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Review

Rethinking Ageing Research: From Lifespan to Healthspan

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Abstract: Lifespan refers to the total number of years lived until death while healthspan denotes the period of time spent in good health, free of overt disease and disability. While global life expectancy has dramatically improved over time, healthspan lags behind. The World Health Organization estimated in 2020 that the global healthspan-lifespan gap was approximately 9.6 years, highlighting the growing disparity between longevity and years lived in good health. This healthspan-lifespan gap continues to persist despite improvements in the standard of living across most of the world. Indeed, in some countries the gap is even growing, with chronic age-related diseases being the main contributor. The personal, socioeconomic and healthcare cost of this gap is significant, and its impact will only increase as our population ages. Multidisciplinary efforts to improve healthspan are required to address this imbalance, which will provide benefits to all and enable older adults to continue to contribute positively to the community and to age well. Here, we discuss the healthspan-lifespan gap and argue that extending healthspan rather than lifespan should be a priority. We also discuss its many determinants, methodological approaches and challenges, potential strategies and interventions to improve healthspan and future research directions. Noting that different strategies may be required across populations and countries to address this imbalance. Given the varied efforts to investigate this question from multiple perspectives and the different strategies proposed, there can be optimism that in the foreseeable future we will increase healthspan and reduce the healthspan-lifespan gap.

Keywords: lifespan; healthspan; ageing; gap; intervention; prevention

1. Introduction

Life expectancy, the average number of years an individual lives from birth to death, has emerged as a compelling narrative of worldwide achievement, with global life expectancy increasing dramatically over the last two centuries. In 1800, no region in the world had a life expectancy greater than 40 years, since then it has almost doubled [1]. Advances in clean water access, vaccination, sanitation, nutrition, antibiotics, and neonatal and medical care—alongside economic growth and reduced poverty—have dramatically improved survival and reshaped ageing worldwide. However, beneath the apparent success of increased lifespan resides a hidden paradox, with the quality of the last years of life often impacted by poor health and disability. Healthspan (healthy lifespan, healthy longevity, disability-free/healthy life expectancy) refers to the number of years lived in good health, devoid of chronic ailments or disabilities and is currently surpassed by lifespan around the world (Box 1). Healthspan encompasses not only the absence of disease and disability but can also include psychological health and functional capabilities (e.g., cognitive ability, mobility), which contribute to overall well-being [2].

Box 1. Common Definitions.

Lifespan = The number of years a person is alive, from birth to death.

Healthspan = The number of years lived in good health, free from chronic diseases and disability.

Healthspan-lifespan gap = Gap between lifespan and healthspan

Healthy Ageing = The World Health Organisation (WHO) defines it as "the process of developing and maintaining functional ability that enables wellbeing in older age".

Life Expectancy = The average number of years someone is expected to live at a particular age based on population statistics. Most commonly it is calculated from the year of birth.

Health-Adjusted Life Expectancy (HALE) = A population-specific metric of healthspan, referring to the average number of years a person is expected to live in good health, in a specific population or sub-group at a certain time.

Biogerontology = Study of the fundamental biology underlying ageing in organisms and the identification of processes to slow or reverse it.

Geroscience = Focuses on understanding why individuals age and how ageing contributes to age-related diseases. It seeks to address the biological ageing process to prevent or delay the onset of age-related diseases.

Geromedicine = Medical specialty aiming to extend healthspan by targeting the ageing process.

Recent data from the World Health Organisation (WHO) suggests the global healthspan-lifespan gap is increasing, growing from 8.5 years in 2000 to 9.6 years in 2019 (Figure 1) [3]. Another study confirmed that global life expectancy was increasing at a faster rate than healthspan [4]. Indeed in 2019, the largest gaps between lifespan and healthspan were observed in the USA (12.4 years), closely followed by Australia (12.1 yrs), New Zealand (11.8 yrs) and the UK (11.3 yrs) [3]. This data suggests that people born in 2019 in these countries are expected to live more than 10 years in poor health during the final stages of their lives.

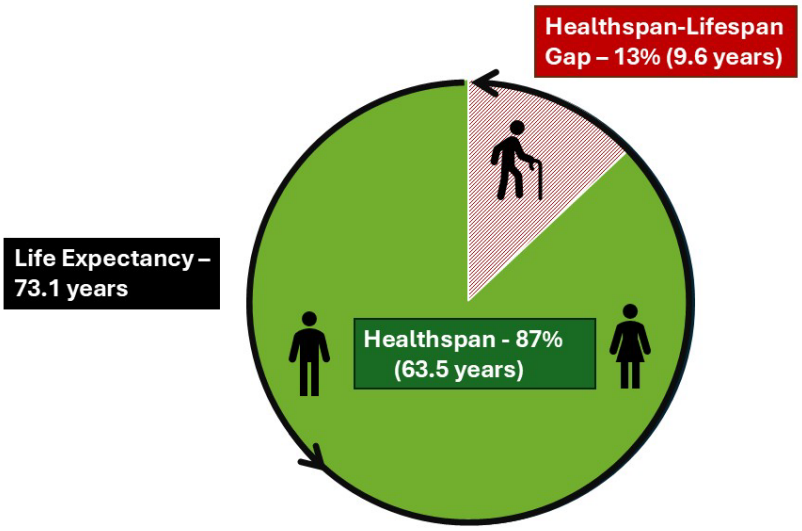

Figure 1. The relationship between global life expectancy and healthspan, showing the healthspan-lifespan gap. In 2019, at birth a newborn could expect to live 73.1 years (global life expectancy). Of that time, an individual could expect to spend ~87% in good health (healthspan) whilst ~13% will be spent in poor health (healthspan-lifespan gap). Figures based on World Health Organization estimates (https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-life-expectancy-and-healthy-life-expectancy, accessed on 14 July 2025).

Currently, the length of healthspan varies across the world, due to differences and inequities in healthcare and socioeconomics amongst many other factors. Women typically live longer but endure a greater number of

years in suboptimal health. Specifically, in 2019 a 2.4-year wider global healthspan-lifespan gap was observed for women when compared to men. This difference was mainly attributed to a higher burden of noncommunicable diseases [3].

Here, we explore healthspan and the current state of healthspan research, advocating for a global shift from increasing longevity to improving healthy ageing—healthspan—for all. In support of this premise, the UN has declared the years 2021–2030 as the Decade of Healthy Ageing aiming to reduce health disparities and improve the lives of elderly people globally [5]. In addition, in 2022 the US National Academy of Medicine produced a Global Roadmap for Healthy Longevity providing comprehensive recommendations to improve healthy longevity worldwide in the short-term and long-term by 2050 [6]. The goal of increasing worldwide healthspan and closing the healthspan-lifespan gap will not only improve the quality of life of older adults and their families but will also have profound socioeconomic implications for the wider community.

2. Economic Benefits of Healthspan Extension

Apart from the enormous personal and psychosocial benefits of ageing well, one convincing argument for prioritising reducing the healthspan-lifespan gap are the significant economic savings. Increasing healthspan enables continued workforce participation among later-life adults, helping to extend working lives, enhance productivity and facilitate greater wealth accumulation to support retirement. It also offers substantial economic benefits by significantly reducing healthcare and long-term care expenditures. In support of the argument to focus on healthspan rather than lifespan, Scott et al. show that delaying age-related disease to very late in life provides a greater economic benefit than just further increases in life expectancy. The authors highlight that addressing the root causes of ageing itself, rather than tackling diseases one by one, could unlock far greater economic gains [7].

Ageing itself is a powerful driver of chronic disease and disability, and even small delays in its progression could translate into profound economic gains. In the USA, modelling suggests that pushing back biological ageing by just one year may yield an annual economic benefit of approximately $840 billion [8]. Chronic conditions like dementia, which impose heavy financial and emotional costs, illustrate this potential clearly. Projections in the USA show that dementia prevalence could rise from 6.5 million in 2022 to 13.8 million by 2060, with care costs reaching 2.2 trillion USD [9] unless prevention or treatment strategies improve. Importantly, research by Zissimopoulos et al. suggest that delaying dementia onset by only three years could reduce costs by one-third by 2030, saving roughly 209 billion USD and easing the societal burden substantially [10].

3. Healthspan Metrics

A commonly used and established healthspan metric is health-adjusted life expectancy (HALE), which describes the number of years a person from a particular population is expected to live in good health, free of disease and disability (Box 1). It relies on population data regarding mortality, prevalence of disease and disability weights e.g., [11]. Organisations and networks focussed on global healthy ageing, such as the World Health Organisation, REVES (Réseau Espérance de Vie en Santé) and the Global Burden of Disease, commonly use this metric, amongst others, to examine healthy life expectancies in populations. This includes monitoring change in HALE over time (e.g., healthcare improvements, during periods of war/peace), comparing different countries/ regions, identifying factors influencing healthspan and to inform population-level guidelines and policy. Examining trends in both lifespan and healthspan is essential for understanding population health trajectories. For example, different countries show varied trajectories, with Africa having the fastest growing healthspan (HALE)-lifespan gap over the last 2 decades (~1990–2019) [12].

Given HALE is a population-based metric, it has limited use for some research purposes, such as individual-level based epidemiological studies and evaluating the effectiveness of small-scale interventions. In research focused on individuals, there is currently no universally accepted definition of healthspan or standardized method for its measurement. Key questions remain unresolved, such as which diseases or disabilities should be included, whether all conditions should carry equal weight, and how many conditions are required to classify poor health. Additionally, individuals can experience alternating periods of good and poor health, raising the question of whether subjective health assessments should also be considered [13]. A recent systematic review (2025) found that while healthspan is commonly described as living free from disease or disability, measurement approaches vary widely. These include age at onset of chronic illness, timing of physical or cognitive decline, metabolic indicators, and changes in daily functioning such as ability to manage personal care [14]. This lack of consistency in defining and measuring healthspan at the individual level has hindered research progress in the field.

An alternate recent metric that may prove useful in the future, is the Universal Healthy Ageing Scale [15]. The Ageing Trajectories of Health-Longitudinal Opportunities and Synergies (ATHLOS) Project utilised

harmonised epidemiological cohort data from over 300,000 individuals across 38 countries to develop the scale. It incorporates 41 biopsychosocial health and functional indicators, including cognition, activities of daily living, sensory function, vitality, and mobility. Notably, it shows strong correlations with country-specific HALE estimates. The authors suggest the scale may be useful for both cross-sectional and longitudinal epidemiological research, facilitate cross-country and inter-study comparisons, and in clinical/public health applications. However, its complexity—requiring numerous variables—and potential bias due to underrepresentation of individuals typically excluded from large cohort studies (e.g., nursing home residents) represent important limitations.

4. Morbidity and the Centenarian Model

A related concept to healthspan is the onset of morbidity and change in morbidity status over time. At the population level, expansion of morbidity in a population describes an increase in time spent in poor health, which can occur if lifespan increases more rapidly than healthspan. Conversely, compression of morbidity refers to living longer in good health and can occur if healthspan increases more than lifespan.

One natural occurring but rare human model that can be used to examine healthspan are those individuals living to the extremes of the lifespan. Centenarians and supercentenarians (aged 110+ years), tend to have long healthspans, demonstrating compression of morbidity as proposed by Fries in 1980. He suggested that individuals approaching the limits of human lifespan tend to experience a later onset and shorter duration of chronic illness, effectively compressing morbidity into the final life stages [16]. This has been supported by many studies, including a longitudinal Swedish study of ageing, that found centenarians tended to delay disease onset and avoid diseases compared to those from the same birth cohort who died earlier [17]. A recent study found that centenarians from India had relatively healthier profiles compared to those aged 60–89 years [18]. Supercentenarians—an exceptionally rare group, occurring at roughly one in five million individuals in high-income countries—tend to exhibit remarkably extended healthspans, reflecting a pronounced compression of morbidity [19,20]. These long-lived individuals represent an ideal human model to unravel the underlying determinants of healthspan. However, to date, most centenarian studies have tended to focus on longevity rather than healthspan.

5. Determinants of Healthspan

In 2025, Irandoust and colleagues analysed 36 health determinants (e.g., obesity, access to drinking water, drug use, urbanization, education and smoking) and their associations with HALE across 194 countries from 2000 to 2018. In general, the authors found that the most influential determinants of HALE differed across global regions. For example, sexually transmitted infection was the most significant factor for HALE in Africa whilst for the Eastern Mediterranean it was obesity and air pollution [21]. This research suggests region-specific health targets that could yield the greatest impact on extending healthspan.

The healthspan of an individual is a complex, multidimensional concept shaped by a dynamic interplay of factors including genetic makeup, environmental exposures ('exposome') and the presence or absence of disease. The exposome refers to the accumulative environmental exposures each individual experiences throughout their lifetime, ranging from chemical exposures, diet, lifestyles, to social interactions, which influence health and well-being. A recent study suggests that the exposome (e.g., smoking, socioeconomic status, physical activity, living with a partner, height and body size at 10 years) has a much greater influence on ageing than genetic factors [22,23]. Consistent with the exposome playing a critical role in human ageing, a recent study across 40 countries found that physical (e.g., air quality), social (e.g., gender inequality), and sociopolitical (e.g., democracy) components of the exposome can accelerate ageing [24].

Social, cultural and lifestyle factors significantly shape healthspan trajectories, accounting for substantial non-genetic variance in ageing outcomes [25]. Lifestyle choices significantly shape how well we age and are ideal targets for interventions, given they are modifiable and cost effective and include:

Physical activity. Regular physical activity stands out for its wide-ranging benefits not only supporting cardiovascular and musculoskeletal health but also contributing to the resilience of multiple physiological systems [26]. It is repeatedly identified as a cornerstone of healthy ageing and healthspan extension [27]. Engaging in aerobic and resistance exercise helps regulate glucose metabolism, preserve muscle function and foster brain adaptability by dampening inflammatory processes, enhancing autophagy and mitochondrial renewal. Research on Blue Zones—geographical regions with unexpectedly high numbers of centenarians—has shown that these long-lived individuals tend to be moderately active, engaging in daily physical activities such as walking, gardening, and outdoor hobbies [28]. Recently, in a different study, a global analysis culminated in comprehensive recommendations to optimise healthspan and quality of life in ageing adults, calling for the use of evidence-based and personalised multicomponent exercise programs [29,30].

Living Environment. The environments in which we live play a role in healthy ageing, which includes access to green space (e.g., parks, recreational spaces), housing and infrastructure (e.g., transport/traffic, urban design). Studying the Blue Zones, has been used to provide age-friendly urban planning and design recommendations to enhance the quality of life for older adults [31]. Climate can also play a role (e.g., favourable Mediterranean climate), and climate change exerts a substantial influence on healthy ageing, owing to the heightened vulnerability of older adults to heat stress and the broad range of adverse effects associated with global warming reviewed in [32,33]. These effects are not evenly distributed, with vulnerable communities facing disproportionate risks to healthy ageing and healthspan [34]. Light exposure has been linked to mood, cognitive performance, alertness, neuroendocrine functions and sleep quality [35,36]. Exposure to xenobiotics can also influence health and healthspan, which includes exposure to pollution, microplastics, drugs, food additives and pesticides. For example, air pollution has been linked to a variety of negative health outcomes, including cardiovascular health (e.g., coronary heart disease, stroke) and disease mortality [37,38].

Microbiome. The microbiome plays a fundamental role in all aspects of health, including ageing. Recently the term of 'biome-aging' has been introduced, referring to age-related changes in the microbiome, including loss of beneficial commensal bacteria and proliferation of pathogens [39]. Notably, longevity research has shown that the centenarian gut microbiome is unique. For example, a Japanese study found the centenarian microbiome was enriched for bacteria that generated novel bile acids, which may contribute to defence against pathogenic bacteria [40]. A more recent Chinese study revealed that the centenarian gut microbiome exhibits high species diversity, depletion of potential inflammatory bacteria, enrichment for beneficial bacteria and was characterised by a 'young' microbial profile [41]. In the future, strategies and therapeutics promoting a healthy microbiome (e.g., dietary changes), potentially guided by the results of centenarian microbiome studies, may be developed.

Sleep. Sustained, high-quality sleep plays a foundational role in preserving cognitive performance and maintaining physiological balance as individuals age. When circadian rhythms are disrupted or sleep becomes fragmented, the ripple effects extend across systems raising the risk of neurodegeneration, impairing glucose regulation and weakening immune defences [42–45]. A Mendelian randomisation study in the UK Biobank found causal associations between sleep duration and insomnia with healthspan termination (defined—onset of any of 8 longevity-related diseases), underlining its importance in promoting healthy ageing and healthspan. Interestingly, the authors found only 24% of UKB participants (n = 400,000+, age range 37–73 yrs) had healthy sleep quality [46]. These findings underscore the essential role of sleep in shaping healthspan trajectories.

Diet. Dietary patterns are an important determinant of healthspan. Whole foods such as fruits, vegetables, whole grains, nuts and seeds offer systemic benefits that help reduce the risk of age-related disease and functional decline [47]. Although emerging reviews highlight promising links between nutrition and healthspan, much of the research to date has relied on short-lived animal models like *Drosophila* and *C. elegans* [48], leaving gaps in our understanding of long-term human outcomes. However, the diet of centenarians located in Blue Zones, has been used to provide dietary recommendations for improving healthspan. Typically, they consume diets that are predominantly plant-based, rich in nutrients, and characterized by limited intake of animal products, very few processed foods, and low sugar consumption [49]. In support of plant rich diets, a recent longitudinal study (N > 100,000 participants) found plant-derived diets with moderate intake of meat were associated with healthy ageing (defined as surviving beyond 70 years free of major chronic diseases and preserved cognitive, physical, and mental health) [50].

Psychosocial. Psychosocial factors are also important in determining healthspan. A recent study using UK Biobank participants found psychosocial stressors (e.g., loneliness, anxiousness, miserableness, depression) were linked to a shortened healthspan [51]. A meta-analysis and review of the literature found social support was linked to health and longevity [52]. Consistent with these findings are observations of the communities in Blue Zones, where there tends to be a high degree of social connectedness, a strong sense of community and purpose in life and where intergenerational relationships are highly valued [32,53–55].

Biological determinants of healthspan are diverse, complex and rarely act in isolation. While genetic research has largely prioritised lifespan studies, Zenin et al. examined healthspan, analysing data from over 300,000 UK Biobank participants. They identified 12 genetic loci associated with healthspan (defined as the age at onset of the first major chronic disease), five of which replicated in an independent cohort. The study revealed genetic correlations between healthspan and traits such as obesity, age at first birth, smoking and all-cause mortality, highlighting shared genetic architecture across these domains [56]. As lifespan and healthspan are biologically intertwined, genes linked to longevity (including *FOXO3A* and those regulating DNA repair, mTOR signalling, and inflammation) may also offer promising avenues for advancing healthspan research.

Epigenetic mechanisms, such as DNA methylation, regulate gene expression without altering the underlying DNA sequence and are shaped by environmental exposures like diet and smoking, making them potentially

modifiable through lifestyle changes. While most human studies have focused on epigenetics in relation to lifespan, fewer have examined its role in healthspan. DNA methylation remains the most widely studied epigenetic mark due to its stability and accessibility in epidemiological research. In a recent Mendelian randomisation study, Ying and colleagues identified over 3300 DNA methylation sites with causal links to healthspan, defined as the age at onset of the first age-related disease [57]. These findings offer promising insights into how methylation may influence ageing trajectories and highlight potential targets of interest for interventions aimed at extending healthspan.

Biological age markers are increasingly used to predict healthspan and evaluate the impact of healthspan-targeted interventions. These include a growing array of epigenetic clocks (e.g., PhenoAge [58]) and emerging tools such as the Healthspan Proteomic Score (HPS) developed by Kuo et al. in 2025 [59], which can be applied longitudinally to track biological ageing trajectories.

Geroscience seeks to understand the biological mechanisms driving ageing and to translate these insights into preventive strategies and interventions/treatments to prevent or delay biological ageing and age-related disease and decline (Box 1). By addressing fundamental ageing processes, geroscience offers the potential not only to prevent age-related disease but also to enhance overall function and quality of life in older adulthood. From a geroscience perspective, the 14 hallmarks of ageing, as proposed by Kroemer and colleagues, provide a valuable scaffolding for investigating the underlying molecular mechanisms of biological ageing and healthspan. They are also useful targets for monitoring preventative approaches (e.g., behavioural changes) and interventions, the development of drugs and treatments and to monitor the effectiveness of anti-ageing strategies. These hallmarks range from genomic instability, telomere attrition to mitochondrial dysfunction, cellular senescence, inflammation and dysbiosis. Notably, psychosocial isolation has also been added to this list of hallmarks, reflecting the strong evidence of its involvement in mental health, anxiety, stress, emotional support and well-being [60].

6. Targeted Prevention, Strategic Frameworks and Interventions for Healthspan Optimisation

Optimising healthspan will require an integrated approach that combines targeted preventive strategies to promote healthy ageing and delay age-related disease, strategic policies and frameworks designed to support healthy ageing across the life course, and evidence-based interventions.

Innovative geroscience and geromedicine strategies and forward-thinking policy reforms are redefining what it means to age well. In Singapore, initiatives like *Healthier SG* [61] reflect a growing shift toward preventive, community-based care that prioritises healthspan over reactive disease management. Digital platforms such as the *Healthy 365* app complement these efforts by empowering individuals to track their health in real time and adopt lifestyle changes through behavioural prompts and incentives. China has a Healthy China 2030 Plan aiming to improve healthy life expectancy by 2030 [62]. Indeed Japan, which has a Healthy Life Expectancy Extension Plan in place, demonstrated modest but greater gains in healthy life expectancy than in overall life expectancy from 2010–2016 [63], showing that the healthspan-lifespan gap can be reduced at the country level.

Healthy longevity clinics have begun to be set up in hospital settings, including Singapore (Alexandra Hospital), Israel (Sheba Medical Institute) and the USA (Mayo Clinic) to promote healthy ageing and increase healthspan. Together, these strategies signal a broader commitment to treating ageing as a dynamic, modifiable process [64].

Equally vital are approaches rooted in the "successful ageing" framework introduced by Rowe and Kahn, which emphasise not only disease prevention but functional independence and meaningful social engagement [65]. Importantly, interventions must be tailored to diverse populations and life contexts, as ageing unfolds differently across cultures, communities and individual circumstances. Recent reforms, such as Australia's new Aged Care Act (2025), further reinforce this shift by embedding rights-based care and personalised support into national policy [66]. Incorporating broader psychosocial and functional perspectives into healthy ageing programs offers a more comprehensive roadmap to ageing well with vitality, dignity and connection.

Interventions to extend healthspan and promote healthy ageing in humans are limited but are increasing due to growing public and commercial interest in healthy ageing and longevity. There are a number of treatments that have been used effectively in animals to improve healthspan that have yet to be evaluated in humans [67]. Repurposing of already approved drugs is one option for interventions. For example, the impact of metformin (a diabetes drug) on human ageing is being evaluated by the Targeting Aging with Metformin Trial (TAME). This ongoing longitudinal study is supported by the American Federation for Aging Research. It seeks to show that biological ageing can be slowed with metformin, delaying the development of age-related diseases using a sample of ~3000 people aged 65–79 years old recruited across the USA [68]. Another example is a recent pilot study funded by the company AgelessRx, which found the use of low dose naltrexone improved healthspan measures in a normative ageing sample [69]. Other repurposed drugs and supplements of interest include bisphosphonates

(used for osteoporosis but may also positively active against other diseases) and rapamycin (improves healthspan/lifespan in animal models, used as an immunosuppressant in humans) [67].

Other potential treatments include senotherapeutics—drugs designed to target senescent cells, which accumulate in the body with age [70]. Senescent cells stop dividing, do not undergo apoptosis and have a distinct phenotype contributing to chronic inflammation, tissue dysfunction and are linked to various negative ageing outcomes. However, this field is still in its infancy and senescent cells have physiological functions important for health (e.g., tumor suppression) [71], so caution is required.

7. Challenges

Developing global recommendations for healthspan is inherently complex because its determinants vary widely across populations, subgroups, and contexts such as socioeconomic status and cultural norms. Health promotion strategies must therefore be tailored to these differences, making universal guidelines difficult to establish.

As Cesari et al. [72] highlight, personalized models of care initiated early in life are likely essential for supporting healthy ageing. Determinants of healthspan also shift with life stage and individual circumstances—such as menopause or changing social environments—underscoring the need for dynamic, context-sensitive approaches. More longitudinal studies are needed to clarify how early and mid-life experiences influence later health and to identify optimal therapeutic windows for preventive strategies and interventions to promote a long healthspan.

Ageing rates differ not only between individuals of the same chronological age but also across cell types and organs within a single person. This variability reinforces the need for individualized strategies and multi-dimensional biomarker panels to accurately assess biological ageing.

Studying healthspan epidemiologically requires rich phenotypic data, biospecimens, long follow-up periods, and large sample sizes—conditions that demand substantial funding. Longitudinal studies spanning decades are rarely prioritized by funding bodies, though notable examples exist (e.g., UK Biobank, Rotterdam Study, Framingham Study, China Kadoorie Biobank, EPIC). Building large-scale platforms that integrate de-identified health records, wearable sensor data, and multi-omics profiles could accelerate discovery and the development of personalized recommendations and interventions. Equally important is co-creating community-embedded programs to ensure any strategies are culturally appropriate and economically feasible.

Intervention trials should include diverse populations and extend follow-up to capture meaningful outcomes, such as long-term independence and quality of life. Additionally, studying centenarians offers unique insights into healthy ageing at the extremes of the lifespan and may suggest further avenues of research and/or strategies to promote healthy ageing in the general population.

8. Conclusions

As our population ages, the gap between lifespan and healthspan demands urgent attention. Chronic age-related diseases continue to drive this disparity, placing increasing strain on individuals, families, and healthcare systems. To meet this challenge, we must advance beyond incremental solutions toward transformative strategies. Geroscience, digital health, and intervention/therapeutic trials, coupled with epidemiological insights, offer unprecedented opportunities to accelerate discovery and implementation. Equally critical are psychosocial and lifestyle approaches, which are scalable and cost-effective across diverse populations. Further, the development of culturally tailored strategies and interventions and policy frameworks that incentivise prevention and support throughout the life course are also vital. Crucially, all initiatives must be accessible and affordable to ensure equity. By prioritising healthspan over longevity, we can transform longer lives into better lives—marked by good health, independence, and high quality of life.

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M.R. and K.A.M. contributed to the conception and design, original draft preparation and manuscript review. All authors have read and agreed to the published version of the manuscript.

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Use of AI and AI-Assisted Technologies

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