

Linking interdisciplinary and multiscale approaches to improve healthspan—a new UK model for collaborative research networks in ageing biology and clinical translation



Improvements in health care, sanitation, diet, and education over the past century have markedly increased life expectancy, but this has not been paralleled by concomitant increases in healthy life expectancy. Increasing healthspan, which is the time spent free of major illness or disease, is therefore an important priority worldwide. The UK Government, for example, has pledged to increase the healthy life expectancy of the UK population by an extra 5 years by 2035 without increasing inequality. Achieving this goal would simultaneously improve individual quality of life, increase productivity, and boost national wealth. Notably, a gain of just one additional healthy year is predicted to be worth US\$38 trillion to the USA.¹ However, a 2021 review of national progress in the UK towards this goal revealed that policy makers have little confidence that healthy life expectancy can be markedly improved either through focusing on technological solutions (which promote independence but not health) or on diet and exercise regimes (which are often out of reach of those who would most benefit, because of socioeconomic inequalities).²

The same review² revealed a general lack of awareness and scrutiny of the potential offered for improving health in later life by ameliorating the ageing process itself. This unawareness is alarming when set against the backdrop of a quiet research revolution in biogerontology that has seen the identification of some key hallmarks of ageing,³ evidence that these hallmarks and underlying mechanisms independently predict the emergence of age-related diseases in real patients,⁴ and positive outcomes from preclinical and early-stage human clinical trials based on targeting ageing mechanisms.^{5,6} Humanity stands on the threshold of being able to prevent multimorbidity and age-associated diseases by addressing the underlying biology of ageing; parallels with the era of antibiotics do not seem unduly hyperbolic.

Ignorance of these developments carries appalling costs, which have been, and will continue to be, borne by older people unless the situation changes. For example, the UK's 2017 Healthy Ageing Grand Challenge specifically excluded biomedical science research from

its funding remit, and the extensive *Decade of Healthy Ageing: baseline report*,⁷ by WHO (2021), fails to mention these advances, or even the word biology, focussing instead on socioeconomic determinants of health and overcoming ageism. Given that hallmark ageing mechanisms cause the progressive failure of innate and adaptive immunity, it is a fascinating counterfactual to consider how the ongoing COVID-19 pandemic would have been handled had it been preceded by a sustained international effort to target immune senescence and enhance later life immune function.⁸ The need to avoid such mistakes in the future is patent, as are the triple economic benefits (lower health and social care costs, greater economic activity of older adults, and investment into new industries) that will accompany efforts in this area.

It is perhaps the perceived complexity of ageing biology that has dissuaded policy makers from directly tackling it. As a result, academic research on ageing in many parts of the globe is fragmented and siloed,² and driven by funding models and professional metrics that reward specialisation and disease-specific focus. However, the biological mechanisms that cause ageing must be a central focus if integrational and intersectional approaches aimed at improving lifelong health⁹ (figure) are to be truly effective.

It is therefore hugely exciting that the diversity and complexity of ageing across the life course has now been recognised in a national initiative by the Biotechnology and Biological Sciences Research Council and Medical Research Council of UK Research and Innovation (the national government-sponsored research funder). Launched in March, 2022,¹⁰ the UK Ageing Network comprises 11 new research networks addressing core aspects of ageing biology and health in a national macro network, drawing together ageing research across systems and scales (figure). These networks aim to enable knowledge exchange and research beyond the narrow focus of individual research projects and academic disciplines, drawing from the social sciences, humanities, economics, and

For more on the UK Ageing Network see www.ukanet.org.uk

For more on the UK's Healthy Ageing Grand Challenge see <https://www.ukri.org/what-we-offer/our-main-funds/industrial-strategy-challenge-fund/ageing-society/healthy-ageing-challenge/>

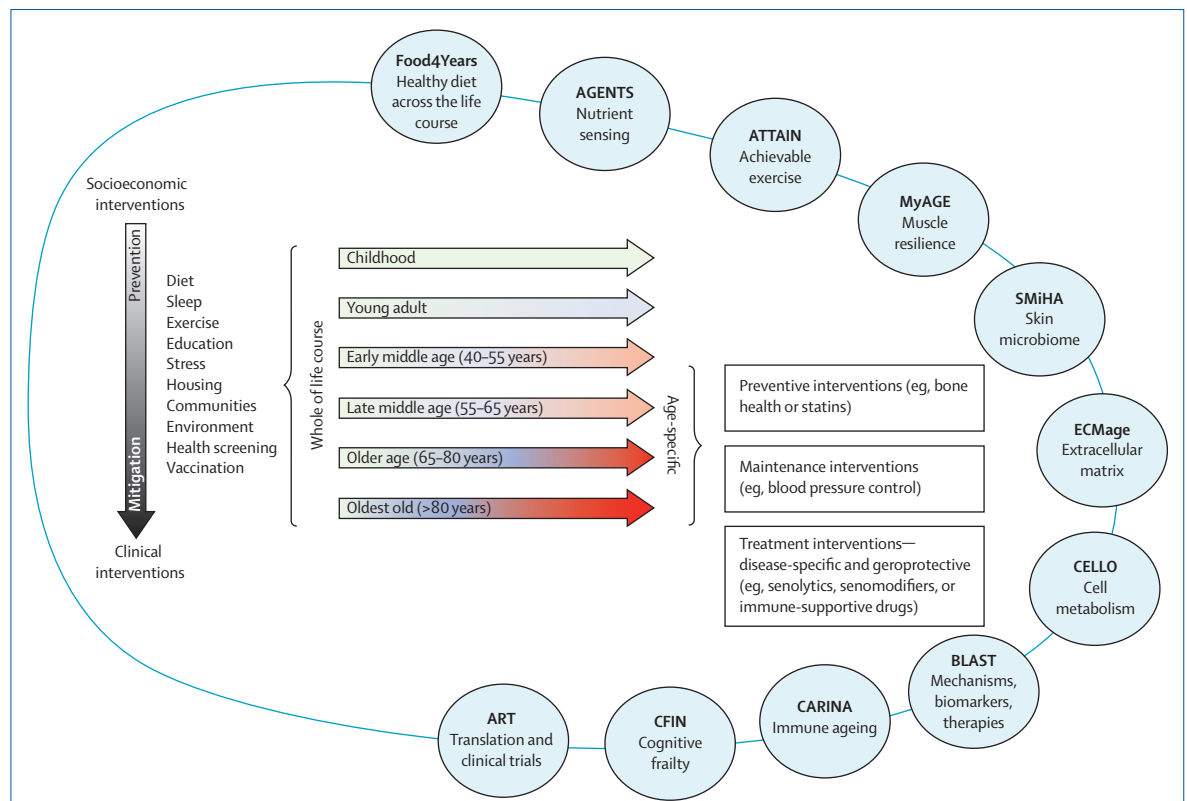


Figure: UK Research and Innovation-funded ageing networks addressing ageing processes across the life course

11 networks (depicted in ovals) cover a broad but overlapping range of research topics, with intersections between socioeconomic determinants of health, diet, exercise, microbiome, extracellular matrix, and molecular and cellular mechanisms of ageing, through to cognition, immunity, frailty, therapeutics, and clinical trials. This breadth allows the networks to identify interventions appropriate for different stages of the life course, with a shift in focus from disease-preventive approaches in early life and mid-life through to more intense clinical monitoring and interventions in older adults, including development and testing of new geroprotective and gerotherapeutic medicines, such as senolytic drugs.^{8,9} A multiscale, multisystem, and whole of life course approach to improve healthy life expectancy can be achieved by drawing these broad research disciplines together through a core focus on hallmarks that underlie the biology of ageing and drive age-related disease.⁴ AGENTS=Ageing and Nutrient Sensing network. ART=Ageing Research Translation of Healthy Ageing Network. ATTAIN=Active and healthy ageing for all. BLAST=Building Links in Ageing Science and Translation. CARINA=Catalyst Reducing Immune Ageing. CELLO=CELLular metabolism Over a life-course in socioeconomically disadvantaged populations. CFIN=Cognitive Frailty Interdisciplinary Network. ECMage=Extracellular Matrix (ECM) ageing across the life course interdisciplinary research network. Food4Years=Food for-added-life-years: putting research into action. MyAGE=Muscle resilience across the life course: from cells to society. SMIHA=Skin Microbiome in Healthy Ageing.

biomedical and physical sciences, as well as bringing in expertise from industry, biotechnology, the third sector, and policy makers; membership is open and non-prescriptive, and interested individuals and organisations are encouraged to join. Importantly, the networks also include the voice of those with the lived experience of ageing, to enable relevant co-design of future research strategies, together with health practitioners and clinical trialists to ensure that promising interventions can be taken forward from the laboratory into patients. Through workshops, training programmes, grassroots events, and research pump priming, the networks will not only enable integration of expertise and cross-disciplinary working to generate new knowledge and provide solutions to ageing problems, they also aim to build ageing research

capacity, enticing researchers from all career stages and disciplines in academia and beyond to embrace ageing research. Dissemination of new findings and development of new training materials for a range of audiences, including clinical practitioners and policy makers, is also key to the networks' goals, to ensure that actionable findings from ageing research are rapidly adopted into policy and practice.

Initially funded for 2 years, positive outcomes from the networks should drive investment to sustain and grow them, with expansion to include colleagues from around the world. We therefore welcome input, suggestions, and support from all who wish to contribute to improve health across the life course and work towards the goal of substantially extending healthy life expectancy.

For more on the individual networks see www.ukanet.org.uk

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