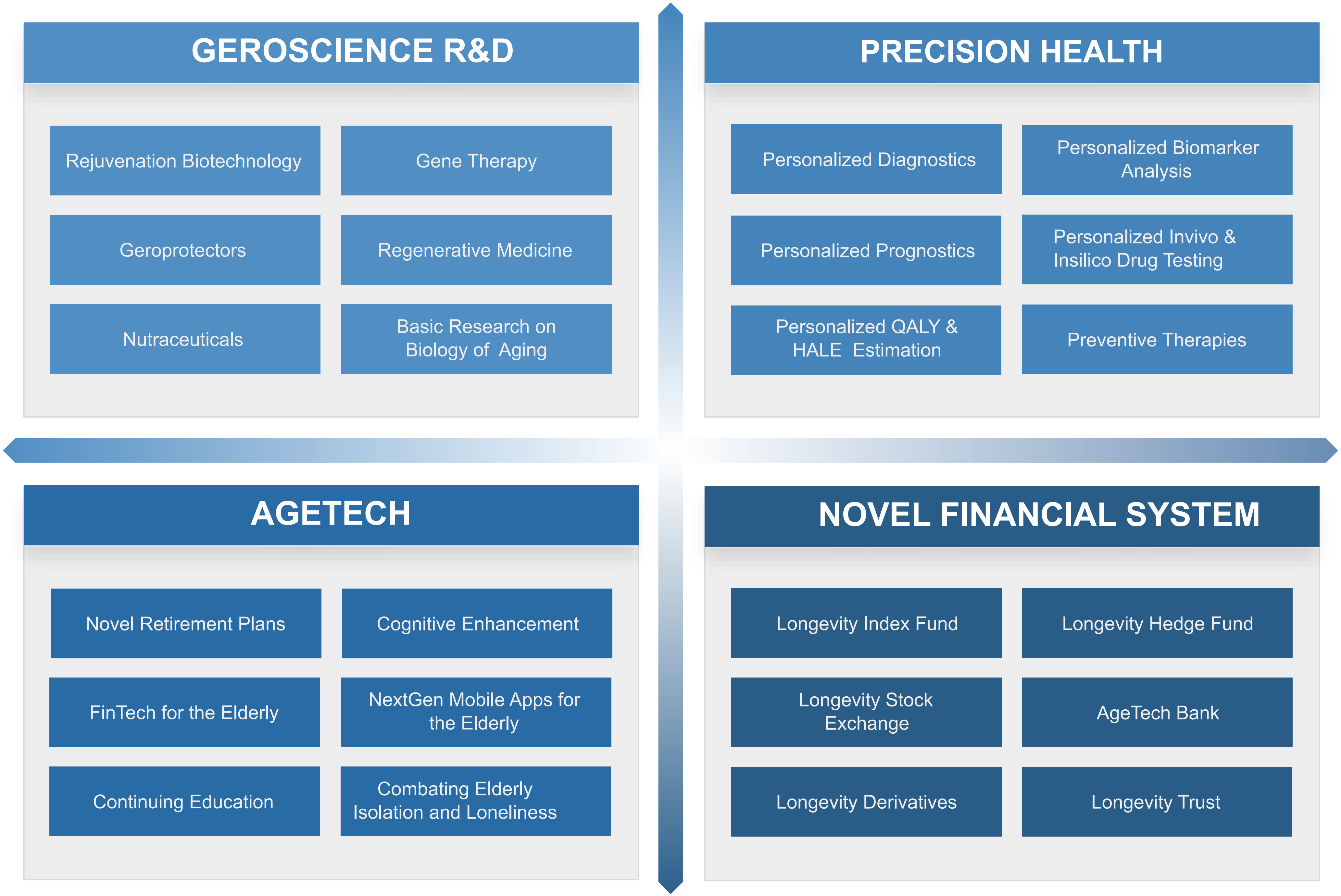
QALY illustrated: Quality-adjusted life years (QALYs) for two individuals. Individual A (who did not receive an intervention) has fewer QALYs than individual B (who received an intervention).
Health-adjusted life years can also be measured relative to DALY (Disability-adjusted life years)

By age 65, half of the population represented by the graph are still healthy, with around 15% being ill. The rest have already died. By 80, merely 20% are still in good health while almost 20% have died.

The rest are ill. Very few reach age 100, and even fewer reach 100 in good health. This highlights the proportion of Longevity that is at present associated with ill health, and the importance of extending health itself alongside the number of years lived.

Sources investopedia.com euro.who.int popflock.com

Longevity Industry Framework



Tying Wealth to Health via Tangible Metrics

HALE

Biological Age vs Chronological Age

QALY

P3 Clinic Innovation Score

Number of Years in Workforce

R&D TRLs

Practical Applications TRLs

Through the use of tangible measurements of **biological age** and **real-time healthspan** such as QALY, DALY, HALE and comprehensive panels of **biomarkers of aging**, combined with quantitative measurements of the **market-readiness** of precision and preventive medicine technologies, measures of health and Longevity can be tied to the **performance of financial instruments**, enabling the full, real-time integration of health and Longevity data science with financial data science, and the formation of a **technological bridge** between **advancing biomedicine** and the **advancing financial industry**.

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Precision Health & Health as an Asset: Tying Health to the Performance of Financial Instruments

The Integration of Health Data Science with Financial Data Science

Sources aginganalytics.com

Derivatives: Solutions to Dealing with Longevity Risk

Longevity derivatives are a class of financial derivatives that provide a hedge against parties that are exposed to Longevity Risks through their businesses, such as pension plan managers and insurers. These derivatives bring payouts when specific groups of the population live longer than expected.

Insurance-based Solutions
Buy-outs
Buy-ins
Longevity Insurance or Insurance-based Longevity Swaps

↑

Traditional Solutions

Derivatives
Longevity-spread bonds
Capital-markets-based Longevity Swaps
q-forwards (Mortality Forwards)
S-forwards (Survivor Forwards)
Tail-risk Protection (or Longevity Bull Call Spread)

↑

Derivatives,
QALY/DALY/HALE-Linked Securities

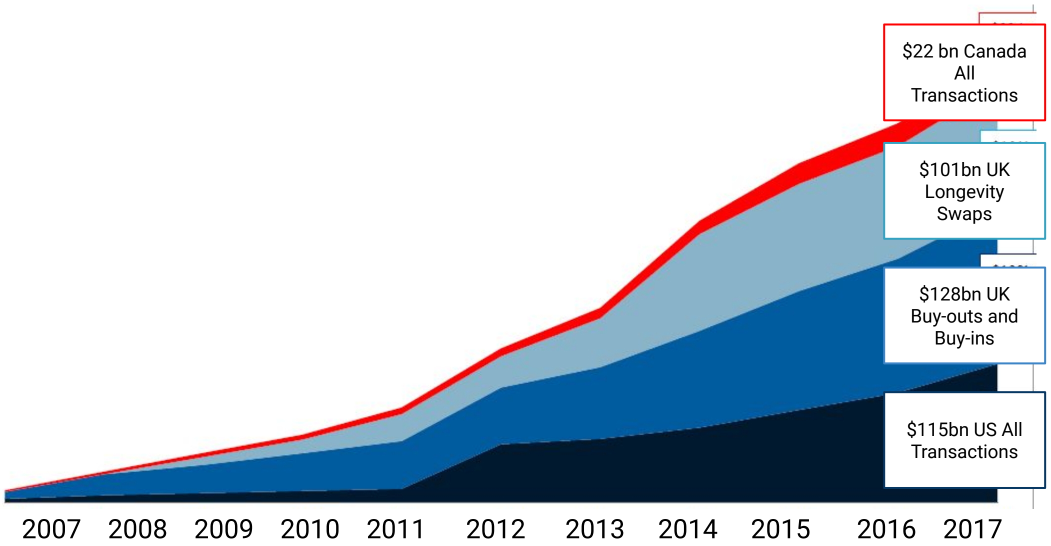
Sources dro.dur.ac.uk

Longevity Swaps and Longevity Risk Transfer

The table on the right shows Longevity swaps, Longevity Risk transfer and Longevity reinsurance transactions that have taken place in the reinsurance and capital markets since 2008, the most frequent type of deals at the top.

It shows that the most popular solutions for dealing with Longevity Risk are Longevity swaps and Longevity reinsurance.

Cumulative Pension Risk Transfer Totals by Country and Product



Sources: LIMRA, Hymans Robertson, LCP and PFI analysis as of December 31, 2017

SOLUTION	FREQUENCY OF USE
Longevity reinsurance	20
Longevity swap & reinsurance	16
Pensioner bespoke longevity swap	14
Longevity swap	6
Longevity reinsurance transaction	5
Index-based longevity derivative (swap)	2
Pension liability buy-out	2
Synthetic buy-in (longevity swap plus asset swap)	2
TOTAL	87

Sources artemis.bm

Major Threats for Financial Institutions

Conservative investing

When populations (and hence markets) age, investment preferences and portfolios will change. Investors, in general, may become more conservative in terms of investment. Elderly people prefer to invest in less risky assets like bonds and other fixed-income securities. Other than that, the rising demand for safe assets by the elderly (including through their pension funds) may lead to safe asset shortages and an overpricing of safe assets. At the same time, since risky assets such as equities are increasingly shunned, there is a possibility of an underpricing of riskier assets.

Change in the banks’ business model

The business model of banks is closely related to the life-cycle behavior of consumers. In their early years, consumers are net borrowers from banks, to pay for education and housing. Over their lifetime, consumers pay back their debt to banks. Therefore, in a consumer's later years, banks will increasingly be used for payment/transaction purposes, and less for maturity transformation. With fewer young borrowers, traditional lending activities would decline, and banks would have to enter new activities and act more like nonbanks. If not well managed (including through supervision), this transition could pose risks to financial stability.

Threat to financial stability

With saving increasingly being channeled to capital markets via pension funds, the similarity of investment approaches may lead to herding, which, combined with procyclicality in the markets, could raise volatility and threaten financial stability.

Decline in real interest rate affecting banks and pension funds

Ageing is likely to translate into a gradual rise in the ratio of capital to labor and some concomitant decline in longer-term real interest rates (Visco, 2005). The flattened yield curve would reduce the effectiveness of monetary policy transmission and could impact institutions such as banks or pension funds that rely on a steep curve for their business model. This effect may be counterbalanced by decreasing saving, which may drive up interest rates.

Major Opportunities for Financial Institutions

Financial services for retirees

Research by ILC-UK and Prudential found that while retirees have more assets than younger generations, they are more willing to save rather than spend. The combined annual savings of those in retirement is estimated to be about £49bn, the bigger amount of which is help in interest-bearing account. Thus, financial services industry should consider how it can help retirees to maximise the return on their savings.

Investments in the goods and services for elders

Elder people often control for the big part of households’ wealth. For example, Americans over 50 already account for $7.6 trillion in direct spending and related economic activity annually and control more than 80% of household wealth, according to Oxford Economics. That is why investing in the products for this type of consumers becomes more popular and many startups in this field appear. There even has been established a competition Innovating for Ageing awards, where best startups in the area are presented.

Strengthening the economy

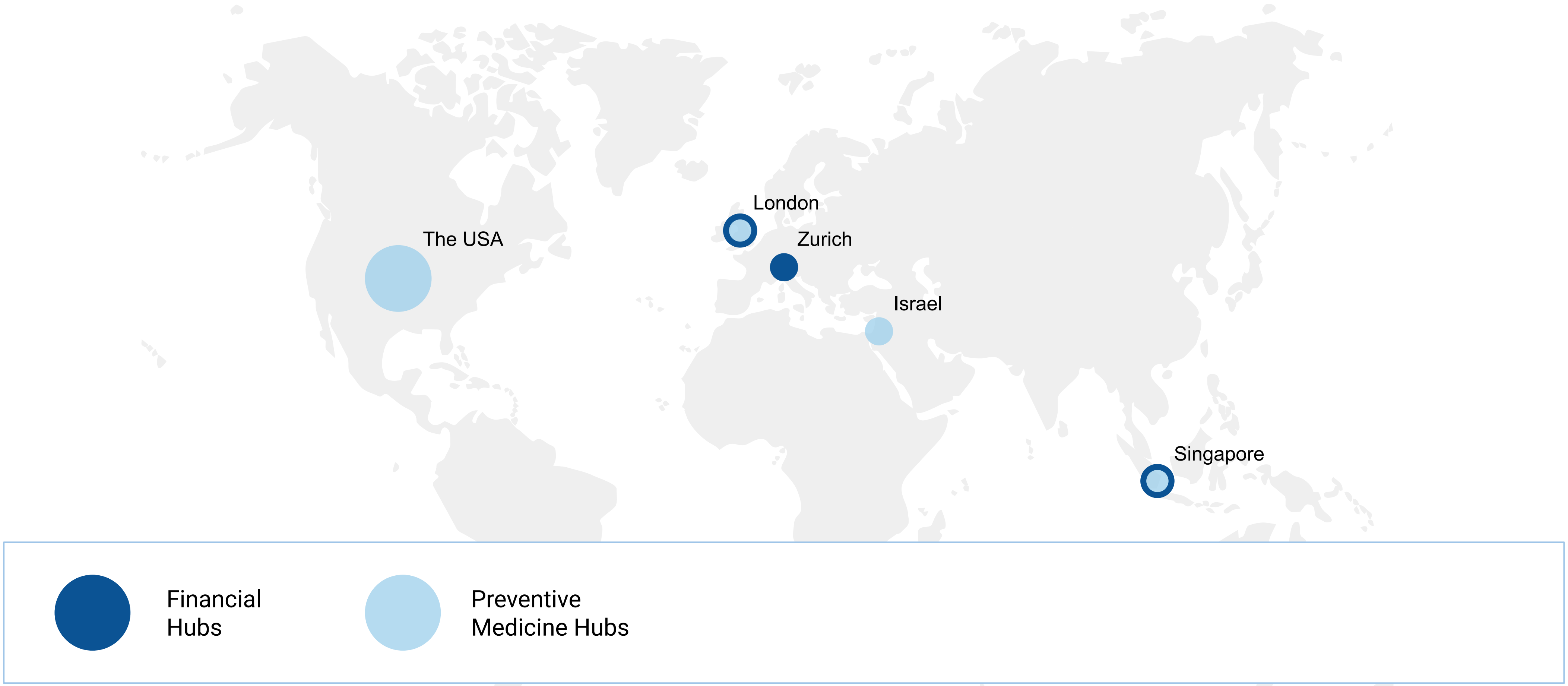
Financial security helps the elderly to bolster the economy as taxpayers and consumers; engagement enhances their own health and wellness. Consequently, it creates opportunities for pension funds, some of which are funded through taxation.

Insurance for the elderly

There will also be a greater need for specific age-related products and services, many of which will involve insurers. The first and perhaps most obvious opportunity will be the requirement for ever-more private health and pensions provision as demand increases and state health and welfare systems come under strain. For example, as there exists pressure on the state healthcare budgets, a number of services are already being withdrawn from public cover. Contributions for public and private healthcare insurances are also increasing, while the insurance cover given is curtailed by introducing more and more exclusions. The resulting demand for supplementary healthcare insurance could grow strongly. There could also be opportunities to develop and market products offering differentiated insurance cover.

Sources forbes.com ft.com pwc.com pdf

Rising Financial Hubs for the New Financial Industry



The map above identifies four major global preventive medicine hubs (London, Singapore, Israel and the USA), which for various reasons constitute hotspots of R&D and industry development in the Precision and Preventive Medicine Industry, as well as three major Financial Hubs, which for various other reasons represent epicentres of innovation and technological development in the Finance Industry.

It is notable that London and Singapore are distinguished as being hubs for both the FInancial Industry and the Preventive Medicine Industry, and as such have extremely strong potential to become global leaders at the emerging intersection of Longevity and the Advancing Financial Industry.

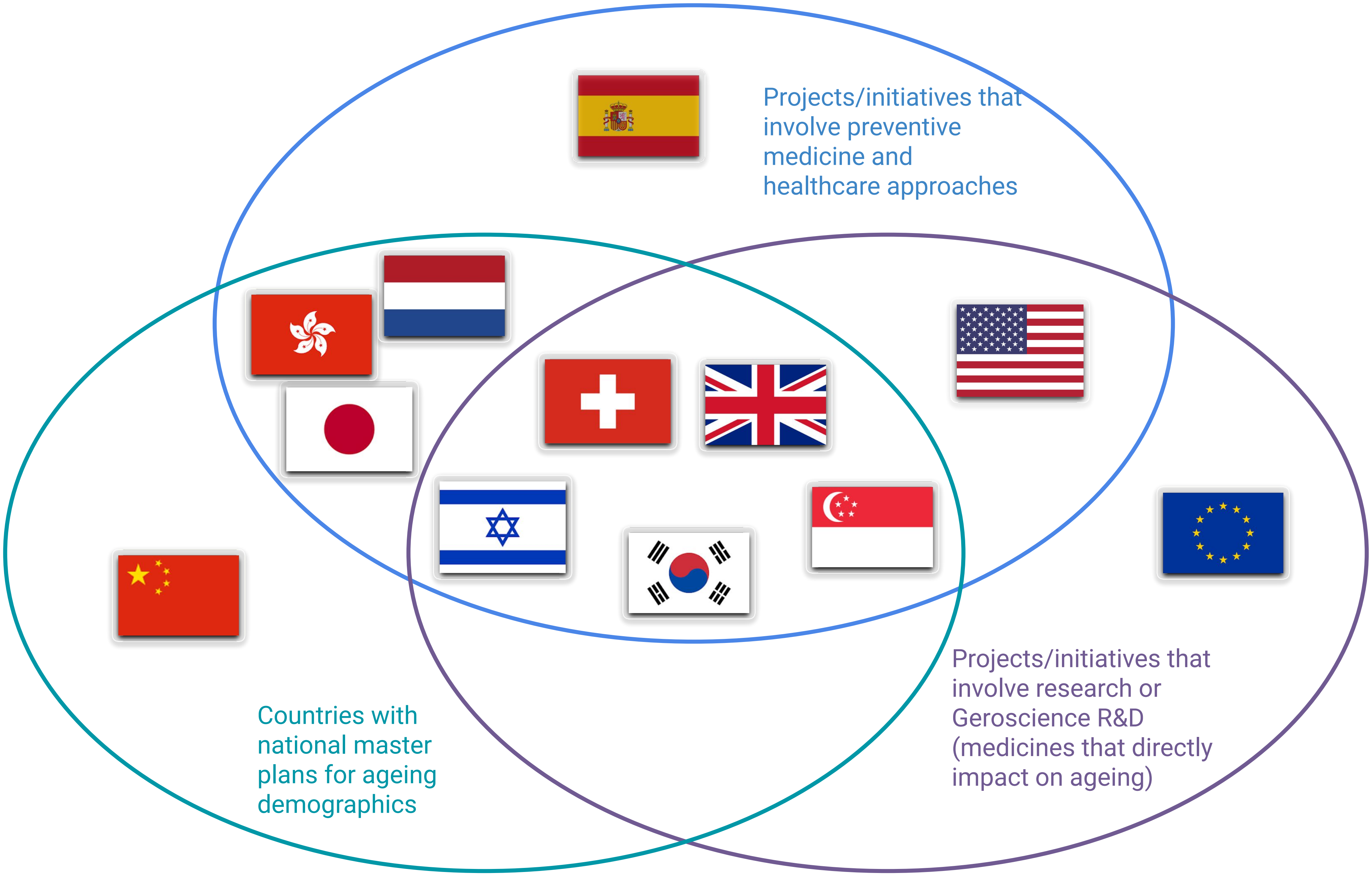
Longevity-Progressive Countries

- Israel
- Singapore
- Switzerland
- Japan
- Hong Kong
- South Korea
- United States
- Taiwan

Several Longevity-progressive countries are working on implementing social policy programmes relevant to combatting the economic issues created by aging population, with regularly advancing biomedicine landscapes, seemingly rising life expectancies, and some in particular are establishing the grounds for fruitful future Longevity-related financial products and instruments, such as Switzerland

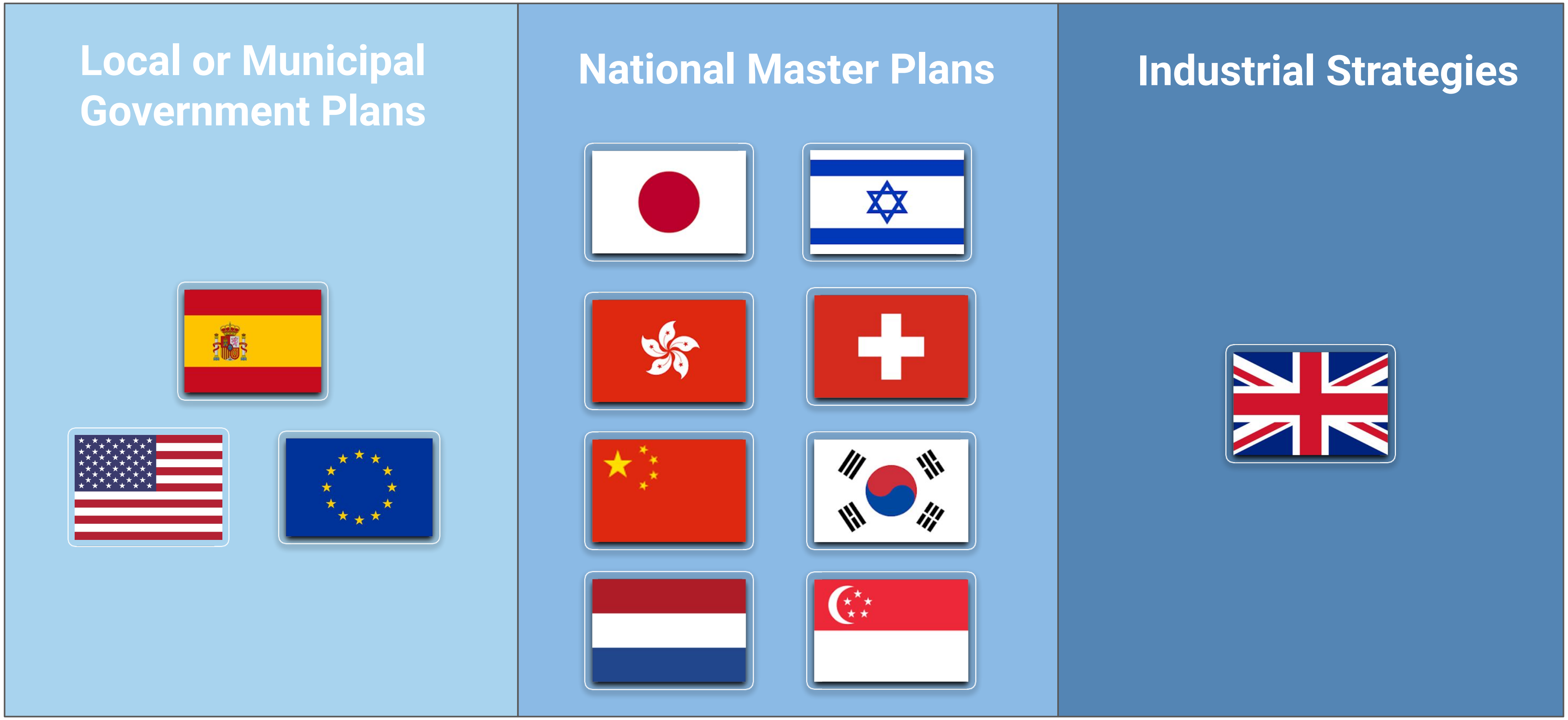
Switzerland in particular has all the elements necessary to become a leading Longevity financial hub, due to such factors as a lean political system that facilitates rapid implementation of integrated government programs, a strong research environment for geroscience, a strong research and business environment for digital health, and most importantly, international financial prowess. Some specific programmes that Switzerland has the power to develop in the next several years include the development a Longevity progressive pension system and insurance company ecosystem that accounts for both population ageing (which threatens to destabilize the current business models of insurance companies and pension funds) and the potential for widespread healthspan extension, and the development of a national strategy for intensively developing its geroscience and FinTech to a state so advanced that it propels Switzerland into a central role in the internationally competitive Longevity business ecosystem, where it can rise to become a global leader in the specific field of Longevity finance.

Longevity Initiatives Classification Framework



Scale and Scope of Government Longevity Development Plans

Some government programs are more integrated than others, some showing more leadership than others in the industrialization of longevity. In this respect, the examples in this document fall into 3 main categories: **independent or municipal programs,** one plan per project (ad hoc) or per city**, national or metropolitan master plans** which bring together multiple sectors of government, and **industrial strategies** which include the use of research and development in pursuit of future economic dividends of Longevity. The next step is the **Longevity Industry Strategy**.



• Summary
• Deliverables of the Report
• Proposal for Cooperation

Population aging and advancing biomedicine are two prominent opposed Longevity MegaTrends that will determine the near-future success or stagnation of large financial institutions.

The key questions on the intersection of Longevity and finance include:

- **What are the major threats and opportunities facing financial institutions regarding population aging?**
- **What are the tools to deal with Longevity risk? How exactly can and should they be applied?**
- **How can financial institutions benefit from the collision of Longevity megatrends?**

This will be a 100+ page report delivering practical answers to these specific questions in order to optimize the short and long-term strategies of financial institutions, with a new updated edition being released each financial quarter, incrementally increasing the precision, practicality and actionability of its industry analysis. Each new edition will provide a more sophisticated, comprehensive and precise understanding of these challenges and opportunities, as well as what financial institutions such as private wealth and retail banks, pension funds and insurance companies need to do in order to benefit, rather than stagnate, from the oncoming collision of two opposed Longevity MegaTrends: Advancing Biomedicine and Silver Tsunami.

It will deliver:

- Concrete deep analysis of the prospects of each sector of financial industry regarding the development of Longevity trends
- Tangible forecasts on the 3-5 years horizon, providing an overview of novel Longevity-related financial products and instruments that will be market-ready by 2022-2025
- Forecasting and scenario-building for the optimized way for assembling best possible tools and solutions to deal with Longevity risk and to gain profits from main Longevity trends
- Analysis and comparison of the key market players in the Longevity financial landscape

The parties who gain early access to this report will acquire deep expertise on how their strategic agendas can be optimized and stabilized in order to manage and hedge Longevity risks, to surpass the challenges and to utilize the opportunities related to progressive biomedicine, ageing population and advancing financial technologies.

Upcoming Analytical Report - Advancing Longevity Financial Industry Longevity / AgeTech / WealthTech

The major analytical deliverables, insights, trends and data from this report will be aggregated and assembled into new, extended and updated editions of the main, industry-wide landscape overview reports, to be re-released every financial quarter, incrementally increasing the precision and actionability of its industry analysis, and the depth of its industry forecasts.

Each new edition will provide a more sophisticated, comprehensive and precise understanding of the challenges and opportunities related to longevity, as well as what financial institutions such as private wealth and retail banks, pension funds and insurance companies need to do in order to benefit, rather than stagnate, from the oncoming collision of two opposed longevity megatrends: advancing biomedicine and silver tsunami.

New editions will include:

- Expanded quantitative metrics of advancing financial industry institutions and its analysis methodology;
- Updated list of advancing financial industry institutions;
- Overview of the most notable events related to the industry that happened in the second quarter of 2019;
- New predictions and possible scenarios analysis;
- Quantitative assessment of concreter market opportunities related to longevity.

These reports will aim to deliver a concrete set of clear deliverables relevant for the strategic interests of leading financial institutions, including:

- Concrete deep analysis of the prospects of each sector of financial industry regarding the development of longevity trends and tangible forecasts on the 3-5 years horizon, providing an overview of novel longevity-related financial products and instruments that will be market-ready by 2022-2025.
- Forecasting and scenario-building for the optimized way for assembling best possible tools and solutions to deal with longevity risk and to gain profits from the main longevity trends, and analysis and comparison of the key market players in the longevity financial landscape.

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