LONGEVITY DIVIDEND

THE ECONOMICS OF LONGER, HEALTHIER AND MORE PRODUCTIVE LIVES

INVESTIGATING AN **ECONOMIC LONGEVITY DIVIDEND**

Every country around the world is set to see an increase in the share of its population aged over 65. That leads to concerns about the negative macroeconomic consequences of an ageing society. But at the same time, life expectancy trends mean that we are living longer and are on average in good health for longer. That should be good news for the economy.

Future economic growth depends on exploiting the opportunities that a longevity dividend brings and minimising the costs of an ageing society. In 2020, the UK's Economic and Social Research Council (ESRC) awarded Professor **Andrew J Scott** of London Business School (LBS) a £1 million grant to investigate an economic longevity dividend (ESRC grant T002204).

The research programme is both empirical and theoretical, and is aimed at identifying the magnitude of a longevity dividend, the channels through which it operates and the policies that can be used to maximise its impact. For more details of the research programme and ESRC grant, visit: **longevitydividend.london.edu**

In the spring of 2022, as part of the research programme and supported by the ESRC grant and the MacArthur Foundation Research Network on an Aging Society, LBS hosted four days of conference in partnership with the University of Southern California (USC) Leonard D Schaeffer Center for Health Policy and Economics and the National University of Singapore (NUS).

The conference steering committee consisted of **Laura Carstensen** (Stanford Center on Longevity), **Dana Goldman** (USC Schaeffer Center), **John W Rowe** (MacArthur Foundation Research Network on an Aging Society), **Andrew J Scott** (London Business School) and **Erin Trish** (USC Schaeffer Center).

For full details of the conference, including video interviews with many of the conference participants, visit: **longevitydividend.london.edu/interviews**

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LONGER, HEALTHIER LIVES

The idea of an ageing society – with its focus on changes in the age structure of the population – is widely understood. What now needs to be realised is a longevity society – one that seeks to exploit the advantages of longer lives through changes in how we age. This requires substantial changes in the life course and in social norms, institutions and policies. It involves an epidemiological transition towards a focus on delaying the negative effects of ageing. The longevity society is about ensuring long lives for all that are both healthy and productive for longer.

THE NEW SCIENCE OF AGEING

Scientific advances in the last ten years indicate the potential for changing the rate of human ageing: to slow down and perhaps even reverse aspects of the process. What then becomes important is not an individual's chronological age – how many years since they were born – but their biological age – how old their body seems to be based on measurements of organ functioning and other markers – and their thanatological age – how many years they are likely to have remaining.

KEY MESSAGES

THE MALLEABILITY OF AGEING

This new scientific approach emphasises the possible malleability of age through scientific innovation and novel therapeutics. But age is malleable through other channels too: nutrition, education, behaviour, public health, the environment and medical practice all influence the pace at which we age. Across a variety of measures (incidence of diseases, mortality rates, cognitive function, physical strength), a longevity society is about helping people to age *more slowly*.

THE LONGEVITY ECONOMY

Past improvements in health and life expectancy have boosted GDP growth. The challenge now is to achieve the same outcome when life expectancy gains occur at older ages. The goal is to ensure that life is not only longer, but also healthy, productive and engaged for longer. The focus should be less on lifespan and life extension *per se* – and more on 'healthspan' and health extension – and supporting the productive use of that additional time.

INNOVATION IN HEALTHCARE

Promoting healthier lives as people get older requires shifting the focus of healthcare away from treatment of late stage disease to early diagnosis, prevention and intervention. Much depends on the incentives for innovation among scientists, pharmaceutical firms and wider society. We can learn from the experience of tackling Covid-19, as well as the longer-standing challenges of the chronic, non-communicable diseases of older ages such as dementia.

A LIFE COURSE PERSPECTIVE

A longevity perspective focuses on all of life and not just end of life. The key feature of a long life is to age well and this requires substantial changes in behaviour across the life course, as society adapts to having more future years ahead and exploits the malleability of age. The adaptation will require major changes in the social infrastructure around education, jobs, relationships and community.

KEY MESSAGES

THE LONGEVITY SOCIETY

Broad changes required to achieve healthy longevity include an increased focus on healthy life expectancy, a shift from intervention towards preventative health, a major public health agenda to avoid increases in health inequality, and an intergenerational assessment of policies to ensure that in adapting to longer lives, policies are not skewed towards older people.

THE POLICY AGENDA

A wide range of policies is needed to ensure that lives are not only longer, but also healthier and productive for longer. The agenda covers all aspects of life, but employment, education and health are central areas in which governments have a key role to play. The main focus should be on boosting employment in those aged 50 years or older, increasing education and training at later ages, and tackling health inequalities in ways that exploit the malleability of ageing and avoid inequalities compounding over longer lives.

THE MULTI-STAGE LIFE

Longer lives will require a greater focus on lifelong learning. We need to replace the traditional three-stage life sequence of 'learn, earn, retire' with a multi-stage career that facilitates a delayed start to working life, time for career transitions and adult education, and time to care for children and older parents. This change requires different corporate policies around recruitment, retention and promotion paths, as well as changes in education systems. It is not enough for governments simply to focus on raising the retirement age.

PRODUCTIVE OLDER WORKERS

Of crucial importance is finding ways to help older workers remain productive. Policies to promote higher labour force participation among older workers will depend on the generosity and availability of pension plans, the health and support available to workers, and the industrial structure and types of jobs offered. Use of robotics and artificial intelligence should also help to support employment among this group. Older workers tend to value flexible and part-time work arrangements highly, often despite lower wages. Firms need to adjust to support these new roles, as well as making use of age diversity in ways that raise innovation and productivity.

KEY MESSAGES

ACKNOWLEDGING DIVERSITY

Age malleability means that there is considerable diversity in how people age. As many more millions live beyond 65, this causes problems for policies couched purely in terms of chronological age, such as raising the state pension age. Governments need policies that provide support for those who are unable to continue working while providing incentives to work for those who can. Chronological age is a weak predictor of people's needs and abilities: what we need are more nuanced policies with different options depending on circumstances. Policies based entirely on age fail to deal with these nuances.

MACROECONOMIC PROSPECTS

The consequences of a rising proportion of older people have long been seen as a possible macroeconomic problem with potentially adverse implications for the economy: weakening economic growth as the number of people of working age declines, worsening public finances because of higher pension and healthcare costs, and persistently low interest rates. But if people behave differently over the lifecycle and if we can achieve longer and more productive careers, then other effects will be at work that can offset declining rates of return and other systemic challenges. Living for longer in better health and sustaining productivity should be good news for the economy.

BUSINESS OPPORTUNITIES

Longer healthier lives require new products and new services and that means the message about longevity needs to spread to businesses. We need more entrepreneurs creating start-ups in this space and more people working in large corporations who understand the potential for this market and the career opportunities it offers. Both through the nature of work and the products and services that they provide, businesses have a key role in a longevity economy.

THE RESEARCH AGENDA

Future economic growth depends on exploiting the opportunities that a longevity dividend brings and minimising the costs of an ageing society. Yet while considerable economic research has focused on the implications of an ageing society, there has been relatively little on the longevity society. In 2020, ESRC awarded Professor Andrew J Scott a £1 million grant to investigate an economic longevity dividend. The research programme is both empirical and theoretical, aimed at identifying the magnitude of a longevity dividend, the channels through which it operates and the policies that can be used to maximise its impact.

1. INTRODUCING **THE LONGEVITY DIVIDEND**

Every country around the world is set to see an increase in the share of its older population. Currently, one in 11 people in the world are over 65: by 2050, it will be one in six; and in China, Europe and North America, it will be one in four. That leads to concerns about the potentially negative macroeconomic consequences of an ageing society: weakening economic growth as the number of people of working age declines and worsening public finances because of higher pension and healthcare costs.

Yet at the same time, remarkable trends in life expectancy mean we are living longer and are on average in good health for longer. In 1870, average global life expectancy was about 30 years; today it is 71 and rising. In addition to there being more older people, lifespans are increasing, with children born in high-income countries today having a plausible probability of living to a 100 and centenarians forming the fastest growing demographic age group – a projected total of 19 million worldwide by 2100.

These long-run trends have been disrupted by the Covid-19 pandemic, the full impacts of which are as yet unknown. But even if the trends moderate or even stall, the reality is that in high-income countries, there is a need to adjust to longer lives.

This should all be good news for the economy. Indeed, all past improvements in health and life expectancy have boosted GDP significantly over the longer term. The key question is how do we ensure that the coming improvements also have that impact: how do we reap the longevity dividend?

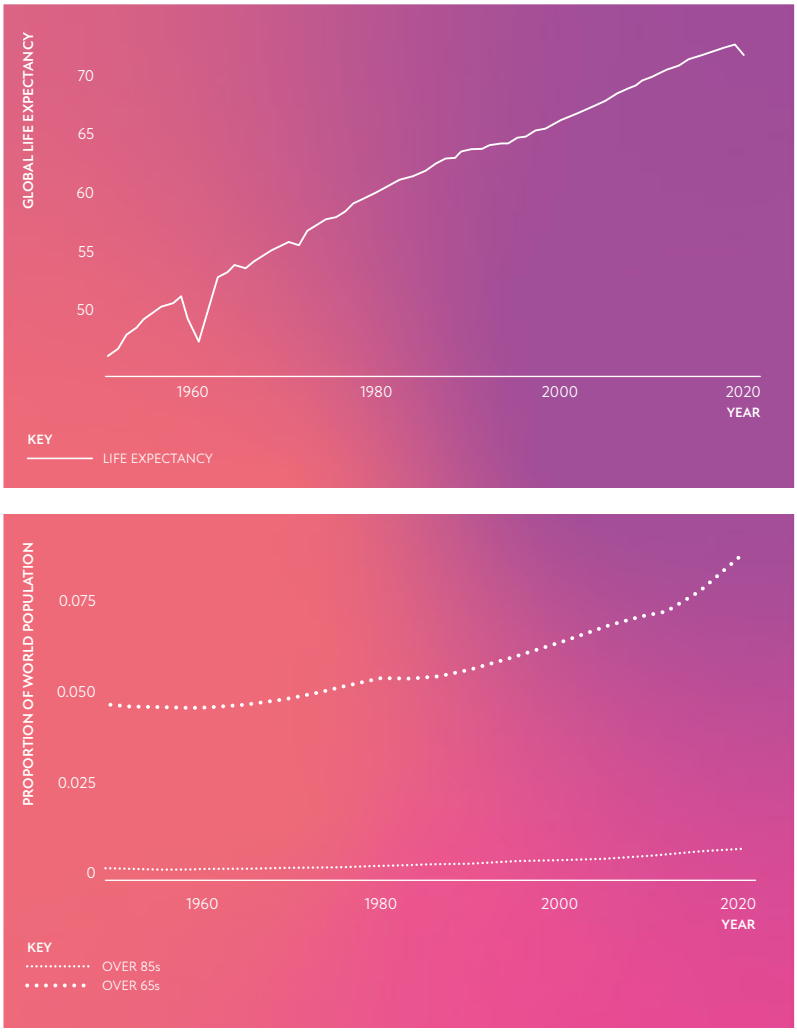
A recent report published by the US National Academy of Medicine (NAM) brought together scientists and social scientists from around the world to describe a 'global roadmap for healthy longevity'. It defines the longevity dividend as follows:

'As life spans increase over time and older adults make up a larger proportion of the population than they have in the past, societies have the opportunity to reap gains if good health is maintained for more of the years of life than has thus far been the case. If longer lives in good health are combined with the structures needed to enable healthier older adults to be productively engaged in life, society and individuals of all ages will benefit.' (NAM, 2022).

A major project at London Business School (LBS), funded by the UK's Economic and Social Research Council (ESRC), is focused on identifying the magnitude of the longevity dividend, the channels through which it operates and the policies that can be used to maximise its impact. A conference at LBS in the spring of 2022 – in partnership with the University of Southern California (USC) Leonard D Schaeffer (USC) Center for Health Policy and Economics and the National University of Singapore (NUS) – explored three key issues: the science and social science of global health and pharmaceutical innovation; the economics of longevity; and policies to promote healthy ageing and longevity-ready cities.

FIGURE 1

RISING LIFE EXPECTANCY AND THE PROPORTIONS OF OLDER PEOPLE IN THE POPULATION



The fact that people are on average living healthier, longer lives has the potential to be positive for the economy, offsetting the negative effects of an ageing society

AN AGEING SOCIETY OR **A LONGEVITY SOCIETY?**

When thinking about demographic change, the dominant narrative in economics and public policy discussion is around ageing rather than longevity. The achievement of huge increases in life expectancy is seen as burden not a benefit.

But the fact that people are on average living healthier, longer lives than previously has the potential to be positive for the economy, offsetting the negative economic effects of an ageing society (Scott et al, 2022). A longevity economy will see a shift in the mix of sectors in the economy, with both health and education expanding further and new financial products arising. Such an economy has the potential to contribute to economic growth through greater employment and human capital.

An ageing society focuses on changes in the age structure of the population, whereas a longevity society seeks to exploit the advantages of longer lives through changes in how we age (Scott et al, 2021). This requires far more than a focus on the older population. The implication of rising life expectancy is that the young can expect to become the old, and they therefore need to take different decisions now to invest in a longer future.

MALLEABILITY, TIME AND DIVERSITY – **THREE KEY ISSUES AROUND THE LONGEVITY DIVIDEND**

Improvements in life expectancy among high-income countries are increasingly occurring in later years, showing that mortality rates at even the oldest ages are malleable, changing how we age. This malleability requires drawing a distinction between chronological age (how many years since you were born), biological age (how fit and healthy you are) and thanatological age (how many years you are likely to have remaining).

By defining 'old' chronologically, the ageing society narrative does not take account of the possibility of changes in biological age and the implications of greater thanatological time, both of which lead to changes in how we age. As a result, the narrative focuses only on the negatives of an ageing society: more older people who require care and support. This omits the potential gains from a longevity agenda that supports longer, healthier and more productive lives.

Longer lives mean that we have a larger endowment of time. It is important to understand how this could change people's behaviour over the lifecycle: what does it mean for how we spend our time, how we organise our working lives and our family lives, and when and how we retire? As always, the myriad

An ageing society focuses on changes in the age structure of the population; a longevity society seeks to exploit the advantages of longer lives through changes in how we age

IMPLICATIONS FOR **POLICY PRIORITIES**

of choices made by individuals about their education, their careers and their retirement will have implications for the macroeconomy.

The malleability of age is already evident in the enormous diversity of life expectancy across social groups, locations and generations. For example, historically, British monarchs and US presidents have lived longer lives than their national averages; Glasgow notoriously has lower life expectancy than the rest of the UK; and younger generations have higher life expectancy than their predecessors. Differences in the duration of life are first defined by genetics, but they are then heavily mediated by education, income, healthcare, clean water, food, indoor living and working environments, and the overall effects of high or low socio-economic status.

The socio-economic concept of the longevity dividend can be portrayed as three-dimensional (Scott, 2021a). Healthy and productive ageing is achieved through a positive correlation between three dimensions: life expectancy, health and economic productivity.

The prospect of longer, healthier lives has big implications for public policy; for business opportunities and innovation; and for individual choices across the life course (Scott, 2021b, 2021c; Bloom, 2019).

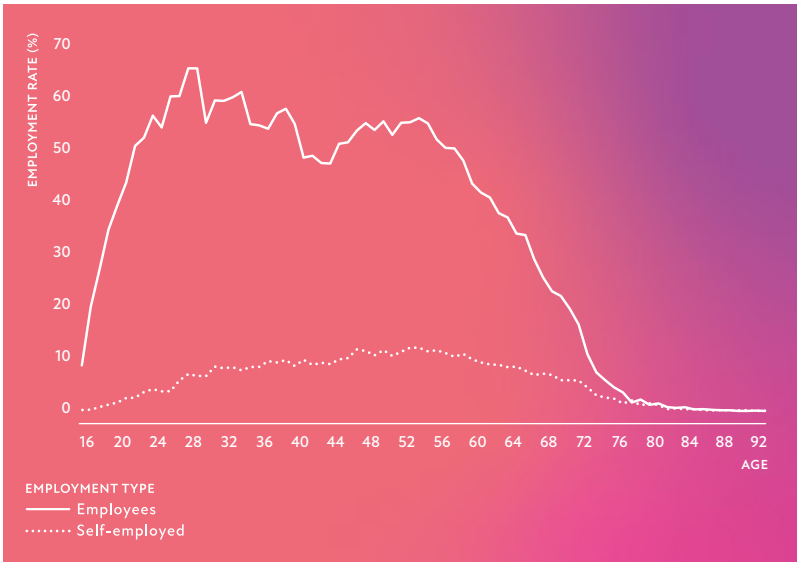
The longevity agenda aims to address the whole life course and help people to seize the opportunities that longer lives present. The agenda covers all aspects of life, but employment, education and health are central areas of focus and those in which governments have a key role to play.

Crucially important is finding ways to help older workers remain productive. This covers more than just retirement age, since withdrawal from the workforce starts at about age 50 and is often involuntary. Policies to promote higher labour force participation among older workers will depend on the generosity and availability of pension plans, the health and support available to workers, and the industrial structure and types of jobs offered. Supporting older workers also requires tackling deep-seated corporate ageism that makes it hard for older workers to get new jobs and more likely for them to be fired.

Longer lives will require a greater focus on lifelong learning. Currently, education is front-loaded in a three-stage model of life consisting of 'learn, earn, retire' (Gratton and Scott, 2016). But longevity and technological change will lead to a big increase in the need for adult education, requiring key changes in education systems. Longer careers will demand more flexibility for workers of all ages.

FIGURE 2

EMPLOYMENT RATE BY AGE AND TYPE OF JOB IN THE UK, 2014



Taking time out to retrain, for family support (both of children and of aged parents) and for reorientation, recuperation and repurposing as people adjust their work commitments up and down will all be necessary in a multi-stage life.

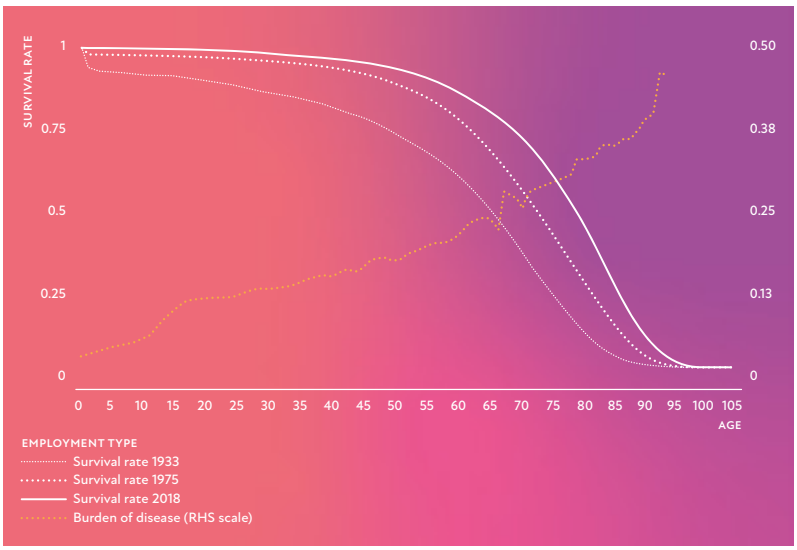
In terms of health, as populations age, the disease burden shifts towards non-communicable diseases, such as heart disease, cancer, diabetes and dementia. Non-communicable diseases are expensively and poorly managed through intervention, so to reduce their impact, healthcare providers should consider a major shift towards preventative healthcare. As with past health improvements, this will require public education aimed at changing people's behaviour when it comes to activity, diet, engagement and purpose – as well as a focus on how to avoid increases in health inequality.

With all such policies, diversity should be a key consideration. Shifting to a longevity economy requires less reliance on policies stated purely in terms of age, and more extension of existing policies aimed at diverse needs and circumstances to older age groups. This shift will be needed to counter inequality within age groups.

A life course perspective is also required, to ensure a focus on intergenerational equity and a better understanding of the needs of older people that are not health-driven. At the same time, it is important to think about intergenerational concerns to ensure that in adapting to longer lives, policies are not skewed towards older people.

FIGURE 3

SURVIVAL PROBABILITY RATES AND BURDEN OF DISEASE BY AGE IN THE US



IMPLICATIONS FOR BUSINESS OPPORTUNITIES **AND INDIVIDUAL CHOICES**

Along with technology and sustainability, demographic change is one of the major business trends of the future. But unlike technology and sustainability, longevity and ageing receive relatively little attention, which means this potential multi-trillion market is poorly understood by firms. As reality catches up with the trend, it looks set to be one of the fastest growing markets in the years ahead. Both through the nature of work and the products and services that businesses provide, they exert a strong influence on how we age.

We need more entrepreneurs creating start-ups in this space and more people working in large corporations who understand the potential for this market and the career opportunities it offers. All of them should be looking to create the products, services and behaviours that support healthier, productive and engaged longer lives.

The business opportunities of longevity go far beyond the traditional health and pharmaceuticals sector. The global food and beverage industry is worth over $6 trillion, and what we eat and drink has a huge impact on our health and longevity. Finance is another big industry with the global pension industry worth more than $50 trillion. Retirement is changing dramatically and that means major changes in pension provision. Life insurance and health insurance are converging for several innovative providers as longer lives become a reality.

Finally, there are the individual choices that people make at all points of the life course in the face of expectations of longer lives. These include their efforts to take care of their health in the usual recommended ways: exercise, diet, sleep, optimism, social interaction and so on. They also include their choices about when to invest in education, when to start families, when to work and when to take career breaks – and how to plan for security in their later years, whether that is in retirement or some new combination of work and personal life.

Central to all these decisions should be considerations of what will deliver a greater sense of wellbeing. While older age can bring many benefits, including greater experience, time and perspective to enjoy life, these benefits can only be fully appreciated if the older person has adequate financial reserves, fulfilling social connections, and good health.

The prospect of longer, healthier lives has big implications for public policy; for business opportunities and innovation; and for individual choices across the life course

2. LIVING **LONGER**

Geroscience - the biology of ageing - has made substantial progress over the last few decades in understanding the pathways by which we age (Campisi et al, 2019). There is genuine hope that treatments will soon be available that can slow down or even reverse aspects of human ageing. Much depends on the incentives for healthcare innovation among scientists, pharmaceutical firms and wider society. We can learn from the experience of tackling Covid-19, as well as the longer-standing challenges of the chronic, non-communicable diseases of older ages such as dementia.

AGEING SCIENCE

Speaking at the LBS conference, Lynne Cox of the University of Oxford provided a scientific overview of the biology of ageing – and what is being learned about therapeutic approaches to treat and prevent age-related diseases (Cox, 2023). She explained that senescence is a toxic state that cells enter as we get older, wreaking havoc across the body and generating chronic low-grade inflammation and disease – essentially causing biological ageing.

There are processes and interventions that should be able to influence ageing. For example, in 2009, scientists showed that middle-aged mice lived longer and stayed healthier if they were given small amounts of a drug called rapamycin, which inhibits a key protein called mTOR that helps to regulate cells' response to nutrients, stress, hormones and damage. In the lab, drugs like rapamycin (known as mTOR inhibitors) make senescent (aged) human cells look and behave like their younger selves. Although it is too early to prescribe these drugs for general use, a clinical trial has been set up to test whether low-dose rapamycin can really slow down ageing in people.

All drugs come with pros and cons. Since too much rapamycin suppresses the immune system, many doctors are averse even to consider using it to stave off age-related diseases. But the dose is critical, and newer drugs such as RTB101 that work in a similar way to rapamycin support the immune system in older people, and can even reduce Covid-19 infection rates and severity.

Another promising way forward is the removal of senescent cells. A growing number of lab studies in mice using drugs known as 'senolytics' to kill senescent cells show overall improvements in health – and as the mice are not dying of disease, they end up living longer too. Removing senescent cells also helps people. In a small clinical trial, people with severe lung fibrosis reported better overall function, including how far and fast they could walk after they had been treated with senolytic drugs (Cox, 2023; Cox et al, 2020).

But this is only the tip of the iceberg. Diabetes and obesity, as well as infection with some bacteria and viruses, can lead to more senescent cells forming. Senescent cells also make the lungs more susceptible to Covid-19 infection – and Covid-19 makes more cells become senescent. Importantly, getting rid of senescent cells in old mice helps them to survive Covid-19.

However fit you are and well you eat, your immune system will get less effective as you get older. Poor responses to vaccination and an inability to fight infection are consequences of this 'immunosenescence'. It all starts to deteriorate in early adulthood when the thymus – an organ in your throat where immune

FIGURE 4

HALLMARKS OF AGEING

	AT 30 YEARS	AT 75 YEARS
Speed of nerve impulse	100%	90%
Heart function at rest	100%	70%
Kidney function	100%	70%
Weight of brain	100%	56%
Vital capacity	100%	56%
Hand grip strength	100%	55%
Maximum O2 uptake on exercise	100%	40%
Number of taste buds	100%	36%
Speed of return of blood pH to normal after exercise	100%	17%

agents called T-cells learn to fight infections – starts to wither. Closing such a major education centre for T-cells means that they cannot learn to recognise new infections or fight off cancer effectively in older people.

A promising area of research is looking at signals that the body sends to help make more immune cells, particularly a molecule called IL-7. We may soon be able to produce drugs that contain this molecule, potentially boosting the immune system in older people. Another approach is to use the food supplement spermidine to trigger immune cells to clear out their internal garbage, such as damaged proteins, which improves the elderly immune system so much that it was tested as a way of getting better responses to Covid-19 vaccines in older people.

Ageing and infection are a two-way street. Older people get more infectious diseases as their immune systems start to run out of steam, while infection drives faster ageing through senescence. Since ageing and senescence are inextricably linked with both chronic and infectious diseases in older people, treating senescence with senolytics, mTOR inhibitors and other potential drugs is likely to improve health across the board.

Early stage human clinical trial results suggest that these approaches will be applicable to ageing humans, and hold significant potential to improve later life health. Investment in effective measures to prevent ill health can give high yields, with clinical adoption of treatments for, or even prevention of, age-related diseases possible within the next decade.

Clinical adoption of treatments for, or even prevention of, age-related diseases are possible within the next decade

IDENTIFYING **HEALTH RISKS**

Longer lives have produced a major shift in the disease burden and a rise in age-related diseases. That requires a shift in the health system towards preventative health. At present, we tend to see ageing as natural and we treat diseases individually, which is bad for people and economically unviable. Our focus is typically on caring for health declines, rather than preventing the decline itself in the ways being explored by Lynne Cox and her colleagues.

At the LBS conference, Sir John Bell of the University of Oxford commented that the major causes of ill health are the infections and chronic non-communicable diseases of ageing such as cardiovascular conditions, diabetes,

obesity, common cancers and dementia. We need to shift the focus of healthcare away from treatment of late stage disease to early diagnosis, prevention and intervention. The key is to identify people at risk, intervene with early stage disease and then develop novel therapeutics.

There is also an important role for people looking after their own health. Keeping the weight off, not smoking, restricting alcohol to moderate amounts and eating at least five servings of fruit and vegetable a day can increase your life expectancy by seven to 14 years, compared with someone who smokes, drinks too much, eats poorly and is overweight. And if the whole world's population got enough exercise tomorrow, the effect would probably be to increase healthy human life expectancy by almost a year.

There are important influences too from the environment in which people live. Healthy longevity is driven by factors across the life course from birth. All things work in synergy, not in isolation: we need to acknowledge that biology is not everything and it is not just about taking drugs. The socio-economic factors are crucial, and we need to look at them together with the biological factors.

LEARNING FROM **THE PANDEMIC**

What can be learned about the biology and economics of ageing from the experience of Covid-19? At the LBS conference, Sir John reflected on the lessons for global healthcare innovation and access, drawing on his experience at the heart of the UK's scientific response to the pandemic.

He said that one of the main successes of the response was the speed at which new vaccines were developed, tested and approved. The time it took to provide new vaccines to the population was far shorter than what had previously been the norm. And it was not only the speed of development, but also the effectiveness of the vaccines that was a success. UK data show that once a large fraction of the population had been vaccinated, death rates remained low even as the number of new cases resurged.

The pandemic also revealed several weaknesses in the healthcare system. First, the globalised production of pharmaceuticals makes the process sensitive to supply chain disruptions. During the pandemic, shortages of medical equipment and unequal access to vaccines could have been mitigated with a more regional approach to manufacturing.

Another weakness was the government's inability to test. UK testing capacity was far below the need for tests to track and limit the spread of the virus. On the flipside, privately provided tests were able to meet this need. Coupled with a high willingness of people to self-test at home, this ensured that social restrictions to limit the spread of the virus could be gradually relaxed.

The pandemic improved the digital environment for health data. In future, we can use genomic and other medical data to shift from age-based screening for diseases to risk-based screening. The vaccine production capabilities that were developed in response to Covid-19 should also be leveraged. Once most of the world's population has been vaccinated, these can be used to produce vaccines and injectables that prevent the onset and spread of other diseases.

On a related note, Sir John emphasised that pharmaceutical innovation needs to shift focus away from specialty drugs to treatments for the most common diseases: 'we have forgotten that the major causes of ill health are the major chronic diseases, not the targets of specialty pharma.'

Janet Woodcock of the US Food and Drug Administration (FDA) also contributed to the conference discussion of lessons from the pandemic, noting that Covid-19 has revealed weaknesses in how we both manufacture and clinically evaluate medical products. These weaknesses hampered the global response. By working together, we can overcome these flaws. The solutions will create more effective trials and generate better data for all diseases, not just pandemic ones – and they will enable innovation in manufacturing, providing much more robustness and resilience, and decreasing the effort required to respond when a plant goes down due to war, disease or natural disaster.

Further conference discussion touched on the global nature of pharmaceutical innovation, vaccine hesitancy and the value of prevention. Lynda Stuart of the Gates Foundation pointed out that one of the major failures in the handling of the pandemic was unequal access to vaccines. While new vaccines were developed at record speed, they did not become available quickly to lower-income countries. This experience seems to have caused a change in mindset in these countries: in future, they are not going to rely on high-income countries for vaccines and instead will be inclined to develop regional vaccine development capacities.

It is vital that politicians understand the value of disease prevention, as it should be the main objective of healthcare systems

As a counterweight to this view, one participant pointed out that much of the capital used to develop new vaccines comes from drug sales in the US. If the country is subsidising the development of new pharmaceuticals, is it not then reasonable that US citizens should be first in line when a new treatment is available? While participants found it hard to argue against this stance, they agreed that regional manufacturing capacities would help to improve global preparedness for the next pandemic.

The response to the pandemic not only differed between higher- and lower-income countries, but also among developed economies. While the UK rapidly implemented lateral flow tests, the US insisted on using PCR tests, a much more time-consuming alternative. Similarly, the US was unable to consolidate and make use of health data in the same way that the UK did. This inability to adapt in the face of changing evidence and conditions made US handling of the pandemic less effective. As one participant pointed out, the size and complexity of the country makes rapid changes difficult.

One of the main challenges in dealing with the pandemic was vaccine hesitancy. In the UK, the government used health data to identify and reach out to people who were slow at getting the vaccine. The lack of centralised data management made this approach impossible in the US. At the same time, the US political environment may have made people more sceptical of vaccines.

Finally, the importance of prevention rather than treatment was reiterated. One participant claimed that 'In America, we don't have a healthcare system, we have a disease care system.' It is vital that politicians understand the value of disease prevention, as it should be the main objective of healthcare systems.

ACCELERATING **HEALTHCARE INNOVATION**

In pursuit of longer, healthier lives, a central issue is not only the science but also the economics. Of particular importance in making it possible to achieve the three-dimensional longevity dividend are the incentives for global pharmaceutical firms to accelerate innovation, lower costs in a responsible way and deal with regulatory reform. This was much discussed at the LBS conference.

Champions of deregulation often point to the endless hoops that pharmaceutical firms must jump through to receive approval from the US government for their products. The most consequential product in recent times – Covid-19 vaccines – became available less than a year after the pandemic started and smashed the previous record of four years set by the MMR vaccine. A primary reason was the reimagining of the FDA approval process as part of the Trump administration's Operation Warp Speed.

Health and domestic policy advisers had been pushing for these reforms in late 2019, leaning on FDA commissioner Steve Hahn to remove hurdles or parallelise procedures. Acting chair of the Council of Economic Advisers at the time Tomas Philipson, now back at the University of Chicago, was among the voices calling for such changes and sees Warp Speed's success as vindication of this view.

Speaking at the LBS conference, he identified three important but controversial areas where the FDA could update its policies based on this experience to foster more innovation. First, he called for expediting the scientific review process after data are received from applicant firms. Medical journals take two weeks to ingest the same material and produce a decision to publish or not, so he argues that it is mainly a backlog problem. One of his proposed solutions is for firms to pay to jump the queue because waiting does not benefit the industry or its customers.

Second, he said firms running clinical trials should be allowed to provide incentives for participation. The primary bottleneck for developing new drugs is running a procedure that has sufficient statistical power, and finding patients to participate. Payments to encourage participation are discouraged on ethical grounds, but Philipson sees this as an artificial restriction of supply. Instead of maintaining indirect quantity controls, interested firms could make the financial decision easier for lower-income people to get to the trial stage as quickly as possible.

Third, he advocated removing efficacy standards from the FDA certification process. 'Why should the government be a naïve arbitrator of product quality' in the market for health products, he argued, when it does not take such an active role in other domains? In other words, supply and demand forces will eventually find an equilibrium where prices reflect the quality of competing drugs, not FDA policies.

Philipson's views elicited strong reactions, particularly on the issue of efficacy, but they represent an important perspective informed by economic theory. Government played an important role in the delivery of vaccines to end the pandemic and now new ways of doing things have shown they may have benefits even if other stakeholders have reservations.

Janet Woodcock picked up some of these issues, noting that while regulators know there is room for improving clinical trials, they must coordinate their responses. As the primary US regulator of drug development, the FDA is a stakeholder at every stage of the process with a dual mandate to ensure safety and efficacy. This includes setting standards for clinical trials and evaluating their results rigorously to fulfil that responsibility.

Key to achieving the three-dimensional longevity dividend are the incentives for pharmaceutical firms to accelerate innovation, lower costs responsibly and deal with regulatory reform

Unfortunately, almost 95% of global Covid-19 trial arms were randomised and inadequately powered to yield actionable recommendations. Similar issues arose in the US, not due to a lack of willing participants but a failure to facilitate access to clinical trials. Many medical centres are either insufficiently staffed to run trials or they engage in non-evidence-based clinical practices. Many resources were devoted to ultimately worthless questions during the pandemic.

Woodcock's recommendations to address these longstanding problems are twofold. First, national and international networks must be established to pool clinical trial resources quickly. These 'master protocols' would pre-arrange the lead agencies, formalise data-sharing and create a transparent process for evaluating candidates that works for all parties. This initiative could also keep such networks 'warm' between emergencies.

Second, manufacturing standards must be aligned across countries to minimise bureaucratic slowdowns. Regulators may have slightly different requirements for specific components, which means that products coming off the same line may not be immediately interchangeable without 50 forms documenting the differences. These difficulties have produced regional shortages, which she argues have little justification because the same products are eventually used in similar healthcare settings in those countries.

A better way already exists: the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use has developed a common submission dossier format for several domains. This enables joint review of various types of submissions for all countries party to the standard. More narrowly, the EU and US have mutual reliance for surveillance inspection of manufacturers, cutting down costs for both regulators and producers.

The evaluation of medical products lacked power and pace during the pandemic, and Woodcock admitted that these processes have room for improvement. Exposure of specific shortcomings means regulators around the world can work together on developing solutions that benefit all parties. She believes that reforms will then have benefits in the fight against other diseases, and not just during times of crisis. They will also support progress towards longer, healthier lives for all.

USING CLINICAL TRIALS **IN COVID-19 TIMES**

Even at the height of Covid-19, many researchers managed to run excellent, informative clinical trials, as two conference speakers explained. Sir Martin Landray of the University of Oxford, who performed the first major study of dexamethasone, an anti-inflammatory, found that when given to very sick patients, it had profoundly positive effects. His team published its findings quickly, circulated them to practitioners in several countries, and within weeks it became a key tool in the treatment of a novel disease. This demonstrated that even during a pandemic, clinical trials could be run at scale without excessive costs.

Carlos del Rio of Emory University managed a similar feat by translating his expertise in HIV/AIDS research into testing therapies for Covid-19 on elderly people. The deployment of personnel to nursing homes to obtain consent, administer the trial and collect data yielded useful results for how to protect the most vulnerable. Adapting to the constraints of telemedicine and avoiding burnout proved challenging. But the skills have been developed for deployment in case another highly transmissible disease emerges soon.

Based on this success, why not do all clinical trials look like that in the future? Both researchers agreed that the CRO (contract research organisation) model of trial administration has serious flaws. Customers, both the pharmaceutical firm running the trial and the patients involved, lose out because the process thrives on complexity. The lack of supply of testing sites creates precarious yet lucrative market power for their administrators. Certified facilities maintain onerously high standards, charge higher fees as a result, continue to get business due to a lack of competition, and the cycle is perpetuated.

Moving the clinical trial infrastructure into the community would disrupt this pattern. It would require training staff to administer treatments in other settings, either local hospitals or care centres, and sacrifice certain scale benefits. On the flipside, more potential patients could access trials, which resolves another potential supply issue. Increased representation in the trial pool also benefits pharmaceutical firms interested in the effect of their drugs on different parts of the eligible population.

Reducing the scope of data collected during trials could also aid in the distribution of sites across more locations. This entails two distinct decisions. First, substituting data that would be collected onsite with the same information that already exists elsewhere. Medical records are often made available on request, but proactive, confidential sharing could cut down on the necessary resources to initiate a trial.

Second, forgoing data that is ultimately unnecessary for bringing the drug to market. Many sites, for example, take blood samples as part of their standard operating procedures even when the firm commissioning the trial does not require them. This delays the arrival of results, discourages some patients from participating, and benefits no party involved. More pragmatic 'no touch' or 'light touch' methods would go even further towards making it possible to run trials in a variety of settings.

Even during a global pandemic, clinical trials could be run at scale without excessive costs

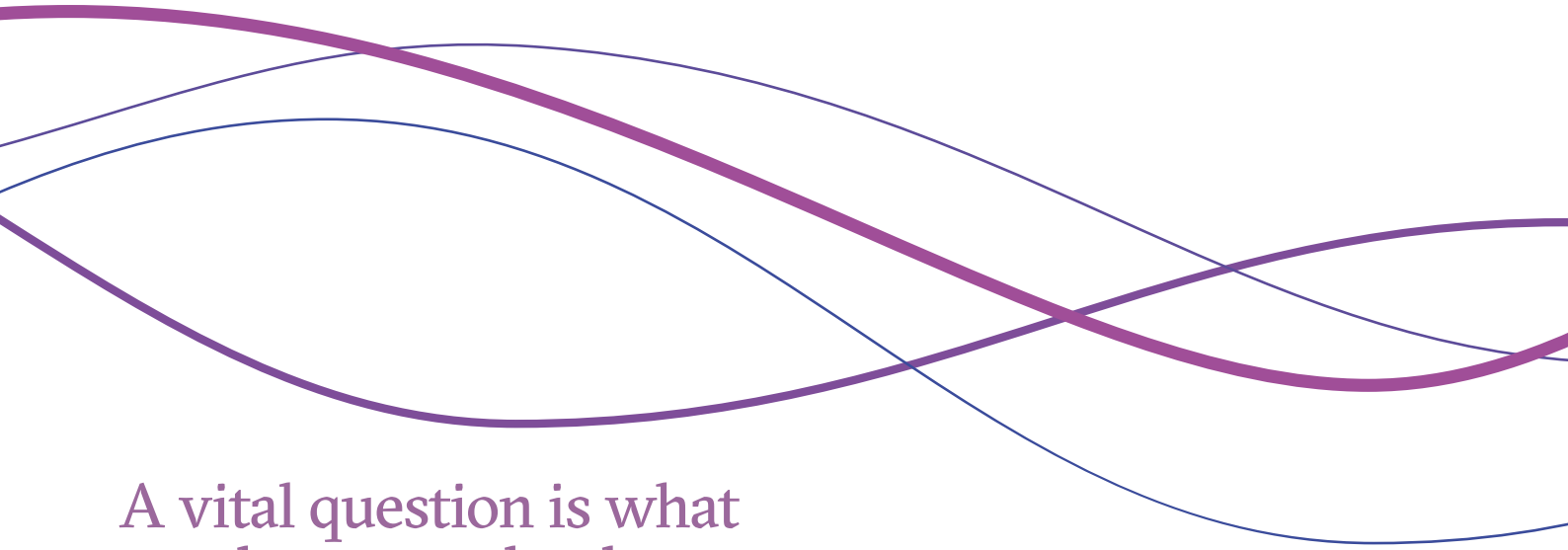
ACHIEVING SAFETY **AND EFFICACY**

A higher-level question is what regulators need to allow a product to go to market: is the role of the FDA to guarantee safety *and* efficacy? Some economists would argue that the market distinguishes snake oil from actual cures using prices that reflect the demand for different treatments. Automobiles, for example, must pass safety tests to be deemed 'road legal,' but consumers can buy whatever vehicle makes them happy.

Medical practitioners counter by saying the experience of taking a new pill is different from driving a new car. The treatment may take a while to register with the body, alternatives may not work as well, and every person is different. In contrast, comparing cars requires a few test drives, which should have no lingering consequences. Applying the same trial and error standard to drugs may result in severe outcomes that could be avoided with slightly more regulation.

Disentangling safety and efficacy is also difficult during a clinical trial. Side effects may interfere with the desired outcome of a treatment or create unacceptable risks for some people. Doctors benefit from more information when deciding whether or not to prescribe specific medicines, especially if there are substitutes with different risk profiles. Regulators would also have to devise a new safety threshold that may prohibit some drugs from becoming widely available to the detriment of consumers.

It should also be noted that some people have serious conditions and different thresholds for what constitutes 'safe'. The 'right to try' movement has empowered these patients to demand access to unapproved treatments when they believe the risk of not taking a pill outweighs the risk of taking it. People saved by experimental drugs, advocates argue, are evidence that onerous safety standards have pointlessly cost countless lives. But expanding and expediting clinical trials in this manner are not decisions that policy-makers take lightly.



A vital question is what regulators need to know about a pharmaceutical treatment's safety and efficacy to allow it to go to market

REWARDING VALUE IN **GLOBAL PHARMACEUTICAL MARKETS**

The conference discussions next turned to how pharmaceutical treatments should be priced. According to Darius Lakdawalla of the University of Southern California, there are two main considerations. First, prices should reflect the value of the innovation – that is, the rewards should be sufficiently large to encourage innovation. Second, the prices should ensure broad access to the treatments: this is achieved through prescription drug insurance that protects consumers against financial risk.

But current drug pricing schemes do not achieve these targets. There is little consensus on how to quantify the value of drugs, which makes setting the right price difficult. In the US, the practice of cost-sharing is becoming increasingly prevalent. One recent study finds that cost-sharing reduces the use of valuable drugs. Indeed, monthly mortality rates rise by 1% for each 1% increase in cost-sharing.

So how can we achieve efficient pharmaceutical markets? A first step is to create a competitive cash market for low-cost generics. Today, drugs are on average significantly cheaper at Costco than when provided through Medicare. The actual Medicare spending on the 184 most common generic drugs in 2018 was $2.6 billion higher than it would have been if drugs were provided at Costco prices. As these are generic drugs, there is no reason why these drugs should be sold with profit. Rather, if the generic drug markets were truly competitive, any profit would be competed away and the price would be the same across all platforms.

Beyond the low-hanging fruit of low-cost generics, a more holistic restructuring of the pharmaceutical market is necessary. Lakdawalla claims that we need a new 'social contract' for drug pricing. This new contract involves value-based pricing for manufacturers, value-based access for payers, and patents that expire at predictable durations and trigger robust competition.

To achieve these goals, it is central that there is an objective measure of the value of treatments. Such a measure of value needs to take account of the context of the treatment. This is because health improvements are worth more to sicker patients, and experience diminishing returns as health improves. A first step towards producing such measures is to collect large-scale data to quantify the value of treatments.

A central driver of pharmaceutical innovation is the monetary rewards that a successful drug generates. Peter Kolchinsky of life sciences investors RA Capital Management discussed the importance of rewarding pharmaceutical firms for their innovations.

He said that drug development can be viewed as a social contract with the pharmaceutical industry. Firms invest in research and development (R&D) to develop new treatments, which are sold on the market at relatively high prices. After a fixed period, the patent protection expires and the price of these drugs drop as generic competitors enter the market. The increasing amount of generic drugs can be viewed as society's reward for financing the development process, as it is the limited period of high prices which ensures that the innovation happens.

Importantly, all drugs are part of a portfolio of innovation projects, in which some will be successful and some will fail. The price of the successful ones must therefore be high enough to cover the cost of those that failed. In other words, the development cost of any one drug should not be viewed in isolation.

Kolchinsky went on to claim provocatively that the UK is hindering progress in drug development. The UK's National Institute for Health and Care Excellence (NICE) has concluded that drugs are overpriced and are not willing to pay the listed price. According to Kolchinsky, this decision is a 'deadly virus that will leave us all worse off'. It has led some pharmaceutical firms to sell drugs to the UK at lower prices. The long-term consequence is that there will be less innovation, which will make everybody worse off.

Disease prevention is a lot more effective – and hence more valuable – than treatment, particularly in the context of longevity and the importance of delaying the negative effects of ageing

As an example, he contrasted the price of hip surgery with and without a drug that preserves joints and helps to avoid surgery. While the cost of that drug is high in the initial period, it will eventually drop. But the price of hip surgery will continue to rise. Hence, over time, the savings from developing the drug will compound and society will be better off than if the drug had not been developed.

How to reward value in global pharmaceutical markets remains a contested topic. The conference brought together people with differing views on how best to achieve the goal of rewarding innovation while ensuring broad access to these innovations. One participant highlighted that since new drugs benefit both current and future populations, it may be sensible to avoid placing the burden of the cost on today's patients. Rather, we may have to rethink the way we pay for these innovations.

Several participants also reiterated that the US should not carry the burden of the cost of developing new drugs. Today, high US drug prices ensure that pharmaceutical firms are profitable enough to fund new R&D initiatives. Since the entire world is benefiting from the drugs they develop, other countries should pay a price proportional to the value created.

A central theme in the conference discussions was how to measure value. One participant highlighted that the cost-benefit analyses performed on most drugs look the same – that is, drugs are valued according to some narrow value elements, and based on these elements, most analysis look the same. But the analysis changes significantly when including more value elements. As an example, cost-benefit analyses of vaccines do not incorporate the value of prevention. The value of new vaccines change significantly once the value of prevention is included.

This relates back to the key point that disease prevention is a lot more effective, and hence more valuable, than treatment, particularly in the context of longevity and the importance of delaying the negative effects of ageing. While how to reward pharmaceutical innovation remains an open question, it seems that the value of preventing disease is one factor that is missing from current valuation frameworks.

DEALING WITH **DEMENTIA**

Dementia exemplifies many of the issues around non-communicable diseases of age, including the value of prevention, the incentives for developing effective therapeutics, the challenges of implementing clinical trials, and the economic and social burden of what is a widespread and globally increasing condition. Julie Zissimopoulos of the University of Southern California, who works on the economics of dementia, explained that the cost of the disease is more than that of heart disease and cancer combined. With no means of treatment or prevention currently available, plus an ageing population, the cost of dementia by 2050 could be $1.6 trillion in the US alone.

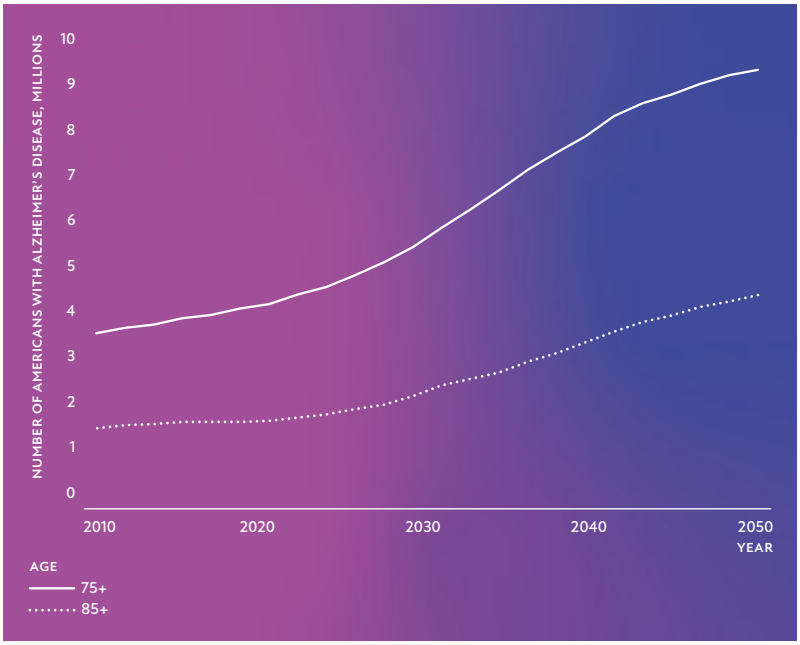
US funding for research on treatments for Alzheimer's disease has increased dramatically over the last decade, and significant progress in brain science is informing trials for novel therapeutics. But recruitment into clinical trials has been much more difficult than for other diseases. It has also been challenging to achieve diversity among trial participants, a particular problem since minority populations are at higher risk of the disease.

Research by Zissimopoulos and colleagues has explored possibilities of prevention of a disease that is typically detected at a late stage or goes undetected. By improving and increasing cognitive assessment early when symptoms are mild or moderate, it is likely to mean that people are more suited for clinical trial participation, which can aid

Dementia exemplifies many of the issues around non-communicable diseases of age, including the need for prevention, therapeutics and clinical trials – and the economic burden

FIGURE 5

DEMENTIA INCIDENCE AND PROJECTIONS



progress on novel therapeutics. It can also help individuals and their families to plan for their financial future and bring together the supportive services that they are going to need (Zissimopoulos et al, 2014).

Finally, there are important issues around the cost of care for people with dementia, and the health and economic implications for their families. People with dementia live for four or five years on average, but some can live for 10-12 years, which implies very high costs of intensive care. Most families need to have unpaid family caregivers or look to the labour market. But since the workforce of caregivers for dementia is currently poorly paid and insufficient to meet demand, care often falls on a family member. If it is an older spouse, they may have their own health issues; if it is an adult child, it has a big impact on their labour force participation with long-term implications for their wealth and wellbeing.

Healthy and productive ageing is achieved through a positive correlation between three dimensions: life expectancy, health and economic productivity

3. ACHIEVING AN ECONOMIC **LONGEVITY DIVIDEND**

Society needs to create a three-dimensional longevity dividend (Scott, 2021a). We already have longer lives, and the previous section emphasised the importance and challenges of making them healthier. This section focuses on a third dimension – making them productive for longer.

That will involve different career structures; changes in work, labour markets and business behaviour; and radical shifts in the nature and timing of retirement. It also requires a deeper understanding of people's choices and preferences, and the key drivers of happiness. The focus here is on extending productive lives in the form of paid employment, but as stressed by Bloom et al (2020), many older people also make a substantial unpaid contribution in the form of caring and volunteering.

CREATING AGE-FRIENDLY JOBS

If societies are to benefit from a longevity dividend, finding ways to help older workers to remain productive and to support longer working careers is crucial. These objectives involve more than just retirement age, since withdrawal from the workforce starts at about the age of 50 and is often involuntary.

Raising employment at older ages requires either greater willingness to work on the part of older workers and/or greater willingness on the part of firms to hire them. A range of measures can contribute to this objective: increasing incentives to work through social security reforms, improving the health of older workers and their education, greater use of automation, and measures to tackle age discrimination.

An especially important lever is to create 'age-friendly' jobs for which older workers have a comparative advantage. For example, if available jobs become less strenuous for older workers or enable them to use their skills more effectively, then they will have greater willingness to work. Reflecting this, current OECD policy is to 'promote employability of workers throughout their working lives' by 'creating a supportive age-friendly working environment' (OECD, 2019).

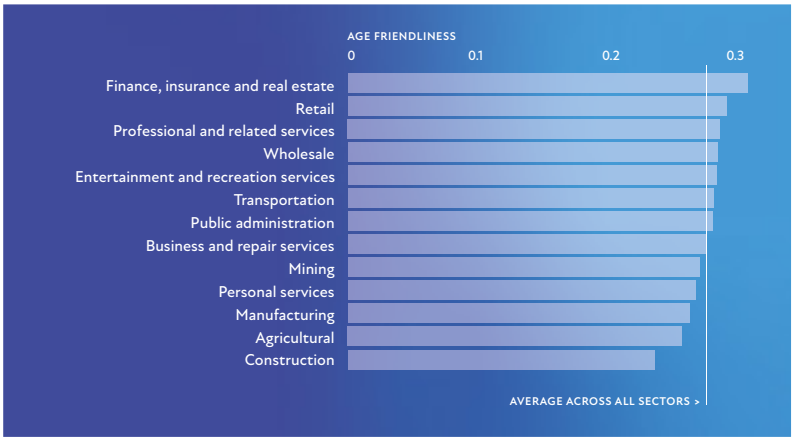
Age-friendly jobs may also have an additional advantage: the prospect of minimising the impact of rising older employment on the rest of the workforce. It is possible that sorting into these jobs by older people will lessen the downward pressure on the wages of younger workers through reducing direct competition.

An 'age-friendly working environment' requires that older workers have distinct skills and preferences. Older workers typically prefer occupations that provide flexible scheduling, reduced job stress, less demanding cognitive and physical work, less commuting time and the opportunity to work from home. While these characteristics are desirable for all workers, evidence suggests that they are particularly attractive to older workers.

Raising employment at older ages requires either greater willingness to work on the part of older workers and/or greater willingness on the part of firms to hire them

FIGURE 6

AVERAGE AGE-FRIENDLINESS INDEX BY INDUSTRY, 2020



Note: This figure shows average age-friendliness based on employment-weighted occupations in each industry. The solid line is average across all sectors.

If societies are to benefit from a longevity dividend, finding ways to help older workers to remain productive and to support longer working careers is crucial

Research that analyses changes in the US occupational structure between 1990 and 2020 to construct an index of its age-friendliness reveals that the labour market has become more supportive of older workers (Acemoglu et al, 2023). The study, presented by Nicolaj Mühlbach at the LBS conference, finds that three-quarters of US occupations became more age-friendly, and employment in above average age-friendly occupations increased by 49 million. This coincided with a significant rise in the proportion of workers aged over 50 – from one in five to one in three.

This substantial increase in age-friendly jobs is partly due to rapid growth in office and retail jobs compared with construction and manufacturing. But most of the increase is simply due to more occupations becoming more age-friendly. In other words, general work trends are making it easier to work for longer.

But the news is not all good. While most sectors have seen an increase in age-friendliness, not every industry is age-friendly: for example, construction, manufacturing and agriculture have the lowest levels of age-friendliness. Closer examination also shows that older workers were not the main beneficiaries of increasing age-friendliness: top quartile age-friendly jobs increased by 33 million, but only 15 million went to workers aged over 50. Many of the new age-friendly jobs have been taken up by young women and young graduates, and older male non-college graduates have not gained much.

These findings have two major implications. The first is that simply promoting the creation of age-friendly jobs may be insufficient for promoting employment and income growth for older workers and shielding younger employees from the impact.

The second is that age-friendly policies need to be designed with other labour market imperfections in mind. There are too many differences among older workers (especially graduates and non-graduates) and similarities between younger and older workers (again, especially among graduates) for purely age-based policies alone to be optimal.

The challenge is how to make the jobs of non-graduate men more age-friendly and how to help them to shift into more age-friendly occupations. The former can be achieved through the greater use of robots that take on more physically challenging work, a process that seems already to be happening in manufacturing. Helping older men who are not college graduates to shift into more age-friendly occupations is part of a much larger multi-stage life agenda. Success requires a focus on skill provision, supporting transitions and shifting social norms that make a more comprehensive range of jobs more acceptable.

WORKING LONGER, RETIRING LATER

So what has been happening to employment at older ages across the world? Speaking at the LBS conference, Shruti Singh at the OECD said that in recent decades, employment rates for older workers have increased in many OECD countries, particularly those aged 55-64. The employment rate for this group has risen from an average of 58% across all OECD countries in 2015 to 61% in 2021. This is largely due to a number of reforms to pension systems, including rising retirement ages, as well as tightening of other working age benefits, notably unemployment and disability, to limit their use as alternative pathways to early retirement (Aitken and Singh, 2023).

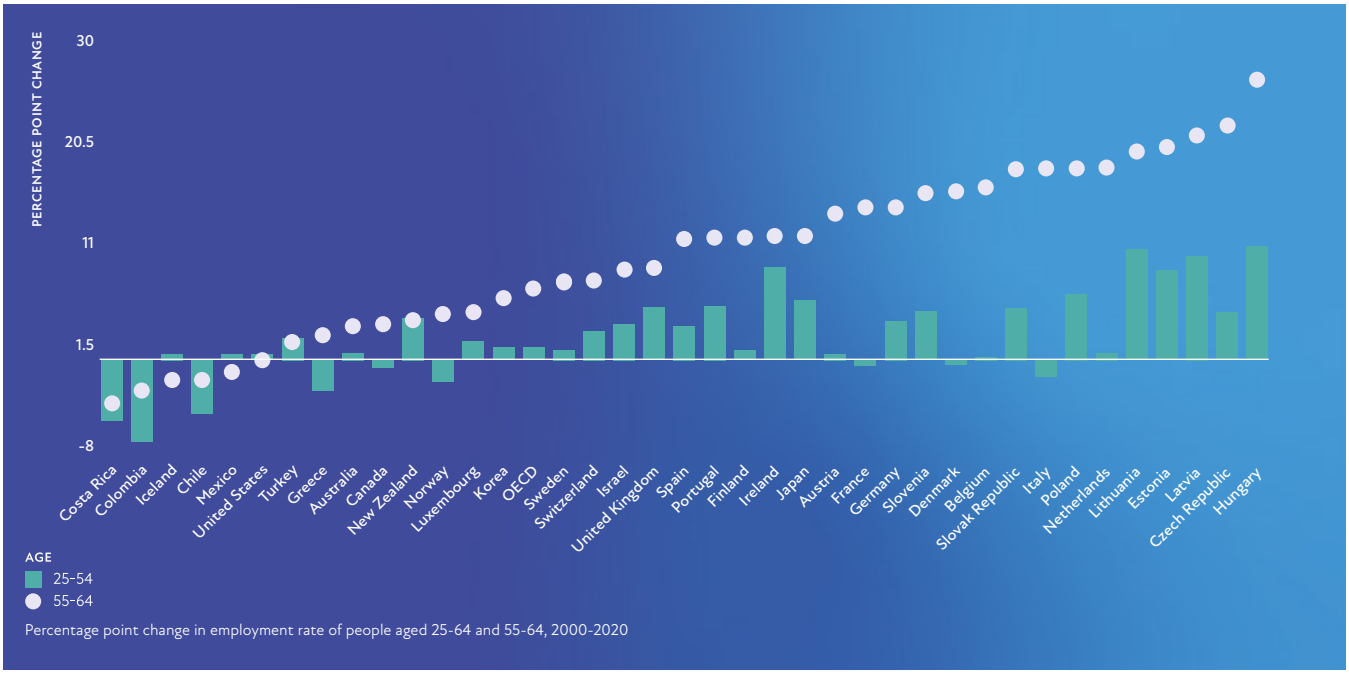
But while countries have been broadly successful in giving people incentives to work longer, it has been more difficult to increase labour demand for older workers and to motivate employers to hire them. In 2020, on average, less than one in ten employees aged 55-64 were among new hires. Combined with relatively low mobility at older ages, this has contributed to a high and growing share of all unemployed people who are aged 55-64 ever since the global financial crisis of 2007-09. Moreover, in 2019, around 38% of all older unemployed workers had been out of work for at least one year compared with 28% of those aged 25-49.

The trend increase in the share of unemployed who are older people suggests that employment and skills policies need to focus more on this group to prevent long-term unemployment. Doing so is even more important in the current debate about a 'Great Resignation' in the wake of the pandemic, which in some countries seems to indicate older cohorts in particular being more likely to have left the labour force.

It is too early to say whether this is a temporary or permanent phenomenon – there are some encouraging recent signs that it may be temporary – but it shows the importance of a greater focus on job retention and job mobility for older workers. Promoting the hiring of older workers, and helping them to stay in jobs, would also help to ease some of the labour and skills shortages that have emerged in many countries during the recovery from the Covid-19 crisis.

FIGURE 7

EMPLOYMENT HAS INCREASED FOR OLDER PEOPLE



Percentage point change in employment rate of people aged 25-64 and 55-64, 2000-2020

Source: OECD Dataset on Labour Force Statistics.

Johanna Wallenius of the Stockholm School of Economics developed the story, noting that the employment rates of older men have risen dramatically since the mid-1990s in a number of developed economies. Nevertheless, the employment rates of men aged 55-64 in many OECD countries remain at or below the levels observed in the mid-1970s, despite substantial improvements in health and longevity.

She summarised some of the driving forces behind the dramatic changes in older men's employment over recent decades (Wallenius, 2023). Part of the decline has been due to negative aggregate shocks to the labour market. But there have also been ill-advised institutional responses: first, the 'lump of labour' fallacy, whereby many countries thought that they could boost youth employment by getting rid of the old; and second, 'shadow' social security, in which older workers receive unemployment benefits for a longer time, creating a bridge to retirement. In France, the two errors were combined with workers being able to claim social security early if they were replaced by younger workers.

In the UK, there have been large changes in patterns of employment among people in their 50s and 60s over the past few decades. The share of these age groups in paid work increased from around 46% in 1994 to around 61% just before the pandemic. The trend was particularly driven by women aged 60-65, whose employment rates increased by around 25 percentage points over this period.

In the last few years, the picture has become less clear. On the one hand, there were large increases in employment rates among 65 year olds between 2018 and 2021. This was due to the most recent rise in the UK's state pension age. But among the larger group of people in their 50s and 60s, employment rates have fallen by 1.2 percentage points since the start of the pandemic, partially reversing a decades-long trend.

Each successive generation approaching retirement has more labour market attachment than the generation before it, particularly for women

It is difficult to say how employment will evolve in the future, and much will depend on the extent to which the increased inactivity rates from the pandemic are long-lasting. In general, retirement tends to be a persistent condition, with only 5-10% of people who retire in the UK returning to paid work. Around six in ten older adults who became inactive during the pandemic reported that they would not consider returning to work. But high inflation and rising energy bills could potentially mean that more return to work out of financial need, especially if retirement has been taken significantly earlier than planned.

Looking further into the future, there are reasons to believe that the long-running trend of higher employment rates among older workers will return. Each successive generation approaching retirement has more labour market attachment than the generation before it, particularly for women, which would be expected to increase employment rates at these ages. In addition, for the UK, an upcoming increase in the state pension age to 67 between 2026 and 2028 will also push up employment rates among 66 year olds.

UNDERSTANDING LIFECYCLE CHOICES

A central issue for the longevity economy is how longer, healthier lives affect what economists call people's 'lifecycle choices' around education, health, work, savings and retirement. If we can expect to live longer, we will make different decisions – and understanding these changes in incentives is essential for constructing better policies to support healthy and productive ageing. These issues have been the focus of a great deal of research by Holger Strulik at the University of Göttingen.

In work presented at the LBS conference (Strulik, 2023), he begins by noting that the observed trends in longevity are an expression of improving health at all ages. This insight implies that a serious discussion of the behavioural adjustments to improving longevity needs to abandon the view that death and mortality are exogenous objects or simple functions of chronological age.

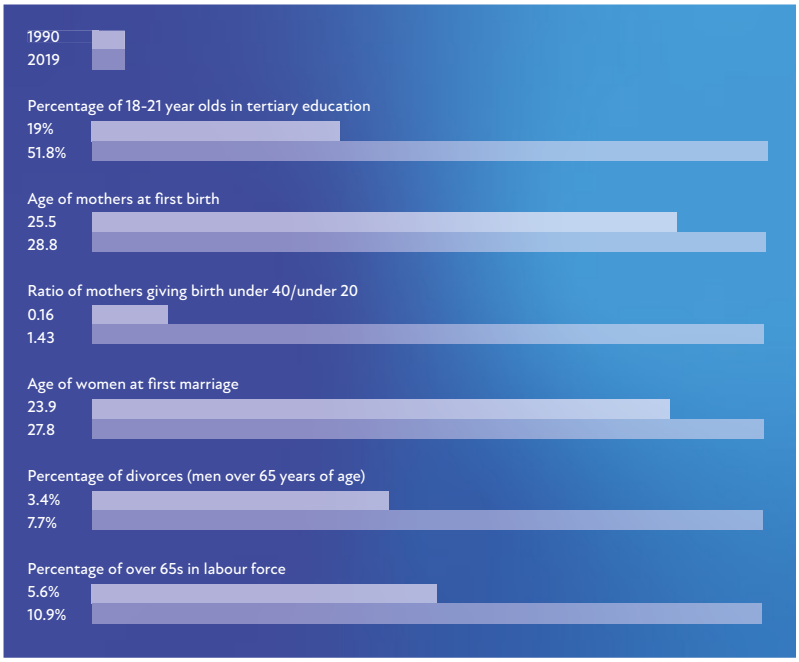
The health deficit model that he developed with a colleague (Dalgaard and Strulik, 2014) provides a gerontologically founded tool to discuss the lifecycle economics of physiological ageing and endogenous longevity. Physiological ageing is expressed as a self-productive accumulation of 'health deficits' that can be slowed down or accelerated by human behaviour.

Health deficits are measured by an established metric in gerontology: the frailty index, which records the fraction of a large list of ageing-related health conditions (deficits) that is present in an individual. Models can be calibrated with real data and used for counterfactual analysis.

In the latest study, Strulik uses the methodology to investigate the behavioural responses to medical progress defined as increasing efficacy of healthcare expenditure. The general takeaway is that behavioural adjustments amplify the impact of medical progress on health and longevity: people respond by investing more in their health, by saving more for health expenditure in old age and by retiring later, but not by consuming more unhealthy goods.

FIGURE 8

LIFECYCLE FACTS, 1990 AND 2019



Source: Scott (2021c).

Calibrated for an average American in the year 2010, the analysis predicts that a 50% increase in medical efficacy leads to a reduction of health deficits at age 65 by more than 20% and an increase of life expectancy at age 20 by more than seven years.

While the direction of behavioural responses is independent from socio-economic status, people with higher incomes and more education are predicted to benefit more from medical progress. The reason for this is that at higher levels of income and consumption, the opportunity costs of health investment and savings (for later health investment) are lower. Thus, while medical advances benefit all, this greater response by people on higher incomes widens health inequalities.

People respond to medical progress by investing more in their health, saving more for healthcare in old age and retiring later – but not by consuming more unhealthy goods

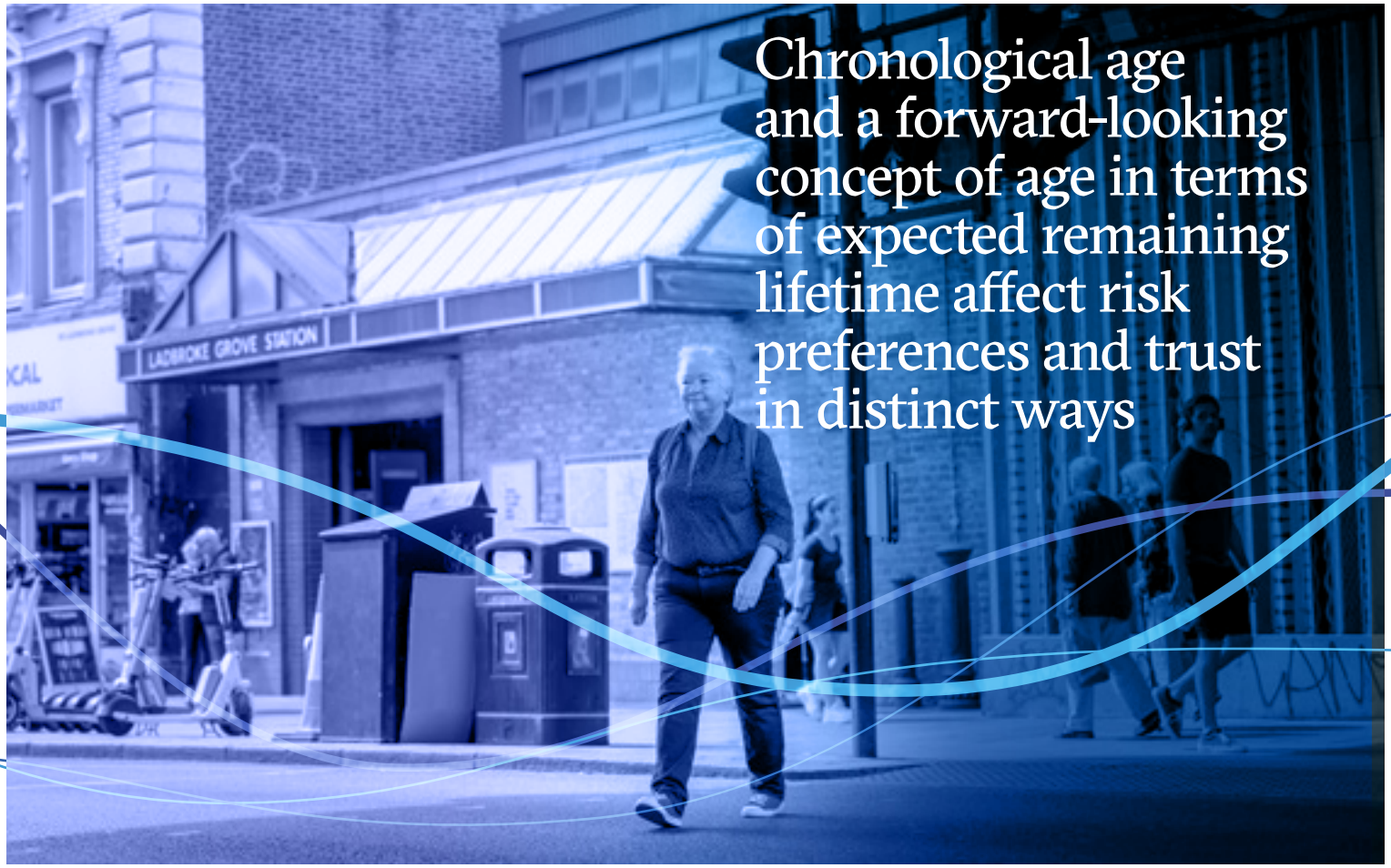
CHANGING PREFERENCES AS WE GET OLDER

Most current economic analysis of the lifecycle assumes that the only difference between young and old is their health. If we age better then this becomes less important – for example, 70 is the new 60 if 70 year olds have the health of 60 year olds, and so on. But 70 year olds are still 70, not 60. Is there something about ageing that changes our behaviour over the lifecycle that is independent of changes in our health?

One way of looking at this is to explore how people spend their time when they are young and when they are old. We can break down time use per day into activities such as paid work, unpaid work, leisure and personal care. Time use differs considerably across ages: more personal care at older ages, more leisure time, less paid work, sometimes a little unpaid work and generally a lot more leisure.

This may be because older people have built up a stock of wealth, but there may also be changes in their preferences. At the LBS conference, economist Uwe Sunde of the Ludwig Maximilian University of Munich reported his research on this question, providing evidence for the distinct roles of chronological age, prospective age in terms of statistical life expectancy, and subjective expectations about the length of life, for patience, trust and risk preferences.

Sunde notes that in some cases, it is straightforward to formulate hypotheses about the relationship between age and preferences, whereas in other cases the relationship is less clear *a priori*. For example, due to the shorter expected life horizon, it seems reasonable for older people to be less patient and less future-oriented.



Chronological age and a forward-looking concept of age in terms of expected remaining lifetime affect risk preferences and trust in distinct ways

But in the domain of risk or interpersonal trust, matters are less clear. The shorter remaining lifespan may induce older people to be more willing to take risks as they may have accumulated more experience and resources to bear potentially negative realisations, which, in addition, have consequences over a shorter horizon. At the same time, there is less time to make up for negative outcomes in the future.

Similarly, older people may exhibit more trust in others as a result of their lifetime experiences. But again, a shorter remaining lifespan may make it harder to deal with the consequences of abused trust.

A body of evidence indicates that patience (as exemplified by preferences for money now versus money later) does fall from around the age of 50 for both men and women. Risk-taking (as exemplified by lottery choice) drops throughout the lifecycle, and this too is consistent across men and women (Dohmen et al, 2017). And while older people do exhibit more trust in others, the age profile is less pronounced.

Personality profiles – openness, conscientiousness, extraversion and agreeableness – also change with age: older people are typically less open, more conscientious, less extroverted and more agreeable (Fitzenberger et al, 2021).

Of course, preferences may not vary by age, but rather by birth cohort. People who were born at different points in time have experienced different living environments or shocks, such as wars or epidemics, during the formative years of their personality. Researchers try to take account of this in their analysis of age and preferences, but it is a difficult analytical challenge.

Sunde's recent work suggests that chronological age and a forward-looking concept of age in terms of the expected remaining lifetime affect risk preferences and trust in distinct ways, with the precise influence depending strongly on the context (Sunde, 2023). In the domain of risk preferences, the shape of the age profile changes substantially once life expectancy is accounted for explicitly.

Personality profiles change with age: older people are typically less open, more conscientious, less extroverted and more agreeable

While older people are less risk averse, people with a shorter expected remaining lifetime are more risk averse. In the domain of trust, on the other hand, the age profile is affected little by accounting for life expectancy.

Another perspective on changing preferences as people get older was provided at the LBS conference by Laura Carstensen of the Stanford Center on Longevity, who works on the psychology of later life. In particular, she discussed a lens that she has developed and tested called 'socioemotional selectivity theory' (Carstensen, 2006, 2021; Carstensen and Reynolds, 2023). This suggests that preferences change as subjective time horizons shrink, and rewards related to emotional meaning in the present come to dominate rewards that play out in the future. This manifests itself in older people displaying preferences for emotionally meaningful experiences over activities that promote exploration and novelty.

Carstensen and her colleagues have tested the theory by asking people of different ages about whom they would like to spend 30 minutes with: the author of a book they had just read; a recent acquaintance with whom they seem to have a lot in common; or a close friend or member of their immediate family. Among older people, nearly two-thirds typically prefer the third option, while younger people are distributed roughly evenly across the three categories.

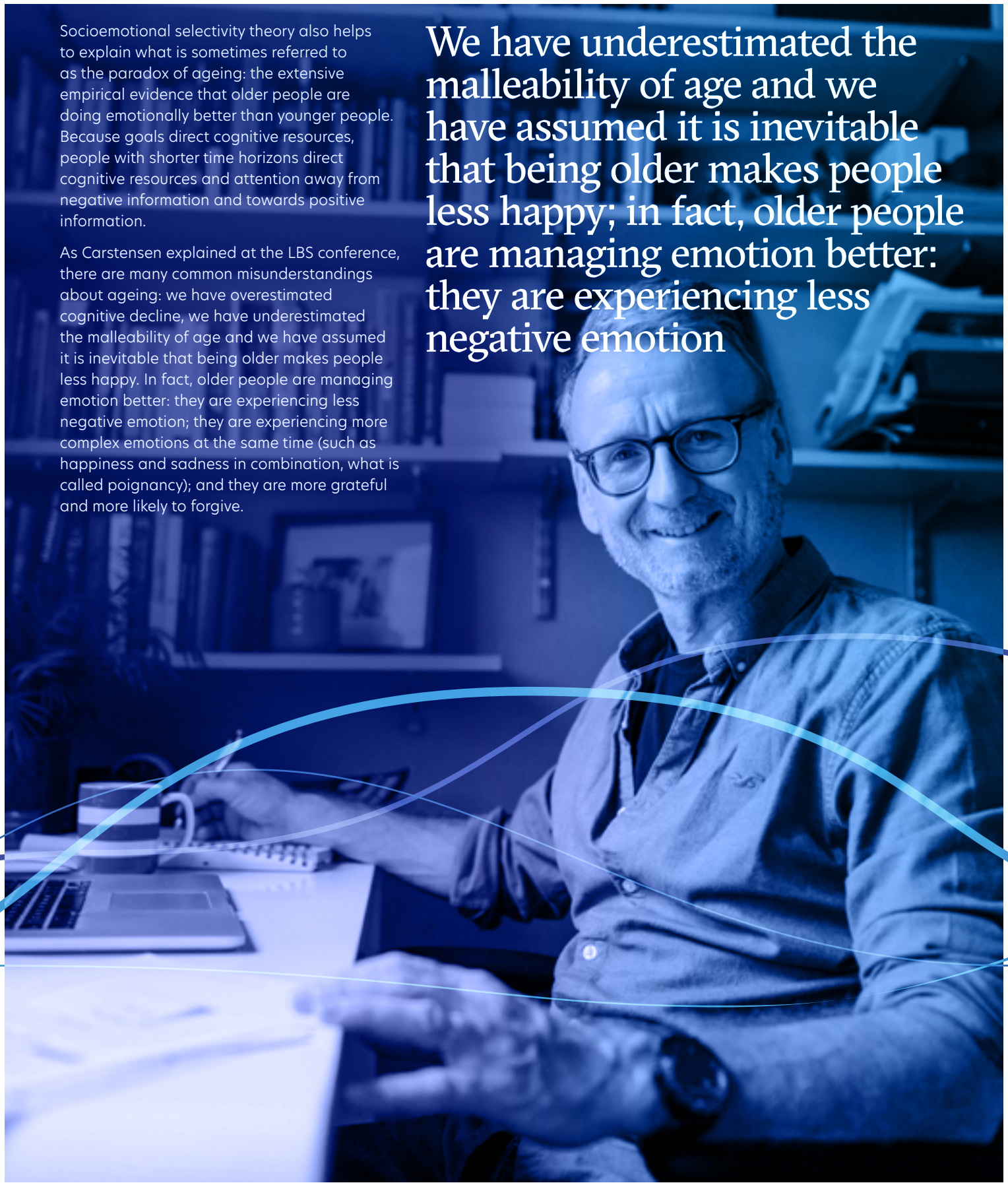
Further experiments reveal that these results are not about age, but about time. For example, if the question is supplemented by inviting the subjects to assume that they are about to move to a new city by themselves, then younger people prefer the family or close friend and look more like old people. In reverse, making the old seem younger by inviting them to imagine that their doctor tells them that they have 20 years of life more than expected, then they no longer want to spend so much time with their families.

Older people display preferences for emotionally meaningful experiences over activities that promote exploration and novelty – but this is about time not age

BECOMING HAPPIER

Socioemotional selectivity theory also helps to explain what is sometimes referred to as the paradox of ageing: the extensive empirical evidence that older people are doing emotionally better than younger people. Because goals direct cognitive resources, people with shorter time horizons direct cognitive resources and attention away from negative information and towards positive information.

As Carstensen explained at the LBS conference, there are many common misunderstandings about ageing: we have overestimated cognitive decline, we have underestimated the malleability of age and we have assumed it is inevitable that being older makes people less happy. In fact, older people are managing emotion better: they are experiencing less negative emotion; they are experiencing more complex emotions at the same time (such as happiness and sadness in combination, what is called poignancy); and they are more grateful and more likely to forgive.



We have underestimated the malleability of age and we have assumed it is inevitable that being older makes people less happy; in fact, older people are managing emotion better: they are experiencing less negative emotion

4. DESIGNING **POLICIES**

The longevity agenda aims to address the whole life course and help people to seize the opportunities that longer lives present. The agenda covers all aspects of life, but employment, education and health are central areas of focus and those in which governments have a key role to play.

In addition, there are important questions about the likely impact of a rising proportion of older people in the population on the macroeconomy: the potential effects on growth, public finances and interest rates – and what could be achieved by refocusing the policy debate away from an ageing society to the possibilities of longer, healthier and more productive lives.

AGEING POPULATION
EFFECTS ON THE MACROECONOMY

At the LBS conference, Adrian Auclert of Stanford University presented research on the current and potential impact of demographic change on the macroeconomy (Auclert et al, 2021). He noted the widely accepted view of what has been driving three key macroeconomic trends to date: ageing populations save more, which helps to explain why wealth-to-GDP ratios have risen and average rates of return have fallen.

Beyond this qualitative consensus lies substantial disagreement about magnitudes. For example, estimates of the effect of demographics on interest rates over the period 1970–2015 range from a moderate decline of under 100 basis points to a large decline of over 300 basis points.

Turning to predictions for the future, economists are starkly divided about the direction of the effect. Some models predict falling interest rates. At the same time, an influential hypothesis argues, based on the 'dis-saving' of older people, that ageing will eventually push savings rates down and interest rates back up. This argument, which was popular in the 1990s as the 'asset market meltdown' hypothesis, has recently been revived as the 'great demographic reversal' (Goodhart and Prabhan, 2020).

In the words of Philip Lane, chief economist at the European Central Bank: 'The current phase of population ageing is contributing to the trend decline in the underlying equilibrium real interest rate [...] While a large population cohort that is saving for retirement puts upward pressure on the total savings rate, a large elderly cohort may push down aggregate savings by running down accumulated wealth.'

The analysis by Auclert and his colleagues refutes this argument and shows that, instead, demographics will continue to push strongly in the same direction, leading to falling rates of return and rising wealth-to-GDP ratios. Their study suggests that although demographic forces will indeed push down net savings rates, this will be overwhelmed by an even larger decline in net investment, leading to a decrease in equilibrium rates of return.

Gertjan Vlieghe, a former member of the Bank of England's monetary policy committee who also spoke at the LBS conference, shares the view that demographic pressures will continue to push down interest rates (Vlieghe, 2023).

According to his view, not only does having more older people increase saving and depress interest rates, but also longer lives mean that people have to accumulate more assets and so want more wealth, which also pushes down interest rates. This has major implications for house prices and intergenerational fairness. It also raises issues for the ability of central banks to deal with business cycles through monetary easing when interest rates are close to the zero lower bound.

There are important questions about the likely impact of a rising proportion of older people in the population on growth, public finances and interest rates

Vlieghe concludes that there are three types of policy available to address the limited space for monetary easing in a low interest rate environment. First, there could be changes that enable policy rates to be cut into deeply negative territory. This is difficult as cash pays zero interest rates. But the constraint is weakening: cash is less attractive so people will be more likely to tolerate negative interest rates.

Second, it may be possible to have temporarily or permanently higher inflation rates. But we cannot just keep moving the inflation target as the stability of expectations will be eroded.

Third, there could be policies that raise the neutral rate by having households spend less time in retirement insofar as longevity has outstripped increases in retirement age. Reducing income and wealth inequality may also help, which may be achieved by reducing market concentration and through progressive taxation.

But perhaps the gloomy forecasts for the macroeconomic impact of longer lives will prove inaccurate. If we behave differently over the lifecycle (as suggested in Holger Strulik's analysis) and if we can achieve longer, more productive careers, then other effects will be at work that can offset declining rates of return and the challenges to growth and the public finances. It is not just about understanding at the individual level how longevity changes things, but also in general equilibrium: just as people need to adapt to longer lives with new kinds of behaviour, so too does the system as a whole.

Furthermore, if macroeconomic analysis continues to focus solely on the potential impact of rising numbers of older people, it abstracts from the need to age well and to focus on the future old in a way that avoids repeating a cycle of people living to ages for which they are unprepared. It also distracts from low fertility, which is going to cause many problems.

Just as people need to adapt to longer lives with new kinds of behaviour, so too does the system as a whole

FALLING **FERTILITY**

Like Auclert and Vlieghe at the LBS conference, David Miles of Imperial College London and the UK's Office for Budget Responsibility (OBR) looked at the overall economic impact of an ageing population (Miles, 2023). He noted that there are two ways in which a population ages (ignoring the potential impact of large-scale immigration or emigration): either people live longer or fewer are born. Both have been happening across the world (although at different rates in different countries). The tendency to longer lives and fewer children has been most marked in the higher-income economies.

There is a key difference in the way in which these two forces change population structure. Ageing coming about through people living longer (holding fertility constant) raises population when life expectancy is going up. Ageing coming about because of a decline in fertility reduces population – and can mean that population declines (potentially continuously). For the world as a whole, ageing is likely to come with continuously and rapidly rising aggregate world population. But that is not at all clear in higher-income countries.

Low fertility may mean we get a bigger decline in the labour force (certainly absolutely and probably relative to overall population) than if ageing were driven by rising longevity. Population falling along with ageing is very different from population rising with ageing, and it is much more likely if low fertility is the driver of ageing. Slow growth in GDP – even falling GDP – is likely if population declines steadily, although this need not come with a decline in either the level, or perhaps even the rate of change, of GDP per capita.

FIGURE 9

TOTAL FERTILITY RATE IN THE UK, 1880-2020

Source: Various; UN DESA; Gapminder © Statista 2022.

Population declines are no longer implausible in many high-income countries, and reflect fertility rates that potentially have greater implications for demographic structure than changes in life expectancy. They certainly have dramatically different implications for the trajectory of total population.

Why has fertility fallen so far in many high-income countries, particularly in Europe? Fifty years ago in most of today's high-income countries, economic necessity underpinned the long-term partnership model adopted by most couples. Men had an advantage in work and wages – they had more job opportunities and were paid more than women in the relatively few jobs that were equally open to both sexes. Women had a unique ability to give birth. Children were seen by many as needed for old age when state pensions were not generous and saving for retirement had been barely possible for most people.

Over the past 50 years, men have lost a good deal of the economic advantages that they brought to partnerships. As the job market opportunities for women in high-income countries have greatly widened and the gender wage gap has substantially narrowed, they have less need for men for purely economic reasons. And for most women, there is far greater control of their fertility with the wide availability of contraceptives.

Some relevant factors are enduring: single parenting remains difficult; and having children for security in old age is unreliable compared with saving. Some relevant factors have changed over the past 50 years: housing has become much more expensive in many high-income countries; and with rising women's earnings and a great increase in career options, childcare has become more expensive.

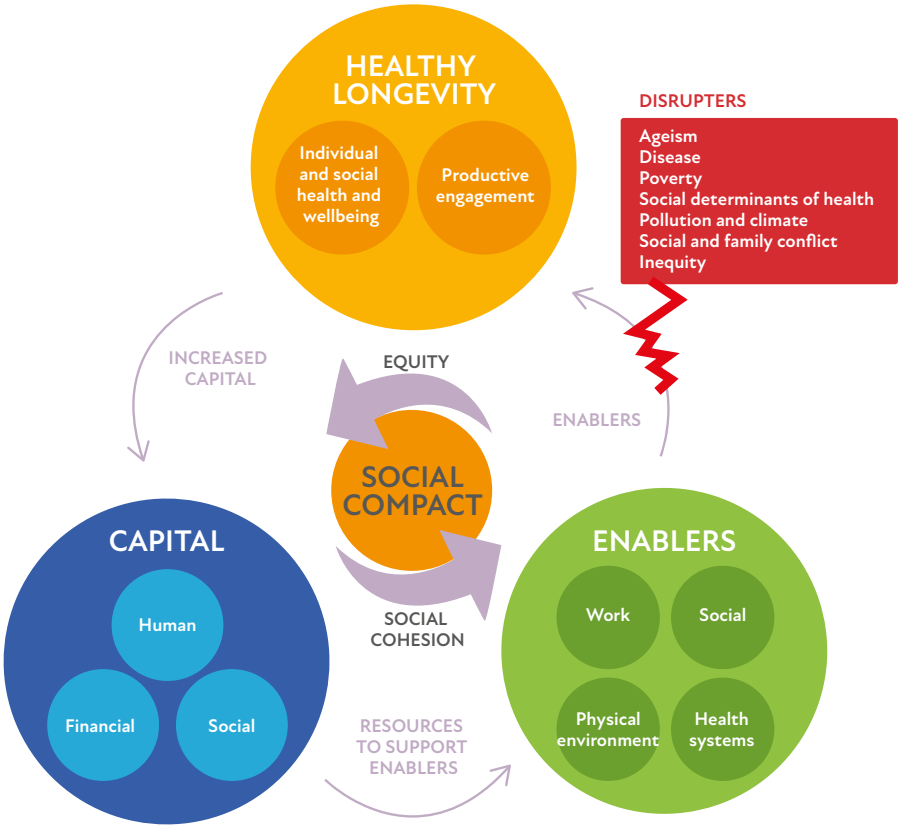
This combination of factors has greatly reduced the attractions for many women (and men too) of starting to have several children in their 20s. The options available to many women, in addition to the previously dominant one of a settled partnership with one man that began in early adulthood after which children followed in a matter of a few years, have greatly expanded. The economic cost of having several children remains high – indeed, it has probably increased for most women.

This may sound a typically dismal economist's view of human life. Yet we need population growth to slow and probably to reverse. More importantly, nearly all of these changes that have brought lower birth rates are positive and are likely to prove enduring. The changes have much increased the options available to women beyond starting a family early in adulthood with a man with whom one expects to spend the rest of one's life. It is not surprising that so many women chose to have far fewer children than in the past.

So it may be that falling population is what we get in higher-income countries from now on, Miles concludes. Is that bad? OBR projections for 50 years ahead (based on a constant fertility rate of 1.59) show a relative decline in the proportion of the population under 65, but also an absolute fall in the numbers aged under 54 despite net immigration over the 50 years amounting to around 6.5 million people. Without that, population would decline by close to 10 million rather than the 1.3 million decline predicted by the OBR to occur between 2022 and 2072.

FIGURE 10

THE VIRTUOUS CYCLE OF HEALTHY LONGEVITY



INVESTING IN BETTER JOBS **AND MORE SECURE RETIREMENT**

What can governments do to boost employment in the future? Johanna Wallenius points to three areas. First, combining carrots and sticks: we may need to provide incentives for continued employment, not just cutting benefits for those not in work. Second, allowing people to combine work and benefit collection: there is a big implicit tax when you are eligible to collect benefits but still work. Third, decisions made at household level: spousal and survivor benefits affect employment (and the budget).

According to the OECD, promoting job retention, but also facilitating job mobility and hiring of older workers, is crucial to prevent those who lose their job at an older age from becoming long-term unemployed and facing a difficult transition to late retirement, being too young to retire but 'too old' to find a new job. It is also essential to sustain and improve the employability of workers throughout their working lives – for example, by promoting better opportunities for lifelong learning and a healthy working life.

Policies to promote higher labour force participation among older workers will depend on the generosity and availability of pension plans, the health and support available to workers, and the industrial structure and types of jobs offered. The use of robotics and artificial intelligence should also help to support employment among this group. Older workers tend to value flexible and part-time work arrangements highly, often despite lower wages – something that Japan and Singapore have put to use.

Supporting older workers also requires tackling deep-seated corporate ageism that makes it hard for older workers to get new jobs and more likely for them to be fired. Governments need to be proactive in extending disability rights as well as enacting diversity legislation to support and protect older workers.

Finally, Lisa Berkman of Harvard University argues that if the US wants to make working longer a healthy reality in the future, policy-makers must level the social and economic playing field for young and middle-aged workers (Berkman and Truesdale, 2023). Investments in better jobs today could lead to more secure retirements tomorrow.

At the same time, reform of the US retirement and disability systems is needed to provide financial security for all Americans as they age. Precarious working conditions, family care-giving responsibilities, poor health and age discrimination will make it difficult or impossible for many to work into their late 60s and beyond. Similar pressures are likely to be present in some other high-income countries.

The research findings of Berkman and her colleagues suggest that working longer is set in motion long before one's 60s; it is structured by a life course history of working steadily through one's 50s. She concludes that retirement policy and labour policy are two sides of the same coin and must be considered together.

Supporting older workers requires tackling deep-seated corporate ageism that makes it hard for older workers to get new jobs and more likely for them to be fired

BUILDING **LONGEVITY-READY COMMUNITIES**

As the authors of the Global Roadmap for Healthy Longevity explain, countless studies around the world have demonstrated important linkages between various factors in the environment and the health of individuals and populations (NAM, 2022; Wong et al, 2023). Critical facets of everyday life can act as barriers to and facilitators of healthy longevity and can influence the length of time a person is healthy at any point along the life course, not just in old age.

Many cities and countries have acknowledged these connections and are modifying their public services and urban designs to create opportunities for growing populations to live longer and healthier lives in 'longevity-ready' cities (Wang et al, 2021; World Bank, 2022). But these changes need evaluation and implementation in varying contexts, especially in low- and middle-income countries, to advance understanding of how they can be optimised to have the greatest effect on achieving healthy longevity for all.

The authors of the Global Roadmap believe that to achieve the goal of creating physical environments and infrastructures that support functioning and engagement for older people, the key targets of housing, public infrastructure, transport, digital access, and environment need to be intentionally designed, properly resourced and shaped for healthy longevity.

Among their recommendations, they call for governments and the private sector to partner to design user-centred and cohesion-enabling intergenerational communities for healthy longevity. Initiatives should include:

- At the city level, developing and implementing mitigation strategies to reduce the negative effects of the physical environment (for example, air pollution and climate events such as flooding and hurricanes/typhoons) on older adults.
- At the neighbourhood level, promoting and measuring the impact of innovation and policy solutions for healthy longevity, intergenerational connection, and cohesion.
- At the home level, updating physical infrastructure to address affordability, insufficiencies, and inefficiencies in housing stock, as well as to support autonomy and social connection.
- Making broadband accessible and reducing the digital divide (for example, usability of and willingness to adopt technology) within the context of each community.
- Designing public transport options, including solutions that address first/last-mile transport needs, that can be provided to firms, foundations and local governments for implementation.

We need to design user-centred and cohesion-enabling intergenerational communities for healthy longevity

TURNING FEARS OF AN AGEING SOCIETY **INTO PROSPECTS FOR A LONGEVITY DIVIDEND**

One reason why societies fear an ageing society is because of the increasing incidence of chronic non-communicable diseases, such as dementia, stroke, heart failure, chronic obstructive lung disease and cancer. These not only affect individuals, but also their families, friends and, ultimately, society.

Caring for these conditions requires significant resources, and countries with rapidly ageing populations are seeing their national healthcare expenditures accelerate substantially. Failure to keep populations healthy will result in the prevailing pessimism around ageing populations. Hence, the importance of healthcare innovation that promotes healthier ageing, as emphasised in an earlier section.

The Global Roadmap for Healthy Longevity offers an evidence-based path forward to address many of the determinants of health (Wong et al, 2023). Harnessing data and meaningful metrics will allow societies to determine if they are able to keep populations healthy throughout the life course, generating substantial returns on investment and highly positive benefit-cost ratios.

The interventions recommended will significantly reduce the incidence and blunt the trajectory, mitigating the burden of chronic disease. Although many of the chronic non-communicable diseases are preventable, many will still be afflicted. But early diagnosis and optimal early management in an integrated, person-centred system before the onset of complications can allow people to remain independent and able to contribute to society in meaningful ways.

The health of a population is a priceless asset. A healthy society is far better prepared to face extreme weather events as well as pandemics. Having populations able to continue contributing well into their older age will realise the investments in human capital made throughout life, which in turn will unlock the social and economic capital of older people to a degree that has yet to be realised.

Longer safe and meaningful working lives will allow stronger financial security throughout life, placing fewer burdens on pensions and social security. Just as economies grew when women entered the workforce in substantial numbers, so can economies grow further when older people remain or are re-engaged in ways that are beneficial to all. The evidence supports the value of intergenerational teams and the value of non-monetary, but yet still highly valued, activities done by older people.

Longer safe and meaningful working lives will allow stronger financial security throughout life, placing fewer burdens on pensions and social security

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LONGEVITY DIVIDEND

THE ECONOMICS OF LONGER, HEALTHIER AND MORE PRODUCTIVE LIVES

London Business School

NUS National University of Singapore

USC Schaeffer

UKRI Economic and Social Research Council

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