

ANTICIPATE

Engineering Pathways for Radical Health Extension

Abstract

By 2050 one in six people worldwide will be over the age of 65. This grey tsunami threatens to put a huge strain on health and economic systems as the burden of age-related illness booms and the proportion of working-age adults shrinks. But breakthroughs in our ability to slow the physical and cognitive decline associated with advanced years are on the horizon. Drugs that target biological pathways that underpin ageing and interventions that turn back cells' "epigenetic clock" could soon extend our healthy years long into old age. This could completely reshape the dynamics of ageing populations and will require fundamental shifts in public health policy, economic planning, and labour relations.

- Where will breakthroughs in radical health extension come from?
- How will societies change as the number of healthy older people grows?
- How can we ensure boosting health span becomes a global priority?

Participants

Moderated by:

Jane Metcalfe, Founder, NEO.LIFE; Co-Founder, WIRED magazine, USA

With:

Samia Hurst, Professor of Ethics, University of Geneva, Switzerland

Brian Kennedy, Distinguished Professor, Department of Biochemistry and Physiology, Yong Loo Lin School of Medicine, National University of Singapore, USA

Guy Ryder, Director-General, International Labour Organization; Member, GESDA Diplomacy Forum, UK

Atsushi Seike, Executive Advisor for Academic Affairs; Professor Emeritus, Keio University, Japan (*remotely*)

Highlights

Today it is still rare, but not uncommon, to live for a century, particularly in parts of Italy and Japan, and most people can expect to survive into their 70s. There are an estimated 573,000 centenarians on the planet today, according to the United Nations. As many as two billion people are expected to be over the age of 65 in 2050. "We have gone from an average lifespan of 30 years beginning in the 19th century to 40 years at the beginning of the 20th century to 72.8 in 2021," explained Jane Metcalfe, founder of *Neo.Life*, a publication that focuses on these issues. "Those numbers, of course, hide the gross inequalities and inequities that existed across geography, across gender, across socioeconomic status. The good news is that on average the entire world now enjoys a longer life expectancy than the richest country did just 100 years ago. And those trends are expected to continue as sanitation, medicine and lifestyle change, and wealth reaches more and more people." Recent studies by researchers in Russia, Singapore and the United States showed that the theoretical limit on the human life span may be up to 150 years of age, assuming no new medical treatments for common diseases are found.

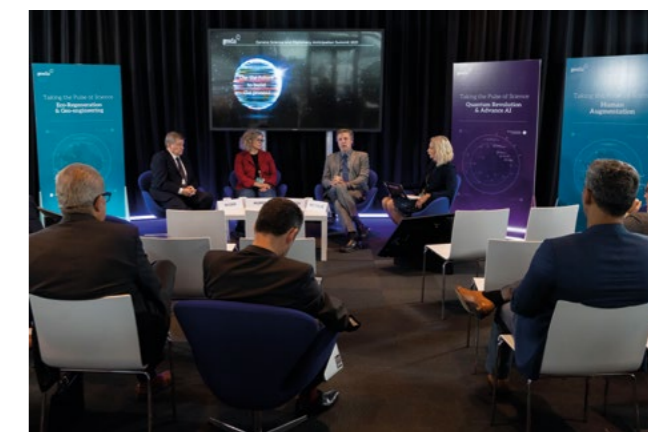
As recently as three decades ago, ageing research was a small field in which most of the practitioners believed it was not possible to alter the ageing process, recalled Brian Kennedy, a biologist and professor who conducts research based in Singapore and has become a widely known expert on the biology of ageing. "I think almost everyone in the ageing field believes now that is possible." The research on this field is growing fast. For example, the Longevity Science Foundation, based in Switzerland, announced on 30 September 2021 it will provide \$1 billion over ten years for research, institutions and projects that advance healthy human longevity and help extend the healthy human lifespan to more than 120 years.

"There are a number of interventions available that could potentially extend both lifespan and health span," Kennedy said. "Much research has been done on mice, including interventions on cells (stem cells therapy) and the genome (gene therapy). The challenge is that we have now to validate those interventions on humans." Other research shows the positive effects of improved diet, exercise, reduced stress and mental outlooks on ageing and age-related disease, he said, and "there are also a lot of pharmaceutical and natural products and supplements that are candidates to slow ageing, and which are being tested right now."

For Kennedy, the first thing people imagine when they are told they could live up to 120 years is that they would be living in a frail state and be kept alive with oxygen machines. "But our field of research is really more of a prevention-oriented field. It's

targeting the biggest risk factor for everything ageing and realizing that it's now possible to alter the rate of ageing, and seeing what the outcome of that is. In pretty much all the studies that have been done so far, the outcome is that individuals don't get sick, they stay more functional," he said. "And it's not just chronic diseases, either. COVID has brought home a major point, which is that ageing itself is the biggest risk factor for mortality in hospitalization due to many infectious diseases."

"What is interesting is that we now also have ways of measuring the rate of ageing – a major breakthrough in the last decade," he added. A distinction must be made, however, between chronological age – the actual amount of time a person has existed, as indicated on everyone's passports – and biological age, which refers to how old a person seems. The latter can be determined by biomarkers; in the blood, for example. "And when you combine the interventions with the markers," Kennedy said, "you really have the possibility to study how ageing has been affecting humans."



If it were to become more common for people to live beyond 100, even to 120, the impacts on society and work remain unclear. As Samia Hurst, a medical doctor, bioethicist and professor who has served as vice-chair of the 25-member Swiss National COVID-19 Science Task Force explained, there are environmental impacts. "If you have people living longer, you also have more people living" on the planet that affects everything from education to retirement, she said. "Is it something we want to have – a longer life?" she asked, while noting along with the other experts that the answers vary according to demographic and geographic variables. "You have to think about what sort of life would that be?" she said. "If we prolong life without modifying how work happens, it means that you wind up spending most of your life doing things that are messaged by your society as less worthy, and that also makes your life not as good. If you are messaged as a sort of second-class citizen for most of your life, that is problematic."

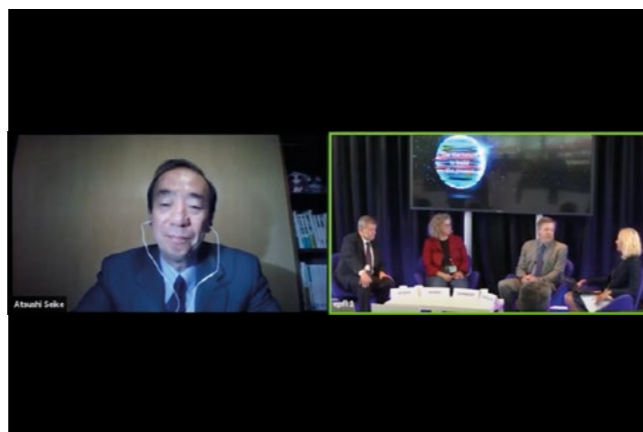
"The concept of learning-working-retiring is dead," said Guy Ryder, director-general of the International Labour Organization (ILO). "I think we're looking – as the age of retirement goes up – at organizing work better for people reaching the end of what is currently defined as their professional working time," he said. "So, adapting workplaces, adapting work arrangements, reduced work hours, that sort of combined less work [and] a little bit of retirement coming in. No, these aren't hard and fast, hermetically sealed frontiers. They're permeable."

For Samia Hurst, an ethics professor, ageing raises mainly fundamental questions about equity "with the minimal goal to be no worse than today". In terms of fairness, she said, "it also raises the question of how much these interventions [to extend lifespan] will cost, which is a point we always forget to resolve, even today." This a big question, Guy Ryder agreed. Will these so-called ageing interventions in the future be made "available generically as a public good", or will they be available only "to those who can afford them, both in terms of intra-societal and inter-societal issues?" he asked. "I think a lot of the societal debate that will follow from these types of interventions depends very much upon them." For him, questions of equity should be debated now, not sometime in the future.

The wider implications for work and society has been on the "radar screen" of the ILO for some time now, though not in precisely the same terms posed today, according to Ryder, who advised distinguishing between lifespan and health span. "If we're looking to increase longevity, at what age do we retire?" he asked, raising the question of "aptitude to work" with regards to age. "So, the real question is: are these longevity interventions such that people will be able to work into their 70s, or their 80s, not based on economical requirements but within the parameters of human welfare which these interventions are supposed to advance? I don't know the answer." Ryder said this raises questions about how to organize care and social protections, noting that the issue of old age pensions is the "most developed of all fields of social protections" and some of the most difficult social debates revolve around retirement ages. "That is when you get people on the street," he said. "They really feel it," he added, because they fear that they are "losing something."

The effects of an ageing population on employment and the labour market point to a paradox, said Atsushi Seike, a labour economist who is president of the Promotion and Mutual Aid Corporation for Private Schools of Japan (PMAC) and former president of Keio University. "We see an ageing population as a result of our success of promoting the health conditions of people, but as a result of our success, we face some problems," he said. "One of the most serious problems we face with the ageing population is the declining workforce. It may slow

down the economic growth and it may also reduce the sustainability of our social security system. So, in order to cope with such a problem, it is extremely important for us to promote the employment of older people." For that, he said, it is necessary for those people to remain in good health conditions, as the two aspects are strongly linked: "Having conducted a survey on labour supply of older people, we could show that if their health condition got better, their likelihood of labour force participation would be increased by about 30%." It also is important for people to maintain good cognitive conditions "so that they can manage their accumulated financial assets," he said. And the distinction between biological and chronological ageing is helpful, he said, partly because older people can still contribute "in many ways" as workers, investors, teachers, and social workers. "We need to change the definition of older people," he said. "Older people who have, for example, experiences in the business community can teach young people at the school" or could provide "childcare services" for younger people.



In some countries, people stop working at an age "where many feel they could continue", Hurst summed up, while modern parenting often leads to a "coexistence of the time when most people want to have their children and there are the most demands on their professional life". These reflect a fundamental "disorganization of our biographies", she concluded. "There are many ways in which our biographies are in a mismatch with our social organization, and this would be increased by a prolongation of life expectancy. So maybe we need to have language based on rules and functions other than actual age. Maybe we need to have language based on health status, and maybe biomarkers will one day be the way in which we make these distinctions, but they of course need to be validated first. And there are many ways in which we can think about that. One of the exciting things in this field [of longevity sciences] is that it leads us to ask questions that we should have been asking anyway. But this throws them in a light that makes them more urgent."

Takeaway Messages

Ageing research formerly was a field in which it was not believed that people could alter the ageing process, but now most researchers think it is possible.

New tools (pharmaceutical and natural products, gene therapies, and stem cells treatments) might increase the average lifespan to 120 years; blood biomarkers may determine the biological age of a person.

People living longer lives raises fundamental questions about inequality based on demographics, geography, and socioeconomic status.

Among the chief questions to be addressed are how to organize social protections and care, and to balance retirement ages with the workforce and funding for social safety nets.

Distinguishing between biological and chronological ageing would be helpful, partly because older people can still contribute as workers, investors, teachers, mentor, social and childcare workers. Promoting good health among elderly people is, therefore, crucial.

The wider implications raise fundamental questions about how people structure the "biographies" of their lives; new language might be needed that is based on health status, rules, and functions, other than actual age.

More information

[Session recording on YouTube](#)

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