

EXECUTIVE SUMMARY

Longevity Industry in UK Landscape 2018

Companies - 170
Investors - 180
Non-Profits - 10
Research Centres - 10

Personalized Medicine



Investors

Companies

Non-Profits

AgeTech

Research Labs

Regenerative Medicine

Preventive Medicine

DEEP KNOWLEDGE ANALYTICS

AGING ANALYTICS AGENCY
Invest for life

Biogerontology Research Foundation
Prevent. Restore. Preserve.

LONGEVITY INTERNATIONAL

Introducing *Longevity Industry in UK*

This special regional case study follows-up on the content and general outline of the Longevity Industry made by our consortium in the previous Longevity Industry Landscape Overviews, including [Volume I “The Science of Longevity”](#), released in February of 2018, and [Volume II “The Business of Longevity”](#), published in April of 2018; i.e. by presenting a broad yet comprehensive Global Longevity Industry Landscape Overviews.

These ongoing analytical reports are part of a collaborative project by The Global Longevity Consortium, consisting of the Biogerontology Research Foundation, Deep Knowledge Life Sciences, Aging Analytics Agency and the Longevity.International platform.

While our aim is first and foremost to provide a comprehensive assessment of the Longevity Industry globally, we are also interested in producing regional case-studies that analyze the Longevity Industry in specific geographic locations, and consider where the United Kingdom fits into this picture.

Given our significant presence in the UK, and the substantial dynamic of development in geroscience and advanced biomedicine in the region, we decided that beginning with a regional case study in the United Kingdom in particular would be most appropriate, given our specific experience and expertise with regards to the industry players and trends located in England.

The “UK Longevity Industry Report” provides a specific landscape overview of the companies, investors, articles, books, non-profits and influencers based in the UK.

The present report gives a brief history of geroscience in the UK, with a particular emphasis on developments in the past two decades which distinguish the region as a longevity-progressive country, culminating in a detailed description of the state of the industry in 2018, and identifies the present custodians of the industry's future.

We then take a broader view of the key persons and developments in regenerative medicine, geroscience, precision medicine, and gene therapies.

Why the UK?

It is hoped that a closer look at this particular country may provide a clearer case study of how these possibilities will play out, by demonstrating how this particular nation's technological, political and economic strengths and weaknesses affect its prospects for maintaining a healthy and productive population. The UK will serve as the standard against which to compare other longevity-progressive regions, most of which have disadvantages compared to the UK, but some of which might have specific advantages in particular areas compared to the UK.

The specific characteristics that make a country 'longevity-progressive' are systematized, categorized and described in detail in Chapter VI of the Longevity Industry Landscape Overview Volume II: The Business of Longevity.

How Does the United Kingdom Measure Up as a Longevity Progressive Country?

In this publication we examine how the United Kingdom in particular is equipped to weather its own incoming 'Silver Tsunami'. As a developed nation, the UK will be one of the first to have exponentially increasing levels of older people, as well as diminishing birth rates - leading to a lower support ratio.

The report is structured in order to introduce readers to the major trends and players in the industry via several infographic MindMaps, so that the reader can quickly ascertain the report's major analytical findings and conclusions. It provides a framework to better structure readers' understanding of the entire Longevity field. It then dives into greater detail in each successive chapter, focusing on specific areas of the Longevity industry in the UK.

- The executive summary charts the major trends in the UK longevity industry in recent years, and concludes that the UK is an excellent position to achieve a global leadership position in the Longevity industry, so long as it focuses on the optimal assembly of its existing resources. It also highlights one of the strongest conclusions to come out of this report: namely that the British government should focus on and prioritize the coordinated development of its AI, Financial and Longevity industries, not separately but in synergetic convergence.
- Chapter I gives a detailed overview of the UK longevity industry, major occurrences over recent years, and charts the landscape in depth in order to identify major trends and patterns.

- Chapter II gives a detailed overview of the history of geroscience and the Longevity industry in the UK.
- Chapter III gives comprehensive coverage of the state of the Longevity industry in the United Kingdom in 2018, and analyses the major roadblocks facing the industry, as well as what major trends and developments are likely to occur over the next several years.
- Chapter IV presents the most relevant infographic MindMaps from our previous reports

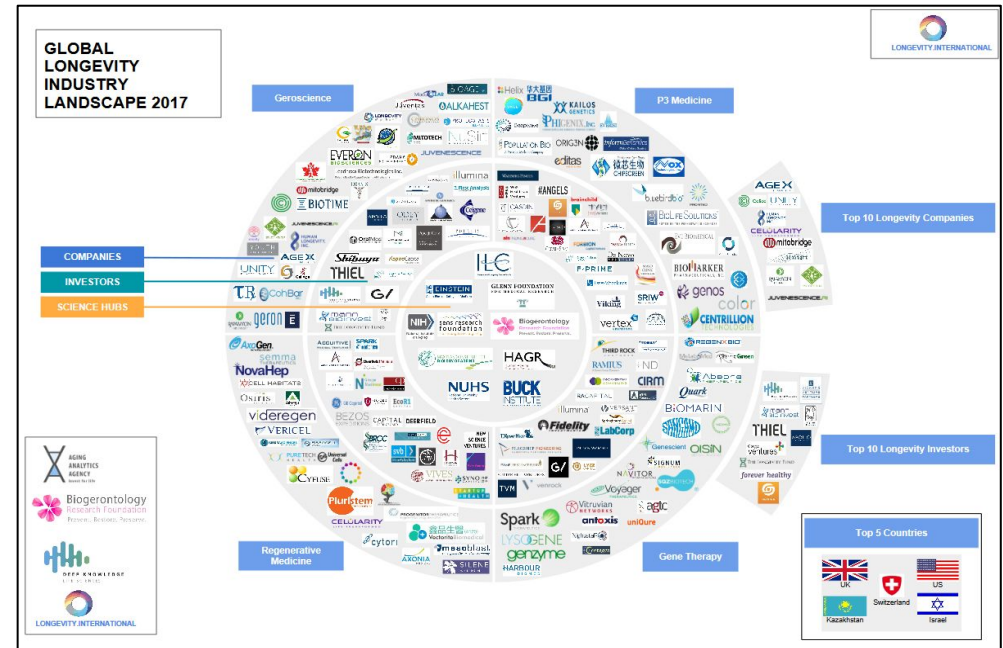
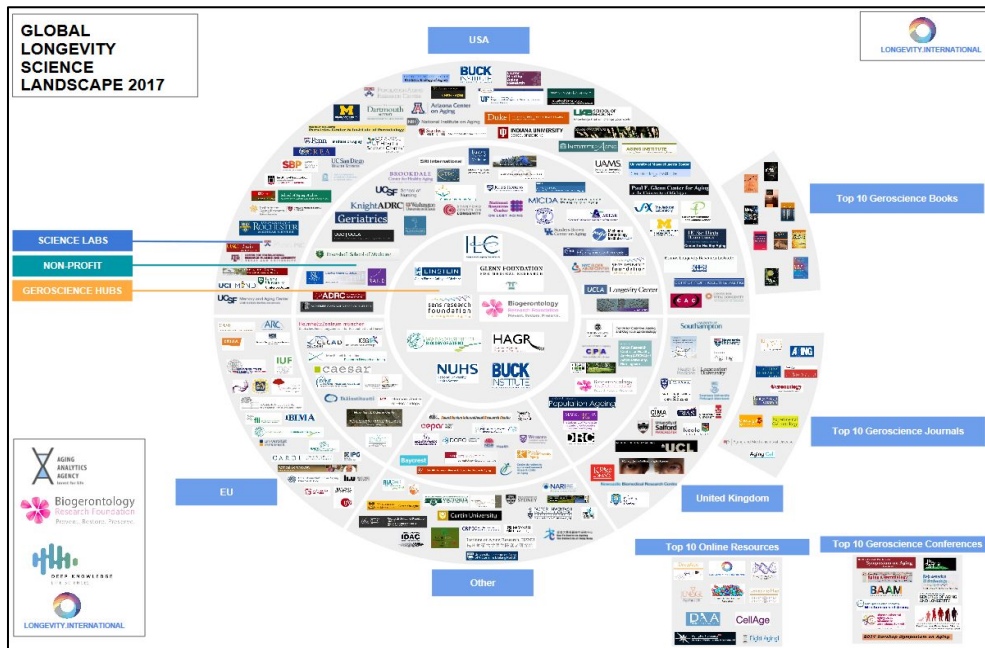
The report concludes with a detailed appendix of profiles on the major entities and influencers making up the UK Longevity industry, profiling:

- 170 Longevity companies;
- 180 Longevity investors;
- 50 Longevity articles published by UK geroscientists;
- 50 Longevity books published by UK geroscientists;
- 25 Longevity scientific journals published by UK geroscientists;
- 50 The top Longevity non-profit organizations;
- 50 Longevity influencers in the UK;
- 25 Longevity university labs and research labs.

This volume, like previous Volumes I and II, includes lists of profiles of companies and investors which we believe play a pivotal role at this juncture. Although these lists are based on dataset analysis and tangible metrics, they are projections and as such, are not exhaustive. The MindMaps below serve as a broad outline of the global Longevity Industry, and the present report includes similar MindMaps for the United Kingdom specifically.

“The Science of Longevity” Global Landscape

“The Business of Longevity” Global Landscape



Indeed our aim is not to create a definitive guide. Such an attempt at perfection would make an enemy of good. Our aim is to get the ball rolling. The sooner we produce consistent approximations of the industry, the sooner a consensus can emerge. Our consortium is also developing an online platform - longevity.international - for aggregating and crowdsourcing data, so that various stakeholders in the geroscience and the longevity industry, both globally and regionally, can play a role in fashioning this consensus. We are producing these reports with the expectation that they will themselves eventually be placed on the platform and will be transformed into interactive mode.

GEROSCIENCE R&D

Rejuvenation
Biotechnology

Gene Therapy

Geroprotectors

Regenerative Medicine

Nutraceuticals

Basic Research on
Biology of Aging

P3 MEDICINE

Personalized
Diagnostics

Personalized Biomarker
Analysis

Personalized
Prognostics

Personalized *in vivo* &
in silico drug testing

Personalized QALY &
HALE Estimation

Preventive Therapies

AGETECH

Novel Retirement Plans

Cognitive Enhancement

FinTech for the Elderly

NextGen Mobile Apps
for Elderly

Continuing Education

Entertainment for
Elderly

NOVEL FINANCIAL SYSTEM

Longevity Index Fund

Longevity Hedge Fund

Longevity Stock
Exchange

AgeTech Bank

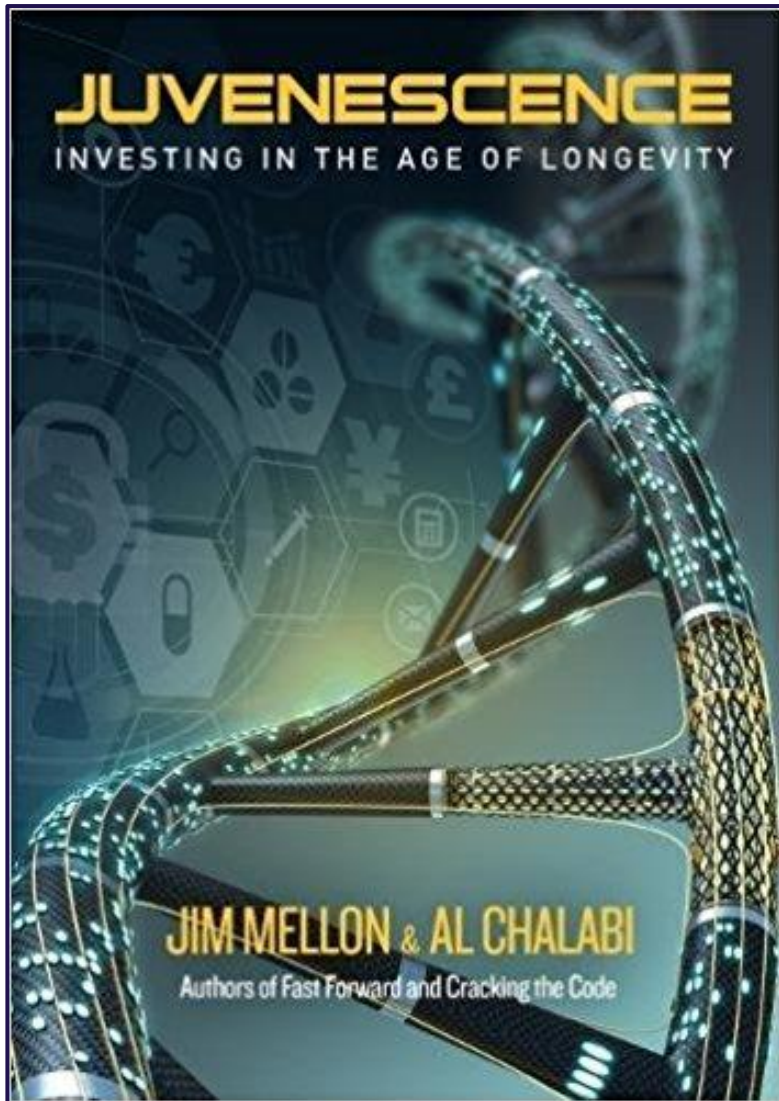
Longevity Derivatives

Longevity Trust

The UK has all the right elements to be a world leader in Longevity

- **Demographics:** The UK population is ageing rapidly while older people are wealthier than ever. All citizens are entitled to effective healthcare, and the birth rate is low. Money and power is therefore concentrated in the hands of those who would benefit from greater expenditure on biomedical advances. By 2040, one in 7 people in the UK will be aged over 75 – an increase from one in 12 today – while a third of children born now are expected to live to 100-years-old. 10 million British people alive today can expect to reach 100.
- **Healthcare system:** The National Health Service is a boon for, and a benefactor of an advanced longevity industry. The centralized healthcare system is an excellent testing ground for various longevity interventions. And the adoption of electronic health records means that it will be able to efficiently target patients for interventions, then collect and analyze the results. The rich data coming through the NHS is stratified by patient type and disease conditions that can be used at all stages of trials. While some data limits its usefulness in new trials, it is still uniquely available for AI-centred emerging solutions. Successful implementation of longevity focused practises will in the end yield a reduction in healthcare costs for the NHS. In contrast, the US' private healthcare insurance system does not allow for the same speed of testing and adoption.
- **Data:** The UK and its GP practices are slowly adopting new systems (**electronic health records**, EHRs) whereby patients can view their records, order medication, book appointments and more. Sir John Bell has said that NHS patient records are uniquely suited for driving the development of powerful algorithms that could transform healthcare and seed an “entirely new industry” in **AI-based diagnostics**. Meanwhile, researchers at an Oxford hospital have developed artificial intelligence (AI) that can diagnose scans for heart disease and lung cancer.

Present challenges at the intersection of these developing areas include the **Silver Tsunami** that is unavoidable and will impact the UK disproportionately due to its large and rapidly accumulating over-65 population. This is counteracted by advancements in **Geroscience** to yield a longevity dividend, all the while the gap between scientific progress and its respective applications is being encouraged to close by Funding Bodies, to maximise public return on investment in science, and translate as much as possible of the basic science into applications for public health via the NHS.



Today the UK is home to several leading longevity industry investors. British billionaire businessman, author of 'Juvenescence: Investing in the Age of Longevity', and founder of the biotech VC fund Juvenescence Limited, Jim Mellon, has already poured funds into Insilico Medicine, Inc. an artificial intelligence company on the forefront of applying AI for Longevity that utilises advances in genomics, big data analysis, and deep learning for in silico drug discovery and drug repurposing for ageing and age-related diseases.



JUVENESCENCE.AI

The first investor in Insilico Medicine was Deep Knowledge Ventures, led by well-known Longevity investor Dmitry Kaminskiy, editor of 1400-page *Longevity Industry Landscape Overview*.

In addition to this, London is home to a large fintech industry, and when combined with the London-Oxford-Cambridge biotech triangle make the UK the site of some of the world's most advanced science and biomedicine. Add to this the UK's geographical position as a crossroads for millions of professionals exchanging ideas and resources, and it would appear that the UK has all the raw material necessary to become a longevity biotechnology hub to rival Silicon Valley, and is in a unique position to meet the approaching challenge of an ageing population. Yet still most ageing-focused companies, Calico, Unity, AgeX, and so on, continue to take root in the US, even though the UK matches the US in scientific manpower, scientific publications, scientific conferences and laboratory facilities. The number of scientists, universities, scientific publications and conferences is significant in the UK and does not put it at any disadvantage compared to the US. In business, Longevity topic in Silicon Valley is strong, but the valuation of some of the companies there might be overhyped, and this puts the UK at an advantage: the same technologies and companies are evaluated more realistically here. This means that the UK can compete with US, and easily outperform other countries and regions to become a significant leader in the Longevity industry, not only in terms of biomedicine, but also the integration of biomedicine with the financial industry (pension funds, insurance companies), because the Longevity industry should be considered at the convergence of Biomedicine and Financial industry.

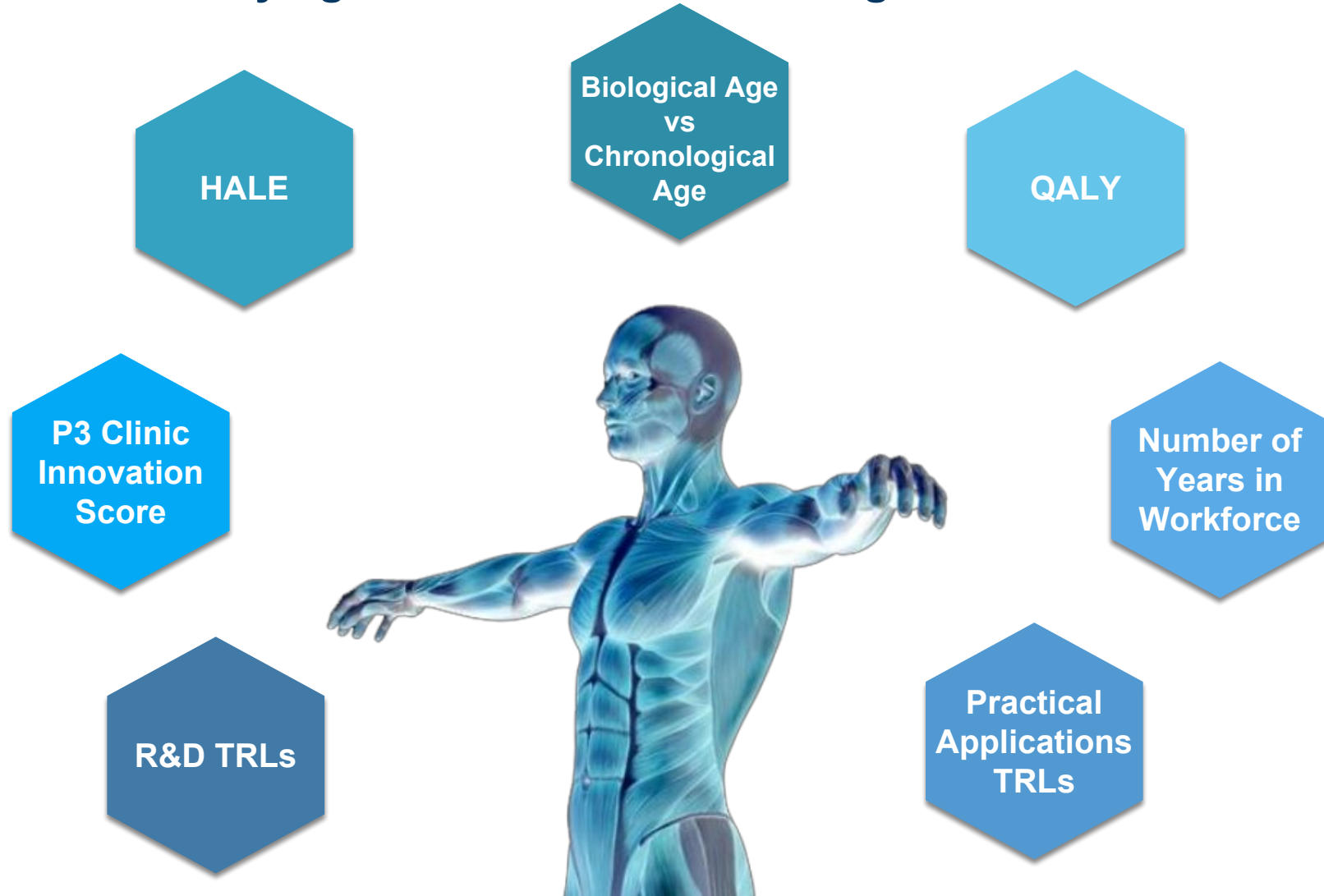
“The disappointment I had was I was hoping that a combination of the cap on care costs would help to deliver an insurer's model, where a market would grow up where everyone could insure themselves against the cost of long-term care. And we just haven't cracked that yet,” Mr Cameron said. “I'm not in politics anymore but we've got to find an answer. Given the catastrophic cost of care that people face from dementia, and I saw this with constituents, we've got to find a better answer there.”

So What's Missing? Synergy and Optimized Assembly of Existing Resources

What's missing is a political *decision* to marshal these resources effectively. Technology hubs don't just happen. There is almost always a government initiative involved at some point. Silicon Valley for example became a centre of gravity in the tech industry due to a series of government programs such as the Aeronautics and Space Act and the establishment of industrial parks. Imagine what could be achieved if the UK seized with both hands the opportunity to create a national program (in the vein of the Manhattan Project), or at least intensively foster the Longevity industry, doing for Longevity what Japan did for robotics. The beginnings of that moment has come with the publication of the UK government's Industrial Strategy in November 2017.

<https://www.independent.co.uk/news/uk/politics/david-cameron-regret-alzheimers-dementia-social-care-funding-a8088031.html>

Tying Wealth to Health via Tangible Metrics



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

The Integration of Health Data Science with Financial Data Science

This report seeks to document what makes the UK fertile ground for a global Longevity industry hub, and how that ground could be developed. The UK is an undoubtable world leader in both the finance and FinTech industries. There is growing evidence that it will become a global hub for AI, in the form of both an exponentially growing UK-based AI industry, as well as in the form of government initiatives which have prioritised development of Artificial Intelligence industry. Indeed, the UK government announced four Grand Challenges poised to transform the nation's future, and which should be treated as priority areas of national development both due to their potential impact on the UK economy, as well as due to the impact they are likely to have upon society in general. These four priority areas are:

- 1. Growing the AI and Data-Driven Economy**
- 2. Clean Growth**
- 3. The Future of Mobility**
- 4. The Ageing Society**

It is notable that both Artificial Intelligence and The Aging Society are among the Government's four top priorities for national, government-led development. If the UK government would apply a strategist for the synergetic development of these two industries, especially on the front of applying AI to preventive medicine and primary care, then, then the UK would be in an excellent position to reap many synergetic resulting from the convergence of these two spheres, i.e. AI and Longevity, increasing healthy lifespans and delivering a 'longevity dividend' from The Aging Society. Even more importantly, it is clear from our analysis both in the UK and globally, that the spheres of Finance, AI and Longevity, while still seen as separate industries by many, are recognized by more advanced thinkers as highly synergistic, with the potential to converge so as to create personalised new products and services delivering more value to consumers. Our previous report, Global Longevity Industry Landscape Overview Volume II: "The Business of Longevity", concluded that Longevity Industry does not consist solely of biomedicine, but that P3 medicine, the AgeTech market and the global financial industry are also crucial subsectors of the Longevity industry, given the significant impact that societal ageing and Longevity have upon economies in general and the economic burden of healthcare, pension funds and insurance companies in particular, as well as the fact that multiple types of financial entities have the potential to tie their performance to quantitative measures of healthy longevity like HALY and QALY in order to help economies thrive in response to an increase in its citizens healthy longevity.

One of the strongest conclusions to come out of this report is that **United Kingdom has enough resources in each of three most crucial sectors - Longevity, Artificial Intelligence and Financial Industry - to be in a strong position to succeed; nonetheless, the nation should focus on cross sector collaboration and synergetic convergence, to accelerate innovation and progress in its Longevity industry at scale.**