ScienceBank

DOI: 10.61340/ADNPLHAAC
Submitted: 19 Apr 2026
Accepted after peer review: 04 Jun 2026
Published: 18 Jun 2026

✦ Review article

Afrolongevity: Defining a New Paradigm for Longevity and Healthy Aging in African Contexts

Wael Mohamed,[1,2] * Stuart Diamond[3]

1. Basic Medical Science Department, Kulliyyah of Medicine, International Islamic University Malaysia (IIUM), Kuantan, Pahang 25200, Malaysia.
2. Clinical Pharmacology Department, Menoufia University, Shebin El-Kom, Egypt.
3. NDA Aesthetics & Longevity, Moorestown, NJ, USA. Equilux – Unlock Your Biology, USA.

***Correspondence:** wmy107@gmail.com

Keywords: Afrolongevity, Health Span, Geroscience, African Genomics, Epidemiological Transition.

Abstract

This review defines Afrolongevity as an emerging interdisciplinary discipline that is dedicated to extending the healthy lifespan of African populations. The continent is currently grappling with a unique "Double Burden" as it navigates a rapid demographic transition: the continuous challenge of managing infectious diseases in conjunction with a substantial rise in age-related non-communicable diseases (NCDs). This dual burden necessitates a paradigm shift in public health and biomedical research. The review integrates diverse domains to establish a strategic roadmap for achieving equitable longevity and constructing a robust framework for geroscience that is unique to the African context.

Introduction

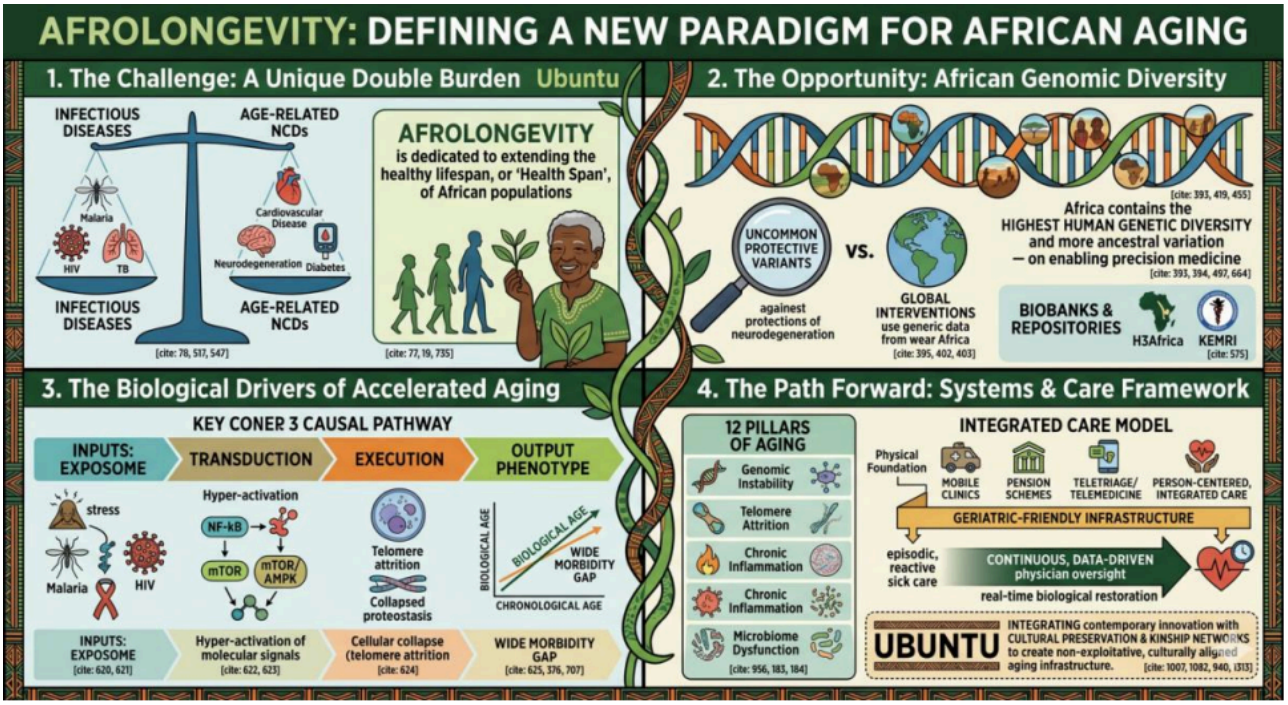

Figure 1. Afrolongevity: Defining a New Paradigm for African Aging. Figure generated with AI (Gemini).

The aging process commences with the birth of human beings, and it is a complex and prolonged process that incorporates alterations in the requirements of the aging individual. Humans undergo a variety of life stages, including neonates, infants, toddlers, adolescents, teenagers, young adults, and old age. Therefore, it is imperative that family members and caregivers comprehend the stages of aging and the corresponding obstacles (Baloyi, 2015). The majority of countries face significant obstacles in establishing effective health and social systems that can accommodate geriatric care (WHO, 2024). He et al. (2020) report that aging is a development issue in Africa in their international population report. The escalating number of senior Africans has prompted this reasoning. As of 2020, the region is home to 74.4 million individuals aged 60 and older, with 54.3 million of them residing in Sub-Saharan Africa. Additionally, 18 countries have populations of 1.0 million or more (US Census Bureau, 2019). The International Data Base (IDB) of the Census Bureau predicts that the number of elderly Africans will more than triple to 235.1 million by 2050 (US Census Bureau, 2019). According to projections, by 2030, one in six individuals worldwide will be 60 years of age or older. According to the World Health Organization (US Census Bureau, 2019), approximately 80% of the elderly population will reside in low- and middle-income countries by 2050 (WHO, 2024). Furthermore, from 2015 to 2050, the proportion of the global population over the age of 60 will nearly double from 12.5 to 22% (WHO, 2024).

The global population is aging. It is anticipated that the proportion of individuals aged 65 and older will increase by an additional 16% by 2050, following a 9% increase over the past two decades on a global scale (United Nation, 2019). This demographic shift will necessitate that societies adjust. Providing sustainable, high-quality, and accessible long-term care is a challenge for governments when individuals live longer and are in poor health (Organization for economic, 2013). The increase in life expectancy is a positive development; however, it also entails a responsibility to ensure that individuals receive the necessary support as they

age and to facilitate the process of aging in place (Pani-Harreman et al., 2020). In 2019, the WHO reaffirmed its dedication to assisting countries in achieving healthier and extended lifetimes through the Decade of Healthy Aging 2020-2030 strategy. Understanding whether extended lifetimes are characterized by an increase in the number of years spent in good health (compression of disability) or poor health (expansion of disability) is a critical component of attaining longevity. This has significant implications for the provision of health and care services that correspond to the requirements of individuals as they age. Therefore, it is imperative to remain informed about trends, particularly the relationship between the increase in life expectancy and the increase in the number of years spent in excellent health. Healthy life expectancy and disability-free life expectancy are the most frequently used metrics for evaluating this. Both are capable of estimating the life expectancy of an individual who is in excellent health, but their methods of measurement are slightly different. Healthy life expectancy is susceptible to fluctuations as expectations of health evolve over time, as it is frequently determined by self-reported health inquiries (Jagger et al., 2016). Disability-free life expectancy is frequently determined by incorporating multiple items regarding activity limitations and/or dependencies (Kingston et al., 2017) and as a result, it is not subject to the same constraints as healthy life expectancy. In general, this type of evidence indicates that, despite the fact that individuals are living longer, the increase in life expectancy is not consistently accompanied by an increase in the number of years spent in excellent health and without disability. However, this is a dynamic body of evidence that necessitates continuous examination (Jagger et al., 2015;2016).

Geroscience Vs. Longevity Medicine

The updated framework for the Hallmarks of Aging expands the original 2013 list to 12 interconnected markers categorized as primary (causes of damage), antagonistic (responses to damage), and integrative (consequences of cumulative damage) (Figure 1). This "expanding universe" includes three new additions: disabled macroautophagy, chronic inflammation, and dysbiosis, reflecting a decade of progress in understanding biological decay across eight strata of organismal organization from molecules to the "meta-organism" microbiota. The central conclusion of the paper is that aging is a complex, holistic process where hallmarks are so deeply intertwined that interventions targeting one often alleviate several others simultaneously. The take-home message for geroscience is that while the distinction between "normal" and "pathological" aging remains debatable, objective quantification through aging clocks and standardized omics is essential for developing therapeutic strategies such as senolytics, NAD precursors, and fecal microbiota transplantation aimed at decelerating, halting, or reversing functional decline to extend human healthspan (López-Otín et al., 2023).

The field of longevity medicine has emerged as a translational advancement of biogerontology and geroscience, with the objective of transitioning healthcare from reactive malady treatment to proactive health span preservation. The institutional frameworks required to facilitate appropriate clinical translation have not kept pace, despite significant advancements in the scientific understanding of aging biology. The primary obstacle to longevity medicine is no longer empirical viability, but rather the absence of substantial educational and governance frameworks that can legitimize the field (Thor et al., 2026). Longevity medicine is a pre-disciplinary domain that examines the issues associated with non-institutional advancement, including commercial exploitation, inequality, and fragmentation. This analysis investigates the stabilizing roles of universities, accrediting organizations, and quality

assurance systems, in addition to offering comparative perspectives on the development of longevity medicine in China, the United Arab Emirates, the United States, and Europe. Education is a critical framework for the transformation of longevity research into equitable, evidence-based healthcare practices.

Figure 2. The Six Key Pillars of 2026 Longevity Medicine. Image created with AI (Gemini).

This infographic provides a forward-looking and comprehensive look at how longevity medicine is expected to evolve by 2026. The image emphasizes a shift away from "biohacking" and generic anti-aging remedies toward a multi-faceted, biological approach focused on personalized systems restoration. The infographic details six specific pillars, beginning with sophisticated epigenetic clock measurements, detailed mitochondrial diagnostics, and a holistic microbiome synchronization across oral, gut, and brain systems. This biological focus is supported by a tech-driven Lifestyle Integration Engine for continuous personalization, a robust AI-powered geroscience platform for unified data targeting, and a final Systems Restoration Index that precisely weighs the integrated impact of a user's genetic predispositions with their environmental conditions.

Over the past two decades, the comprehension of ageing has been significantly transformed by advancements in the biological sciences of aging. The process of aging, which was previously regarded as an unavoidable and largely untreatable process, is now widely recognized as a multifaceted, plastic biological phenomenon that is responsible for a

substantial portion of the global burden of chronic disease. Biogerontology has elucidated molecular and cellular mechanisms of ageing across species, while geroscience has articulated the ways in which these mechanisms contribute to disease vulnerability and functional decline in humans (Rattan, 2024; Kennedy et al., 2014). These developments have collectively established the scientific foundation for longevity medicine, a healthcare approach that is systems-oriented, preventive, and translational, with the objective of preserving physiological resilience and extending health throughout the adult lifespan. Despite this scientific maturation, the clinical and institutional transmission of longevity science remains inconsistent and fragmented. A flourishing ecosystem of diagnostics, digital tools, and interventions has emerged, and public interest has increased significantly, as private investment has expanded. Nevertheless, the conventional healthcare systems have not yet thoroughly integrated longevity concepts (Bischof et al., 2021).

In the present day, longevity medicine is in a precarious position: it is socially visible, scientifically promising, and institutionally underdeveloped. This tension is indicative of a more general challenge that numerous emerging medical disciplines face: the fact that scientific preparedness does not necessarily imply clinical legitimacy or systemic coherence. The absence of formal institutional education is a defining characteristic of this divide. Despite the growing recognition of the significance of educating clinicians in preventive strategies and ageing biology, education is frequently characterized as professional upskilling rather than as foundational infrastructure. In addition to the expertise of their clinicians, longevity medicine necessitates institutions that can establish shared standards, professional identity, ethical governance, and public trust. The absence of these components poses a threat to the development of a cohesive and responsible medical discipline, as longevity medicine is at risk of remaining a fragmented collection of practices. Innovation has not been the sole factor in the development of new medical disciplines throughout history. The trajectory of fields such as endocrinology, intensive care medicine (Grenvik et al., 2009), sports medicine, and genomic medicine was consistent: a protracted period of institutional consolidation followed early scientific advancements. During this phase, the development of educational programs, accreditation pathways, clinical standards, and professional norms occurred, often in an uneven manner and over the span of several decades. This institutionalization, rather than the initial discoveries, ultimately enabled these disciplines to integrate sustainably into healthcare systems. Currently, the discipline of longevity medicine is in a similar pre-disciplinary stage. An illustration of the hazards associated with an inadequate institutional foundation is the current state of longevity practice. The discipline's scope, evidence thresholds, and ethical positioning are significantly heterogeneous as a result of the absence of unified educational standards.

The Afrolongevity Paradox

The implementation of longevity medicine is profoundly local, despite the fact that the scientific foundations are inherently global. The biology of aging is consistent across populations; however, there is a substantial contrast in the regulatory administrations, healthcare systems, and societal attitudes toward prevention and aging of various regions. As a result, longevity medicine is not developing as a single, unified discipline, but rather as a collection of regionally influenced trajectories. In order to establish educational and institutional frameworks that are both globally coherent and locally legitimate, it is essential to understand this divergence. In Europe, the United States, the United Arab Emirates, and China, there are four distinct models of healthcare governance and cultural orientation toward ageing. Each paradigm has an impact on the practice, regulation, and perception of longevity

medicine. These distinctions have a fundamental impact on the role that education and institutions must play in stabilizing the field, rather than exclusively affecting clinical delivery.

The global nature of longevity science further complicates the longevity challenge. Despite the fact that ageing populations are a universal phenomenon, there is substantial variation among regions in terms of healthcare systems, regulatory environments, and cultural attitudes toward ageing (Amalaraj et al, 2025; Department of Health Abu Dhabi. 2024). Europe's gatekeeper-based primary care systems, the swiftly developing healthcare infrastructures of the Middle East, and East Asia's technology-driven approaches to ageing all present unique opportunities and constraints for longevity education. As a result, it is highly unlikely that a training paradigm that is exclusively national or uniform will be successful. In contrast, the importance of academically anchored education is once again emphasized by the need for institutional frameworks to maintain a balance between global scientific standards and regional adaptability. Ethical considerations serve as an additional rationale for institutionalization. The societal implications of extending healthy lifespans, intergenerational responsibility, equity, and access are among the inquiries that longevity medicine poses, which extend beyond individual clinical encounters (Scott et al., 2012; Callahan et al., 2017). Practitioners may be inadequately qualified to negotiate these intricacies in the absence of formal education that integrates ethical reasoning, regulatory literacy, and systems thinking. Institutional education, which is systematic rather than ad hoc, provides a framework for the resolution of these issues, thereby enhancing public trust and professional accountability.

Standard vs. Accelerated Aging

Geroscience Hallmark	Standard Aging (High Income)	Accelerated Aging (Afrolongevity)
Genomic Instability	Cumulative damage (70+ years)	Early-onset oxidative stress (Pathogen-led)
Inflammation	Late-life “Inflammaging”	Early-onset “Double Burden” systemic fire
Epigenetic Noise	Predictable methylation drift	Accelerated “Weathering” clock scores
Metabolic Sensing	Gradual nutrient-sensing decline	Rapid dysregulation (Urban transition)

Figure 3. Comparison of Geroscience Hallmarks: Standard vs. Accelerated Aging.

This figure presents a comparative analysis of four key geroscience hallmarks Genomic Instability, Inflammation, Epigenetic Noise, and Metabolic Sensing between standard aging in high-income contexts and accelerated aging, specifically referenced as Afrolongevity. For each hallmark, a fundamental divergence is highlighted. For instance, while standard genomic instability is characterized by cumulative damage emerging in later life (70+ years), accelerated aging manifests as early-onset oxidative stress driven by pathogen-led exposures. Similarly, the inflammatory profile shifts from late-life "inflammaging" to an early-onset

"double burden" of systemic inflammation, and metabolic sensing from a gradual decline to rapid dysregulation associated with urban transitions. Overall, the figure underscores how different socioeconomic and environmental contexts can shift the timeline and drivers of these biological aging mechanisms.

As a result of global medical advancements, there is still a substantial disparity between the length of life and the duration of health. Within the African context, this "health span gap" is particularly nuanced. Despite the consistent rise in life expectancy across the continent, the burden of age-related chronic diseases is on the rise, resulting in a distinctive paradox: a population that is aging but is not receiving targeted interventions (Gomez-Olive et al., 2024). Not only is the extension of life the primary challenge in modern gerontology, but the compression of morbidity as well. The rapid demographic transition toward an aging population in numerous African nations has surpassed the development of healthcare infrastructures that are specifically designed to address chronic, non-communicable diseases. This leads to a persistent "gap" in which the late-life years are frequently characterized by disability rather than vitality (Figure 3).

Recent data indicates that African populations are still unable to achieve their maximum healthspan potential in comparison to global averages due to socioeconomic factors and late-stage diagnoses (Kazeem & Adedini, 2023).

Africa is a "goldmine" for genomic research and longevity, as it contains the highest level of human genetic diversity on the planet. African genomes contain more ancestral variation and shorter linkage disequilibrium blocks than any other population, as the human species originated in Africa. This diversity provides a distinctive opportunity to identify uncommon protective variants against neurodegeneration and aging that may have been extinct in non-African populations due to genetic constraints (Choudhury et al., 2020). Comprehending these "African Advantages" could unleash biological mechanisms of resilience that are universally applicable. The current reliance on Eurocentric genomic data has resulted in a "one-size-fits-all" approach to aging that may be suboptimal for diverse populations. This poses a critical central question: Can African-specific genetic and phenotypic data redefine global aging interventions? The scientific community can progress toward a more precise, equitable framework for healthy aging that benefits the global population by reorienting its focus toward inclusive, diversity-driven research.

The Biological Blueprint: Genetics & Epigenetics

Africa is the geographic origin of the global dissemination of our species and the crucible of modern human evolution. Modern humans are believed to have originated in Africa within the last 300,000 years (ky) and dispersed globally within the last 100,000 years, according to evidence from paleontology and genetics. As a result, the African continent has been the site of continuous human habitation for a lengthier period than any other region (Fan et al., 2019). The African continent is home to the highest level of genetic diversity in the world; the average African genome contains nearly one million more genetic variants than the average non-African genome. In contrast to the global average of 3.2 to 4.7 ethnic groups per country, African countries have an average of over 8 and collectively represent 43% of the world's ethnic groups (Atkinson et al., 2022; Gomez et al., 2014). Additionally, Africa is exceedingly culturally and ethno-linguistically diverse. Research on protein polymorphisms, as well as the variation of mtDNA, Y-chromosomal, autosomal, and X-chromosomal DNA, indicates that African populations are the most variable and ancestral. The phylogenetic analyses of mtDNA

and Y-chromosomal haplotypes (Tishkoff and Williams, 2002) demonstrate that the majority of ancestral lineages are African-specific and that all non-African lineages can be derived from a single ancestral African haplogroup, thereby supporting the RAO model (Tishkoff and Williams, 2002). This diversity is so extensive that the genetic differences between Africans are greater than those between Africans and Eurasians. This is consistent with the "Out of Africa" paradigm of human evolution, which contends that the genetic diversity of Eurasians is predominantly a subset of that of Africans (Yu et al., 2002).

The genetic diversity of Africa is the outcome of the complex interplay between biological, historical, environmental, and cultural factors (Gomez et al., 2014). Geographic diversity, which encompasses a diverse array of environments from deserts to rainforests, has facilitated the development of unique genetic adaptations in populations that inhabit a variety of locations (Rotimi et al., 2010). Historical migratory patterns, including the continent's role as the cradle of humanity and subsequent surges of migration and trade, have facilitated genetic diversity and interaction. In addition to environmental pressures such as endemic diseases and a variety of subsistence strategies, cultural practices and societal structures have further influenced genetic diversity through differential selection pressures and patterns of human migration and settlement (Schlebusch and Jakobsson, 2018). There is a considerable need for innovative interventions to address a variety of African-specific health challenges, as African populations have exhibited a significant degree of genetic diversity (George and Akinwale, 2022). The concepts of P4 medicine—predictive, preventive, personalized, and participatory medicine—have emerged in the past two decades, predominantly in conjunction with advancements in digital technology, artificial intelligence, and clinical genetics. In the context of personalized medicine, the primary foundation of P4 medicine is the utilization of extensive quantities of data, predominantly biological data (Delpierre and Lefèvre, 2023).

The RODAM study (Chilunga et al., 2021) provides critical insights into the biological aging of transitioning African populations, revealing that migration status is negatively associated with epigenetic age acceleration (EAA). Contrary to the hypothesis that migration-led lifestyle changes would accelerate aging, Ghanaian migrants exhibited lower EAA than their non-migrant counterparts, potentially reflecting a "healthy migrant effect" or molecular advantage in all-cause mortality. Within the context of Afrolongevity, the paper identifies a complex interplay between environment, nutrition, and cardiometabolic health: higher fasting blood glucose was linked to accelerated aging in migrants, while a higher BMI and folate intake were associated with lower EAA in non-migrants living in Africa. This suggests that in environments with high infectious disease and chronic inflammatory loads, a nutritional reserve may be essential for cell repair and biological resilience. The study concludes that interventions for cardiometabolic diseases must be context-specific, leveraging the protective effects of nutrition and weight management to improve health spans and life expectancy across diverse African settings.

Precision medicine and personalized medicine have been developed as innovative interventions to tailor treatments to the genetic composition, lifestyle, and environmental factors of a specific individual. In reality, genomics is an indispensable element of both personalized medicine and precision medicine (Muin, 2016). The meticulous customization of remedies and investigations to the unique requirements of each patient, taking into account clinical skills, circumstances, and evidence, is known as personalized medicine. In contrast, precision medicine is dependent on the biological omics platforms' increasingly detailed molecular characterization of disease states to more effectively personalize diagnostics, prognostics, and therapeutics (McAlister et al., 2017). On the basis of the principle that individuals may

necessitate interventions for diseases that are specifically tailored to their nuanced and unique characteristics at the molecular, physiological, environmental exposure, and behavioral levels, personalized medicine is established (Goetz and Schork, 2018). In 2018, the application of emerging technologies, such as DNA sequencing, proteomics, imaging protocols, and wireless health monitoring devices, partially corroborated this belief by disclosing significant inter-individual variation in disease processes (Goetz and Schork).

The pronounced genetic heterogeneity that is evident in African populations has particularly significant implications for medical science in the domain of disease management. This includes endemic diseases like malaria, communicable diseases like HIV/AIDS and tuberculosis, and non-communicable diseases like hypertension and diabetes. African genetic diversity is of essential importance in light of the growing prevalence of personalized and precision medicine, which is based on the intricacy of genetic and phenotypic profiling to enable personalized therapeutic interventions. Nevertheless, it also poses specific challenges. As a result, the purpose of this scholarly review is to elaborate on the complex facets of Africa's genetic multiplicity, including its implications for personalized and precision medicine, which are both advantageous and difficult.

The distinct genetic diversity and healthcare requirements of Africa necessitate a multimodal approach to the development and implementation of personalized and precision medicine. A multimodal approach is therefore necessary. It is essential to guarantee the effective implementation of personalized medicine in Africa by establishing and empowering genomic research centers and innovation hubs, increasing funding opportunities for genomic studies, establishing African genomic biobanks and repositories, training competitive researchers, improving infrastructure, and integrating available customized treatment approaches into clinical practice. Africa has the capacity to enhance healthcare equity and health outcomes by promoting international cooperation and implementing culturally cognizant healthcare systems, thereby capitalizing on its genetic diversity. The most critical phase in the advancement of genomics and personalized medicine research and development is the establishment of genomic research institutes and innovation clusters in Africa. These research centers and sites can serve as centers of excellence, facilitating the collaboration of professionals from the fields of genetics, medicine, technology, and research on innovative projects. They can capitalize on local knowledge and resources to develop more effective preventive and therapeutic approaches and promote the development of innovative technologies and approaches that are suitable for the African environment by focusing on common diseases in Africa, such as HIV, TB, and malaria. Additionally, they can utilize genetic knowledge. Additionally, they may play a role in the transformation of research discoveries into practical healthcare solutions, thereby guaranteeing that a greater number of individuals can receive personalized treatment (Omotoso et al., 2022; PMC, 2026; Frontiers, 2026).

There are substantial obstacles to genomic research in Africa due to insufficient funding, which impedes the continent's advancement in this critical field. This leads to a dearth of infrastructure, knowledge, and resources that are indispensable for the conduct of significant genomics research. It further fosters an environment that hinders the ability of African scientists to collaborate on research projects, thereby delaying the application of genomic research findings to real-world public health benefits. Genetics and genomics research programs in Africa received $216 million of the estimated $300 billion spent annually on medical research worldwide in 2015 (Science Direct, 2026). It is essential to increase the availability of financing for research and development in order to surmount these challenges and advance genomic research and personalized medicine initiatives in Africa. African nations have the potential to establish enduring infrastructure, cultivate partnerships, and provide

significant genomic data that is specific to their populations by investing in genomics research. In the end, this will improve health outcomes throughout the continent. The ethical and secure management of genetic data necessitates the establishment of data repositories and biobanks (Hewitt, 2011). These repositories are capable of storing biological samples and their corresponding data, thereby enabling their use in scientific and clinical settings. H3Africa Biorepositories, South African National Biobank, MyAfroDNA, Malaria Research and Training Center (MRTC) Biobank, Kenya Medical Research Institute (KEMRI) Biobank, and Egyptian National Biobank are among the biobanks and repositories that have exhibited a substantial role in the collection, processing, storage, and distribution of human biological samples and associated data. It is imperative to establish suitable governance frameworks and ethical standards to guarantee that the data is utilized appropriately and the privacy of participants is safeguarded (Malakar et al., 2024).

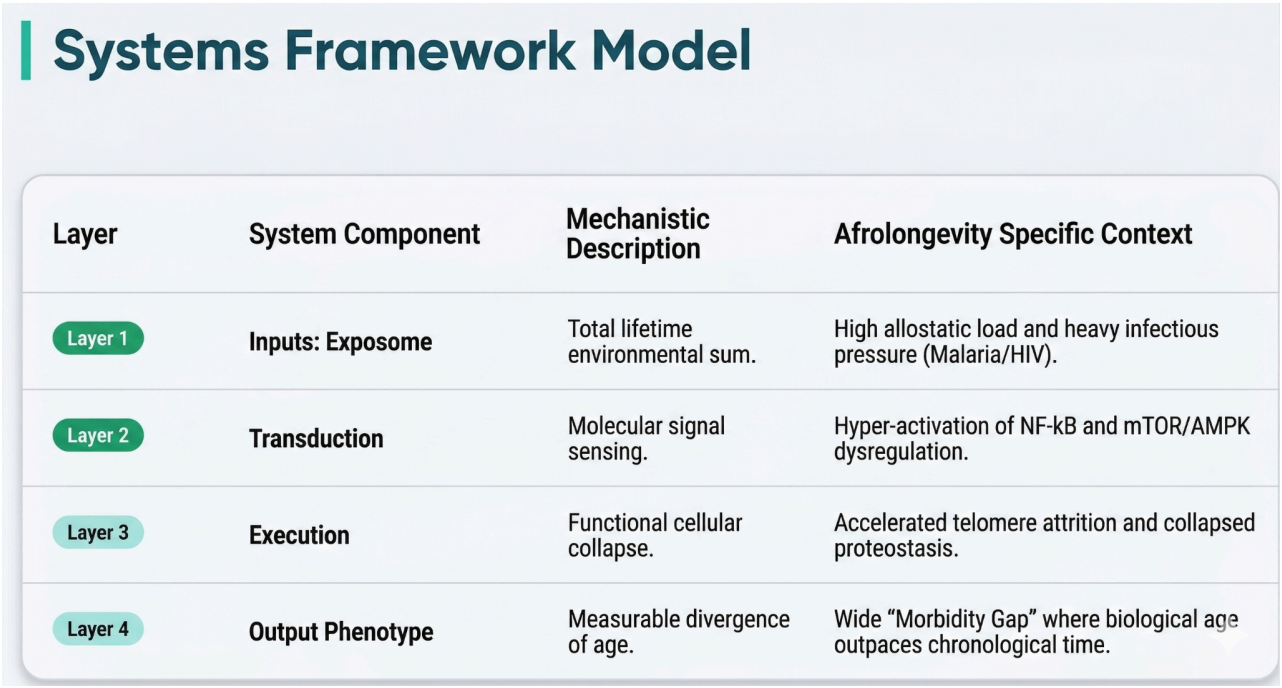

Figure 4. A Systems Framework Model for Afrolongevity: From Exposome to Phenotype.

This image illustrates a four-tiered systems framework model designed to conceptualize and address longevity specifically within the African context (Afrolongevity). The model, organized into "Layers," "System Components," "Mechanistic Descriptions," and "Afrolongevity Specific Context," delineates a causal pathway from external inputs to biological outcomes. It begins at Layer 1 (Inputs: Exposome), defining the exposome as the cumulative total of lifetime environmental exposures. In the context of Afrolongevity, this includes a high allostatic load—or the biological wear and tear from chronic stress—and a heavy burden of infectious diseases, such as malaria and HIV. These inputs feed into Layer 2 (Transduction), which represents molecular signal sensing. Here, the Afrolongevity context points to significant dysregulation of critical cellular pathways, specifically the hyper-activation of the pro-inflammatory NF-κB and the disruption of the mTOR/AMPK nutrient-sensing pathways. This molecular dysregulation drives the Layer 3 (Execution) of functional cellular collapse, manifesting as accelerated telomere shortening (telomere attrition) and a failure of protein quality control (collapsed proteostasis). Finally, Layer 4 (Output Phenotype) is the measurable divergence of age, defined as a wide "Morbidity Gap," where individuals' biological age—their actual rate of physiological decline—surpasses their chronological time on earth.

Healthcare practitioners, researchers, and policymakers must be provided with the requisite knowledge and skills to implement personalized medicine through comprehensive education and training programs (Towfighi et al., 2020). The ethical implications of genetic testing and data utilization, as well as all aspects of genomics and bioinformatics, should be the primary focus of these programs. Education will cultivate local knowledge, which will enable the workforce to navigate the intricacies of personalized medicine and contribute to its advancement. In the fields of genomics, bioinformatics, and precision medicine, the African Genomic Medicine Training Initiative (AGMT), the South African Precision Medicine Program, and the Precision Medicine Program by the African Union Development Agency-NEPAD (AUDA-NEPAD) are all examples of programs that offer training and fellowships. In order to prepare a substantial number of competitive practitioners, researchers, technicians, and policy implementors, the development of personalized and precision medicine requires the multiplication, nurturing, and empowerment of such programs. Optimization of the healthcare system is required to enable genetic testing and counseling services, which is essential for the deployment of precision medicine (Ramos, 2020). The integration of genetic testing into standard clinical practice and the establishment of laboratories endowed with state-of-the-art genomic technologies are both required (Figure 4). More precise diagnoses and personalized treatment programs will be possible as a result of improved infrastructure (Meric-Bernstam et al., 2013). Furthermore, it is imperative that genetic counselling services are easily accessible in order to improve health outcomes and assist patients and their families in making informed decisions (Raspa et al., 2021).

One of the numerous opportunities for the advancement of precision and individualized medicine is the high genetic diversity of the African population. Consequently, it is essential to confront challenges such as underrepresentation in genomic research initiatives and databases, incomplete reference genomes, and inadequate funding. It is essential to execute a thorough investigation of African genetic variation in order to enable the development of personalized treatment strategies. It is imperative to conduct further in-depth research in order to leverage the potential of the high genetic diversity of Africa and convert the extant obstacles into opportunities for further exploration of African genomics. The ultimate objective is to develop personalized and precision medicine approaches that are specifically designed to meet the unique requirements of the diverse African population.

Lifestyle & Environment: The "African Blue Zones"

Longevity Vs. Lifespan: Living Longer or Living Better?

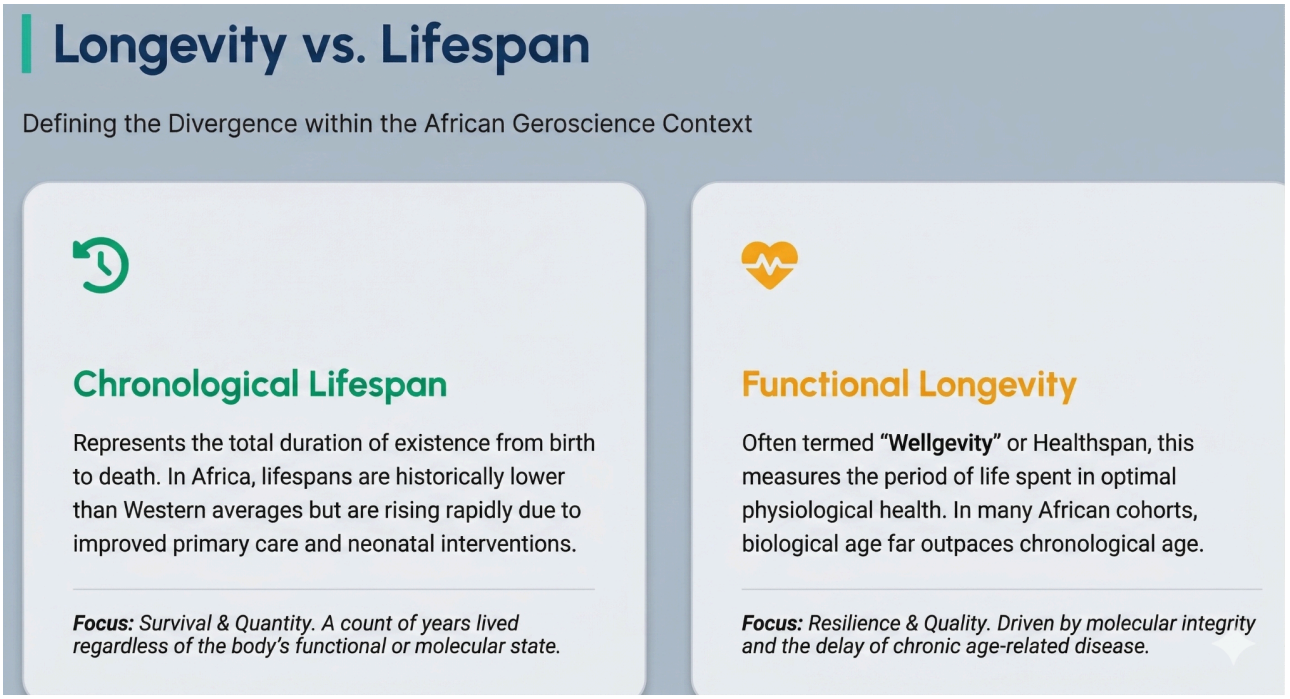

Figure 5. Difference between longevity and lifespan in an African concept. Picture generated with AI (Gemini).

Longevity typically denotes the duration of life—specifically, the lifespan of an individual. For ages, the enhancement of lifespan has been a primary objective of medicine, public health, and scientific inquiry. Advancements in sanitation, nutrition, vaccination, and medical technology have significantly enhanced global human life expectancy. In some nations, individuals now have lifespans that exceed those of earlier generations by several decades. Nonetheless, having extended lifespan does not inherently equate to a better or more happy existence. This is where the notion of wellgevity arises. Health span merges the concepts of wellbeing with longevity, highlighting the importance of living not just longer but also better, more functioning, and more purposeful lives. The emphasis transitions from just increasing lifespan to enhancing the quality of life throughout those years. Lifespan emphasizes physical health, emotional wellness, cognitive performance, social interaction, and autonomy in later life. Although longevity has historically been a primary aim, several experts now contend that lifespan represents a more significant and desirable objective. Prolonged lifespan without health maintenance may result in extended durations of chronic illness, incapacity, and dependence. Conditions such as dementia, cardiovascular illnesses, diabetes, and neurodegenerative disorders may markedly diminish quality of life, despite an increase in life expectancy. Conversely, lifespan emphasizes health span—the number of years an individual lives in optimal health—rather than just longevity. The rising prominence of lifespan signifies a wider shift in healthcare ideology towards preventative medicine and comprehensive well-being. Lifestyle determinants like diet, physical exercise, stress management, sleep quality, and social relationships are essential for attaining wellgevity. Progress in customized medicine, genetics, and digital health technology facilitates this approach by enabling people to sustain optimum health during their lifespan. Cultural and religious viewpoints significantly shape societal perceptions of lifespan and well-being. In several cultures, longevity is esteemed and linked to knowledge, respect, and familial continuity. Numerous East Asian

cultures see longevity as a gift and an indication of harmony with nature. Conversely, several philosophical and theological traditions prioritize the quality and purpose of life above its length. Islamic traditions, for example, often emphasize the significance of a "good life" defined by health, equilibrium, and purposeful deeds, rather than just striving for life extension devoid of meaning. Many spiritual traditions also stress balance, temperance, and well-being as essential components of a successful life.

Achieving a balance between lifespan and well-being requires a multifaceted strategy. Healthcare systems should focus on preventative initiatives to mitigate the burden of chronic illnesses. Secondly, people need to embrace healthier lifestyles that promote both physical and mental well-being throughout their lives. Third, governments and researchers should prioritize not just the extension of life expectancy but also the enhancement of functional independence, cognitive health, and social engagement in later life.

The objective should be to amalgamate lifespan and well-being, rather than to choose one over the other. An effective strategy for aging would enable individuals to extend their lifespan while maintaining health, activity, and social engagement. By prioritizing wellgevity, society may guarantee that more years of life are meaningful, useful, and enriching, rather than just prolonging life without enhancing its quality.

In conclusion, discussions on lifespan are prevalent; yet, the associated terms and circumstances remain unaddressed (Figure 5). Prolonged life is advantageous; yet, if it necessitates a plethora of medications, constant consultations with several doctors, and a sedentary lifestyle, it only constitutes an extended warranty rather than a life of quality. The true objective may not be longevity. Perhaps it is Wellgevity —greater emphasis on physical activity than medication, more joy over laboratory examinations, and more experiences than scheduled consultations. The objective is not just to extend lifespan, but to enhance the quality of life within those years.

Challenges: The Roadblocks to Research

Given the increasing number of elderly Africans, it is imperative that governments and societies take action to ensure their participation and well-being. Additionally, the United Nations (UN) Sustainable Development Goals, which are based on the "leave no one behind" principal (United Nation, 2025), as well as Africa's own Protocol on the Rights of Older Persons (African Union, 2016), both enshrine this entitlement. Additionally, Won et al. (2018) have identified numerous obstacles encountered by the geriatric population. The physical, social, medical, and economic aspects are among the challenges. Despite the prevalence of these unique requirements among the elderly in Africa, there is a dearth of specialized and differentiated service packages. In addition to this, Buowari (2022) asserts that the elderly population in Africa encounters social obstacles, including neglect, abandonment, elder abuse, and social isolation. The author attributes this to the absence of long-term care facilities and convalescent residences for the elderly in Africa. As per WHO (2023), the United Nations Decade of Healthy Ageing encourages nations to enhance and revolutionize the provision of geriatric care and support by implementing person-centered, integrated care that is tailored to the distinctive requirements of this demographic.

In Africa, Buowari (2022) asserts that geriatric care is traditionally and primarily provided by family members, including the extended family, which also plays a significant role. Nevertheless, the emergence of challenges such as a lack of access to healthcare and financial constraints, as a result of social and economic factors such as urbanization and migration, has

led to a growing concern about the availability of adequate care for the elderly in numerous regions. Overburdened family caregivers, particularly women and girls, are an additional, emerging challenge associated with traditional caregiving. Ikeorji (2024) argues that the family is the primary caregiver for the elderly in Africa, as they rely on a robust traditional support system. Additionally, the author emphasizes that cultural beliefs regarding aging, traditional healing practices, gender roles, and an emphasis on a robust extended family support system are all significant sociocultural factors that significantly influence the care of the elderly in Africa.

All of these factors have the potential to either positively or negatively impact the welfare of the elderly. Nevertheless, Africa has experienced substantial transformations as a result of evolving social, economic, and health landscapes, necessitating a transformative approach to the care of the elderly. Assunção et al. (2020) emphasize that the dissolution of the family structure leads to a negative impact on the care of the elderly and a weakening of the support system, as most African societies are becoming urbanized. Gyasi et al. (2019) emphasize the necessity of social support for this demographic, as their mental health, quality of life, and health and psychological well-being are all impacted. Iyare et al. (2021) argue that the notion that old people are revered and respected in the majority of African societies is highly prevalent. However, the issue of stigma and discrimination against the elderly in care in communities is also a significant factor. Geriatric-friendly care is defined as healthcare that is specifically designed to address the distinctive requirements of senior individuals, as per Ssensamba et al.(2019). While addressing the intricate medical, psychosocial, and emotional requirements of this population, this care prioritizes aspects such as safety, dignity, independence, and quality of life.

The infrastructure for easy access, commodities and equipment for geriatric care, availability of medicines for non-communicable diseases, Comprehensive Geriatric Assessment, and human resources trained in geriatric care are all necessary to further enhance the accessibility and friendliness of geriatric care services. In addition, Age-Appropriate Communication: that is, communication that is explicit, respectful, and slow-paced, and that takes into account hearing or vision impairments. Consequently, Ssensamba et al. (2019) assert that there is no documentation regarding the public health system's preparedness to offer geriatric-friendly services in the context of developing countries in Africa, nor are these countries provided with explicit guidance on the provision of such care. Naidoo et al. (2020) conducted a study in South Africa that shows that both the nursing and medical curricula encompass a diverse array of geriatric topics. Nevertheless, there is a dearth of collaboration among stakeholders regarding geriatric care. This dearth of collaboration among stakeholders has an impact on the capacity of nursing and medical graduates to co-manage geriatric patients in a patient-centered and efficient manner.

The author also advocates for the necessity of all key stakeholders and community representatives reaching a consensus on the minimum essential competencies in geriatric care for health professionals. Furthermore, the recognition of the significance of practical training and clinical experience fosters a sense of preparedness for the provision of geriatric-friendly care, which is essential for improving the quality of elderly care in healthcare facilities (Ghaffarie et al., 2016). South Africa has a social grant that assists the elderly population, as well as a well-defined set of laws, policies, and programs. Moore and Kelly (2024) reported financial challenges and hardships in the provision of services for the elderly populations in a South African study, despite this. In addition, Solanki et al. (2019) ascribe these challenges to the magnitude of inequality, the size of the older population, poor budgetary allocation to the older population, poor governance, and poor implementation of the scheme. Dhemba (2023)

asserts that social pension schemes for elderly individuals are present in the majority of East African Community countries and in Southern Africa; however, they are insufficient to address the fundamental financial and social obstacles they face.

The objective of this integrative review was to investigate the existing evidence regarding the factors that affect the welfare of the geriatric population in Africa. Access to medical resources, family dynamics, and socioeconomic conditions are all critical factors that influence the quality of life of the elderly. It is expected that the results of this integrative review will provide governments and policymakers in Africa with information regarding the planning and/or improvement of the quality of geriatric care. This will elucidate potential strategies for enhancing elder care, thereby fostering social policies that honor both the cultural heritage and the modern realities faced by aging individuals in Africa.

Future Horizons: Precision Afrolongevity

In Africa, people are aging as traditional family patterns change due to urbanization and economic pressures. The function of elders within communities is being redefined. The need of geriatric care transcends basic survival. It involves the safeguarding of dignity, cultural identity, and social cohesiveness.

The present review article on Afrolongevity introduces the scientific and theoretical framework for extending the healthy lifespan of Africans, which functions as the "what" and "why" of the evolving field of geriatric care. Afrolongevity emphasizes the biomedical and socio-economic factors that enable Africans to reach advanced ages, including genetic resilience and enhanced public health. However, the "African context" of elderly care provides the practical "how." In numerous African societies, care is traditionally based on Ubuntu (communal interdependency). However, as longevity increases, these informal family structures are subjected to unprecedented strain. By connecting the two, we contend that Afrolongevity is not solely concerned with the extension of life; rather, it is about the optimization of integrated care models that integrate contemporary medical interventions with traditional kinship networks, thereby guaranteeing that the "gift" of a longer life is bolstered by a robust, culturally aligned aging infrastructure.

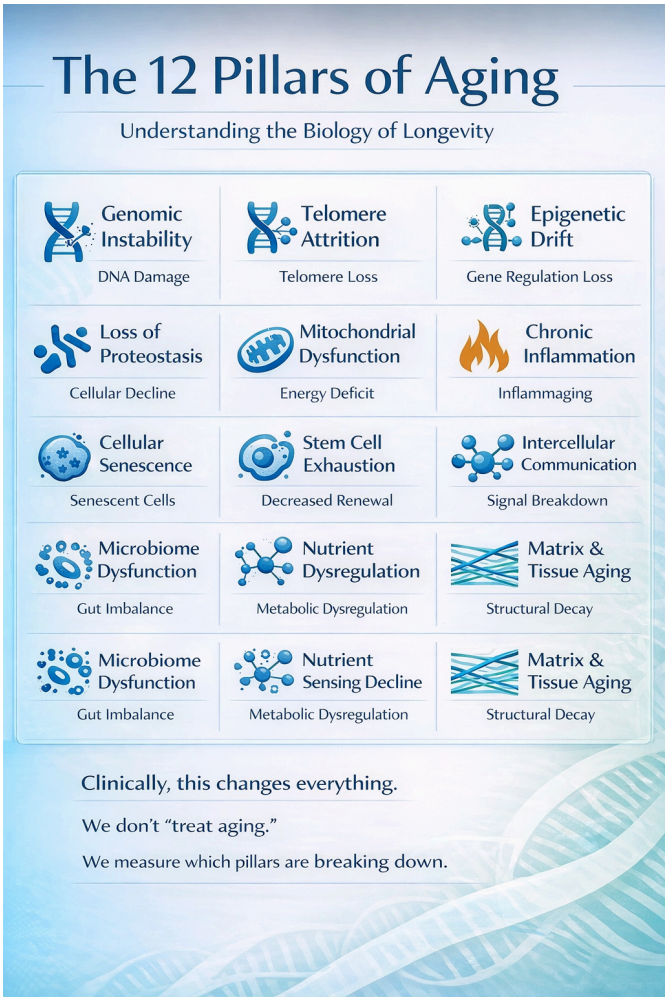

Figure 6. Managing Longevity: The Intersection of Genetic Constraints, Modifiable Health Factors, and Biological Aging Pathways. Image generated with AI (Gemini)

The infographic outlines the 12 Pillars of Aging, a clinical framework used to measure biological decline rather than treating aging as a singular condition. These pillars encompass molecular and cellular failures, such as genomic instability, telomere attrition, and epigenetic drift, alongside systemic issues like chronic inflammation, microbiome dysfunction, and nutrient sensing decline. By identifying specific areas of breakdown—including stem cell exhaustion, mitochondrial dysfunction, and structural tissue decay—clinicians can better understand the underlying biology of longevity and target the specific mechanisms driving an individual's aging process.

Although Afrolongevity offers a theoretical and empirical framework for life extension, the African care context embodies the practical application of these theories. The primary distinction between the two organizations is their scope: Afrolongevity concentrates on systemic variables, including the investigation of NCD prevention, economic "longevity dividends," and high-level biotech, in order to transform the narrative of aging from a burden to a resource. In contrast, the care context is established through localized application, which emphasizes the "how" of daily survival through mobile clinics, addresses the pension gap for informal caregivers, and employs telemedicine to span the rural-urban divide. In the final analysis, the connection between them is the integration of contemporary innovation with

cultural preservation, which guarantees that the biological gift of extended life is bolstered by a dignified, Ubuntu-based infrastructure.

To summarize, there are many challenges that make Afrolongevity is a hard mission that include: the healthcare system and the elderly, social isolation and loneliness, pension schemes and the elderly, the cultural fabric of African societies, and the socioeconomic factors affecting access to healthcare and support services (Figure 6).

The Healthcare System and the Elderly

Non-communicable diseases are prevalent in the elderly, as per the WHO (2021). In that regard, the increasing prevalence of chronic ailments among senior individuals requires a more robust health system that is capable of providing specialized treatment for the elderly. In accordance with the second guiding principle of WHO's Integrated Care for Older People (ICOPE), 'older people should have equal opportunity to access services that address the determinants of healthy ageing, and to be supported to adopt healthy behaviors, regardless of their social or economic status, place of birth, residence, age, gender, or other social factors' (WHO 2024). Consequently, it is imperative that the healthcare system is responsive, provides effective management of these conditions, diagnoses them, and implements prevention activities in order to enhance the quality of life for this population. Similarly, in the African ubuntu context, both men and women collaborate to provide caregiving to the elderly (Chisale, 2018), indicating a focus on pastoral care that disregards the potential for health systems to impede support for the elderly. For African communities, ubuntu is a term that denotes a state of harmony and interdependence (Letseka and Letseka, 2021). In accordance with Chisale (2018), it is reasonable to presume that this concern is a visible ethic that is applicable to both genders. This method will enhance the quality of life and health outcomes of the elderly. Ogunyemi et al. (2023) conducted a study in Nigeria that demonstrated that healthcare providers who possess inadequate training for the care of elderly individuals provided suboptimal screening and treatment services for conditions that are prevalent among this demographic. Furthermore, healthcare professionals frequently lack the knowledge and expertise necessary to recognize, resolve, and administer care that is pertinent to the elderly. In a separate but related study, Tanyi and Pelser (2020) established a positive, supportive, and friendly communication environment in which healthcare personnel provided a comprehensive explanation of all treatment procedures. This environment facilitated the provision of friendly services for the elderly. The WHO (2024) emphasizes the significance of enhancing the healthcare services and support provided to the elderly by delivering person-centered, integrated care that responds to the distinctive and diverse requirements of this demographic.

Grounding genomics governance in the African communitarian ethic of Ubuntu—the philosophy that humanness is defined through communal relationships—provides a transformative framework for advancing justice, fairness, and equity in African research. By centering on solidarity, this model addresses macro-level issues such as the exploitation of local researchers and the "genomics divide" by demanding global collective action and the prioritization of diseases relevant to the African burden. The framework is operationalized through seven core principles: solidarity (interdependence), reciprocity (mutual benefit for study communities), open sharing (preventing the hoarding of data or patents), inclusivity (substantive representation of all stakeholders), deliberative consensus (preventing disproportionate influence by powerful entities), accountability (treating participants as agents of change), and mutual trust. In the context of Afrolongevity, this Ubuntu-based approach serves as a vital moral skeleton to ensure longevity research remains non-exploitative and culturally aligned,

allowing African nations to leverage their genetic diversity as a common heritage to build sustainable infrastructure and foster global health equity. (Munung et al., 2021)

The scoping review by Ali et al., (2021) indicates that while genetics and genomics research (GGR) is expanding in Africa, many countries lack the robust, enforceable legal and policy frameworks necessary to ensure ethical conduct and prevent exploitation. The study analyzed 36 policy documents and found that current regulations often fail to address critical issues like broad consent, data sharing, and community engagement, with only six country-level documents being specific to GGR. In the context of Afrolongevity—the pursuit of extended healthspans for African populations—this policy gap is a significant barrier to ensuring that genomic advancements provide equitable local benefits rather than contributing to "brain drain" or "mistrust". A pivotal actor in addressing these gaps is the Human Heredity and Health in Africa (H3Africa)(H3Africa, 2011) initiative. Launched in 2010, H3Africa provides a comprehensive ethical and governance framework designed to foster African professional leadership and scientific sovereignty. Its benefit to Afrolongevity lies in its role as a baseline for creating country-specific policies that protect African genetic diversity while facilitating the preventive and diagnostic research essential for improving long-term health outcomes on the continent.

Social Isolation and Loneliness

Retirement institutions are among the older groups most vulnerable to isolation. Many researchers have examined the frequency of loneliness among community-dwelling seniors and found that care assistance significantly impacts the mental and physical health of the elderly (Gyasi et al., 2019). Following social or economic transformations, cultures see alterations in the degree to which families provide assistance to their senior relatives. A departure from the Ubuntu ideals arises from an inadequate balance between familial and governmental obligations (Mpofu et al., 2024). Alongside the difficulties of autonomous living in care facilities, families often place their elderly relatives in retirement homes. This requires the formation of social networks to mitigate the adverse effects of loneliness. According to ICOPE guiding principle number 1, older adults are entitled to the highest attainable standard of physical and mental health. Therefore, it is essential to foster supportive networks that enhance resilience and mental health, since social isolation and loneliness pose considerable issues for the elderly (Moyle et al., 2010).

Conventional beliefs and practices in several African civilizations profoundly impact the structure of geriatric care, highlighting household obligation and community accountability (Buowari, 2022). However, several studies have raised concerns about the disregard for familial care, since the elderly population experiences social isolation that adversely impacts their mental health (Gyasi et al., 2019). These researchers have disclosed a significant association between mental health disorders (including anxiety, sadness, and cognitive impairment) and social isolation. WHO (2024) and Buowari (2022) emphasize the need of a strong social support system for the elderly to enhance their mental health. Consequently, the safeguarding and enhancement of the mental health of the senior population must emphasize social contacts. Social isolation and loneliness have been shown to adversely affect the physical function, disability, and overall health state of the elderly. Thus, cultivating social ties would guarantee that people preserve their ideal physical health (Gyasi et al., 2019). Older individuals are often seen as sources of knowledge, and their well-being is considered a communal responsibility rather than a personal concern. This thinking system ensures that seniors get the respect and support they deserve by cultivating a strong bond among family

members and promoting active community involvement in caring. Women constantly undertake caregiving tasks, reflecting the deeply entrenched gender norms in these communities and the significant burden they carry in elder care (Manyonganise, 2015). The African society highly values cultural rituals and communal meetings, which enhance social bonds and bolster geriatric care practices (Columbus, 2014). In the African setting, integrating traditional values in elder care enhances familial and communal bonds while elevating the quality of life for the elderly, thereby representing a comprehensive approach to aging (Theron and Theron, 2013).

Pension Schemes and the Elderly

Limited resources and inadequate healthcare infrastructure exacerbate the multifaceted challenges associated with providing care for the elderly in Africa (Oyinlola, 2024). Secondly, the practice of pension sharing demonstrates the interconnectedness of family dynamics and resource distribution, as senior adults frequently assume a critical role in their households despite societal pressures (Schatz et al., 2015). Schatz and associates assert that "pensions provide financial autonomy for older individuals". This is consistent with the third guiding principle of ICOPE, which emphasizes the regard for their autonomy. This implies that it may also indirectly affect living arrangements, as the senior community may opt to reside in a separate location from adult offspring and other families, which could affect their care. Due to their diminished physical capabilities and productivity, the elderly are compelled to share their sole consistent income source, as they are eligible for government-funded non-contributory pensions. This is due to their dependency on their family for care. Therefore, the practice of pension sharing would serve as an illustration of the interconnectedness of family dynamics and resource distribution, as the elderly continue to play a significant role in their households despite societal pressures (Schatz et al., 2015).

It is believed that the elderly are essential to the subsistence of numerous South African households (Schatz et al., 2015). Nevertheless, the well-being of the aging population is frequently compromised by economic constraints, which result in insufficient investment in essential services. Nyang'oro and Njenga (Schatz et al., 2015) express their regret for the lack of savings for old age among sub-Saharan African workers, as they reveal that a staggering 91% of individuals are unable to save for their old age because of the fragility of pension systems. In numerous African countries, the delivery of care can be complicated by cultural attitudes toward aging. Families may be inadequate or unwilling to undertake caregiving duties, resulting in a reliance on formal services that are frequently overextended (Nzima and Maharaj, 2020). The necessity of policies and measures that address these challenges is critical, underscoring the imperative need for systemic improvements in the delivery of healthcare to the elderly (Nzima and Maharaj, 2020).

The Cultural Mosaic of African Societies

Comprehensive geriatric care not only addresses health and well-being requirements but also reinforces the cultural fabric of African societies, imploring policymakers and communities to acknowledge and implement holistic care strategies that empower older individuals in their twilight years (Kohil et al., 2020). In various African cultures, elderly care is often viewed through a familial lens, where intergenerational relationships play a critical role in caregiving practices (Rutagumirwa et al., 2020). In line with this, further supports the importance of understanding the stages of aging by family members and caregivers. While Rutagumirwa et al. (2020) highlights the evolving norms, where older people’s life experiences are being

impacted by neglect as their children neglected the care of their parents, the traditional perception suggests that aging individuals hold significant wisdom and experience and, thus, deserve respect and support from younger family members (Awuviry-Newton et al., 2022). This is in line with the ICOPE guiding principle 3 that recognises older people as key decision-makers in their own care, respecting their autonomy (Cesari et al., 2019). This line of thinking fosters cultural resilience and a communal approach to eldercare, contrasting sharply with the Western preference for formal, institutional solutions. The WHO has highlighted the importance of integrating local practices into eldercare frameworks (2021). However, challenges persist in the application of health systems within developing contexts. Many African communities lack the resources and infrastructure to implement comprehensive care models that align with the ideals of healthy aging (Rudnicka et al., 2020). As health needs evolve, the demand for high-quality care in low- and middle-income countries intensifies, necessitating a re-evaluation of customary practices to ensure they meet contemporary requirements of elder health maintenance (Kruk et al., 2018).

The Socioeconomic Factors Affecting Access to Healthcare and Support Services

Structured barriers have a substantial impact on the quality of care that the elderly in Africa receive, as they can produce disparities in access to healthcare and support services (Braimah et al., 2022). According to these researchers, the age of the senior adult population has increased in recent decades, which has resulted in a higher rate of healthcare utilization and an increasing burden of chronic non-communicable diseases among this demographic (Braimah et al., 2022). Nevertheless, economic constraints would restrict the availability of resources, including transportation to healthcare facilities and the ability to pay for essential treatments. ICOPE guiding principle 4 states that "care should be provided equally to all, without discrimination, particularly gender discrimination, ableism, or ageism." Lategan (2021) cites South Africa as an example, where a demand was made to safeguard the elderly in a manner that extended beyond healthcare. Additionally, this researcher has noted that the health and well-being requirements of the geriatric community are multifaceted, encompassing physical, socio-economic, and environmental factors, as well as socio-cultural and life expectancy considerations. Additionally, health disparities rooted in socioeconomic inequities are responsible for the asymmetrical distribution of health across socioeconomic status.

Educational disparities also impede comprehension of the available healthcare options, resulting in underutilization of these services. In particular, immigrant populations may experience systemic discrimination within the healthcare framework, which may further confound access due to cultural and linguistic barriers (Gil-Gonzalez et al., 2015). Lategan (2021) has observed that these obstacles can exacerbate health issues in the geriatric community, emphasizing the necessity of culturally sensitive care. While the new sociological role of aging individuals to care for children due to the mortality of their parents, caused by, among others, HIV/AIDS, continues to influence the experiences of elder populations in palliative care, the intersection of ethnicity and socioeconomic status remains a significant factor. This implies that it is imperative to resolve these socioeconomic determinants in order to enhance the care and support provided to the elderly in Africa.

Conclusions and Recommendations

The previous discussion clearly indicates that the African setting poses many challenges to Afrolongevity. Food security, housing, healthcare access, and poverty are critical determinants of health that profoundly affect the senior population due to substantial societal differences. This requires a comprehensive understanding that encompasses cultural, social, and communal dimensions. This integrative study emphasizes the need of developing care frameworks that recognize the many community viewpoints on aging and caring, while also respecting the unique cultural values and customs of older persons. Abulaiti et al. (2022) noticed that crises reveal the adaptive power and resilience inherent in societies, enabling people to manage their caregiving experiences during hardship. Similarly, Brownell and associates underscore the critical need for heightened awareness and education among healthcare workers about culturally unique attitudes related to illnesses such as dementia (2024). The quality of care for the elderly will be enhanced, consequently improving their dignity and well-being in various African contexts, using a collaborative approach that merges traditional knowledge with modern caring approaches. The examination of the intricate geriatric care framework in Africa uncovers numerous pivotal findings that underscore the need for extensive modification. The research highlights the significant shortage of healthcare professionals proficient in geriatrics, adversely affecting the quality of care provided to elderly patients. Moreover, the aged demographic has other challenges stemming from socioeconomic considerations, such as poverty and limited access to healthcare services.

Recommendations to address these difficulties include community-based health initiatives that mobilize local resources and improve training programs focused on geriatric care. Furthermore, promoting intergenerational activities helps foster social cohesiveness and support networks for older folks, ensuring their sustained connection and recognition within their communities. It is advised to build networks of geriatric experts who educate and teach their junior colleagues to facilitate the implementation of intergenerational initiatives. The change of geriatric care in Africa will depend on the priority of these methods, ensuring the dignity and improved quality of life for this vulnerable population. Studies have shown that loneliness contributes to major geriatric diseases. This review advocates for the use of community resources, perceived social support, and social participation. Such initiatives would provide the elderly with resilience and coping mechanisms to address loneliness. It is essential to encourage comprehensive treatments that tackle both individual and environmental factors contributing to loneliness to reduce age-related functional decline and foster social engagement and community integration, so improving the overall well-being of the elderly. The health ministries may enact systemic policy reforms, including the incorporation of geriatric nursing into nursing education, the establishment of mobile clinics for remote seniors, and the development of associated community outreach initiatives for the aged. African nations have the potential to replicate South Africa's innovative "Older Persons Act, 2006" in their legislation.

One final thought; "Is the Longevity Industry Truthful?"

In the synthesis of current geroscience delivery models, it becomes evident that the longevity industry’s primary challenge is not a deficit of scientific innovation, but rather an operational reliance on an obsolete, 20th-century framework defined by episodic clinical interventions. Despite the availability of high-resolution biomarkers, wearable integration, and predictive analytics, the prevailing model attempts to manage dynamic, continuous biological processes through infrequent, semi-annual evaluations. This structural mismatch ignores the reality that

physiological adaptation, stress response, and molecular degradation are incessant. Effective health span management requires a paradigm shift from reactive diagnostics toward a model of continuous, data-driven, and physician-led oversight—comparable to the "private banking" sector of wealth management.

Within this framework, the biological state is managed as a complex portfolio requiring active, real-time optimization. The role of the physician evolves into that of a "health investment manager," leveraging longitudinal data to implement proactive risk mitigation strategies that delay chronic disease before pathological thresholds are reached. Such a model is particularly vital for Afrolongevity, where unique environmental stressors and high allostatic loads drive accelerated aging phenotypes characterized by early-onset systemic inflammation and rapid metabolic dysregulation (Figure 7). Ultimately, the transition from static healthcare to continuous biological restoration represents the next necessary evolution in longevity medicine, ensuring that scientific advancements are matched by a delivery system capable of managing the relentless continuity of human biology.

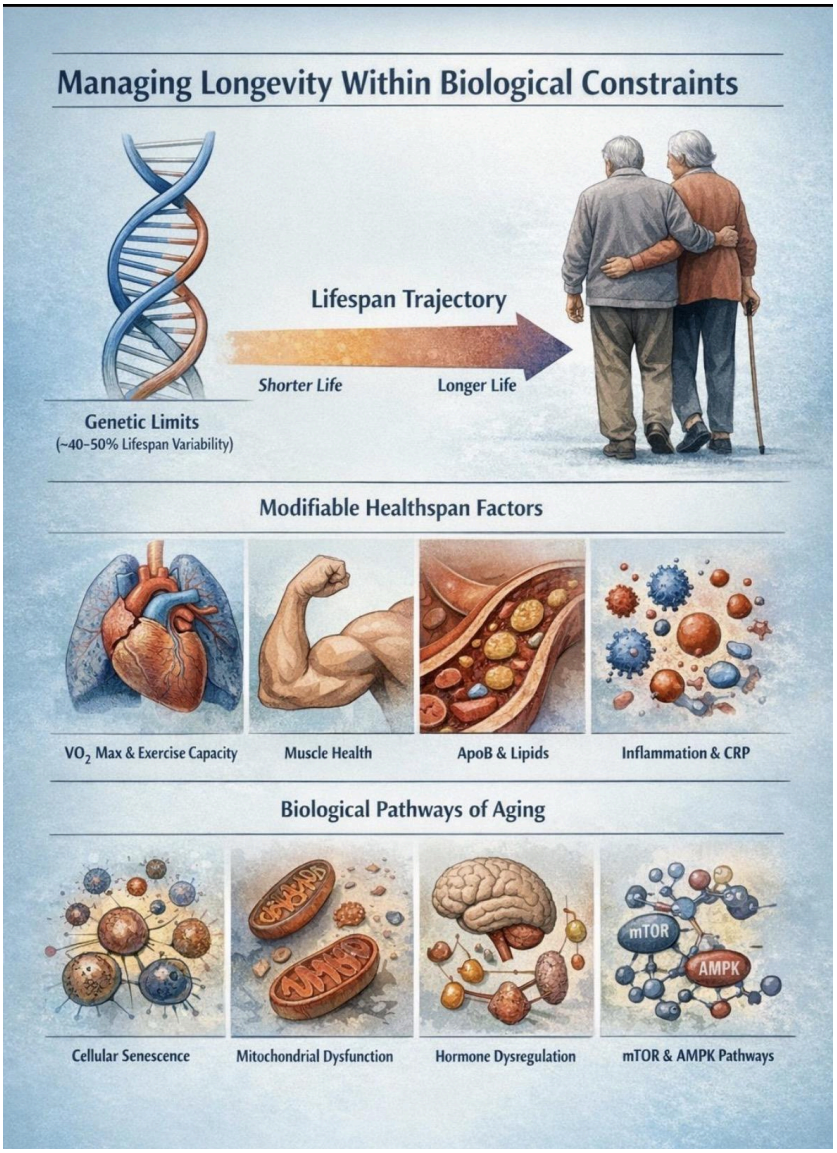

Figure 7. Managing Longevity: The Intersection of Genetic Constraints, Modifiable Health Factors, and Biological Aging Pathways. Image generated with AI (Gemini).

The infographic presents a holistic framework for understanding longevity, emphasizing that while genetic limits account for approximately 40–50% of lifespan variability, there is significant room to influence the "Lifespan Trajectory" through intervention. The central message is that longevity can be managed by focusing on modifiable health span factors such as improving VO_2 max, maintaining muscle health, and managing biomarkers like ApoB, lipids, and C-reactive protein (CRP) to reduce systemic inflammation. These lifestyle and clinical factors directly interact with deep biological pathways of aging, including cellular senescence, mitochondrial dysfunction, hormone dysregulation, and the metabolic signaling of the mTOR and AMPK pathways. By addressing these pillars, individuals can navigate biological constraints to shift toward a longer, healthier life.

Key Facts: Afrolongevity and the African Aging Paradigm
Definition of Afrolongevity: It is a new interdisciplinary field focused on extending the healthy lifespan, or "healthspan," specifically for African populations
The Double Burden: African nations are simultaneously managing a high prevalence of infectious diseases (HIV, Malaria, TB) alongside a surge in age-related non-communicable diseases (NCDs).
Demographic Shift: The number of elderly Africans is projected to triple to 235.1 million by 2050, with 80% of the world's elderly expected to live in low- and middle-income countries.
The Morbidity Gap: While life expectancy is rising, biological age often outpaces chronological age in Africa due to "weathering"— accelerated aging caused by chronic stress and environmental "exposome" factors.
Biological Mechanisms: Accelerated aging in the African context is characterized by early-onset oxidative stress, hyper-activation of proinflammatory signals (NF-κB), and rapid telomere attrition.
Ubuntu-Based Ethics: Longevity research and governance in Africa are grounded in Ubuntu (communal interdependency), which prioritizes solidarity, justice, and collective equity over individualistic models
Economic Challenges: Approximately 91% of Sub-Saharan workers are unable to save for old age due to fragile pension systems, leading to a heavy reliance on "pension sharing" within extended families.
Infrastructure Gaps: There is a critical shortage of healthcare professionals trained in geriatric medicine and a lack of "geriatricfriendly" facilities equipped for the specific needs of the elderly.
Precision Medicine Goals: To achieve "Precision Afrolongevity," the continent must move from reactive, episodic sick care to a model of 30 continuous biological restoration using AI-driven diagnostics and African-specific genomic biobanks.

AI Use Acknowledgement

The authoracknowledges the use of Gemini 3 Flash (specifically the Gemini 3 Flash Image / Nano Banana 2 model) in the preparation of this work. The AI was utilized to generate the illustrative figures and graphical representations based on user-provided conceptual prompts. To ensure scientific integrity, all AI-generated content was thoroughly reviewed, edited, and verified for technical accuracy by the authors.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

1. Abulaiti B, Zhang X, Guan T, Wang M, Jia S, Wang A. The dyadic care experiences of elderly individuals with disabilities and caregivers in the home setting from the perspective of family resilience: a qualitative study. Front Psych. 2022;13: 963101.

2. African Union. Protocol to the African Charter on Human and People's Rights on the Rights of Older Persons in Africa. Addis Ababa: African Union; 2016.

3. Ali, J., Cohn, B., Mwaka, E., Bollinger, J. M., Kwagala, B., Barugahare, J., Sewankambo, N. K., & Ochieng, J. (2021). A scoping review of genetics and genomics research ethics policies and guidelines for Africa. BMC Medical Ethics, 22(39), 1–15.

4. Amalaraj JJP, Island L, Ong JYY, Wang L, Valderas JHM, Dunn M, Chong YS, Meij J, Maier AB. Towards Precision Geromedicine in Singapore. Geroscience. 2025 Oct;47(5):6399-6409. doi: 10.1007/s11357-025-01686-7.

5. Assunção MRSD, Pinto SIM, José HMG. Public and health policy for the aged in Africa to the South of Saara. Rev Bras Enferm. 2020;73(Suppl 3): e20190313.

6. Atkinson EG, Dalvie S, Pichkar Y, et al. Genetic structure correlates with ethnolinguistic diversity in eastern and Southern Africa. Am J Hum Genet. 2022;109(9):1667–1679.

7. Awuviry-Newton K, Tavener M, Wales K, Byles J. Using ethics of care as the theoretical lens to understand the lived experiences of caregivers of older adults experiencing functional difficulties. PLoS ONE. 2022;17(5): e0267658.

8. Baloyi ME. A pastoral investigation into some of the challenges associated with aging and retirement in the South African context. In die Skriflig. 2015;49(3):1–10.

9. Bischof, Evelyne, et al. "Longevity Medicine: Upskilling the Physicians of Tomorrow." The Lancet Healthy Longevity, vol. 2, no. 4, pp. e187–e188, 2021.

10. Braimah JA, Oduro Appiah J, Adei D, Ofori-Amoah J, Mensah AA, Agyemang-Duah W. Effects of demographic and socioeconomic factors on dissatisfaction with formal healthcare utilisation among older adults with very low incomes in Ghana. Cogent Public Health. 2022;9(1):2108568.

11. Brownell M, Sehar U, Mukherjee U, Reddy PH. Creating cultural and lifestyle awareness about dementia and co-morbidities. J Alzheimer's Dis Rep. 2024;8(1):747–64.

12. Building local capacity for genomics research in Africa: recommendations from analysis of publications in Sub-Saharan Africa from 2004 to 2013 - PMC. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4867048/. Accessed March 23, 2026.

13. Buowari D.Y. Perspective chapter: geriatric care in Africa. 2022.

14. Callahan D, Gaylin W. How Long a Life Is Enough Life? Hastings Cent Rep. 2017 Jul;47(4):16-18. doi: 10.1002/hast.735.

15. Cesari M, Keeffe J, Dent E, Kondo N, Laiteerapong A, Izquierdo M, Zdanys K. Integrated care for older people (ICOPE): handbook: guidance for person-centred assessment and pathways in primary care. 2019.

16. Chilunga, F. P., Henneman, P., Elliott, H. R., Cronjé, H. T., Walia, G. K., Meeks, K. A. C., Requena-Mendez, A., Venema, A., Bahendeka, S., Danquah, I., Adeyemo, A., Klipstein-Grobusch, K., Pieters, M., Mannens, M. M. A. M., & Agyemang, C. (2021). Epigenetic age acceleration in the emerging burden of cardiometabolic diseases among migrant and non-migrant African populations: the population based cross-sectional RODAM study. Lancet Healthy Longevity, 2(6), E327–E339

17. Chisale SS. Ubuntu as care: Deconstructing the gendered Ubuntu. Verbum et Ecclesia. 2018;39(1):1–8.

18. Choudhury, A., Aron, S., Botigué, L. R., Cano-Gamez, E., Sethi, A., Ramsay, M., & H3Africa Consortium. (2020). High-depth African genomes inform human migration and health. Nature, 586(7831), 741-748. https://doi.org/10.1038/s41586-020-2859-7.

19. Columbus O. African cultural values and inter-communal relations: the case with Nigeria. Dev Count Stud. 2014;4(24):208–17.

20. Delpierre C, Lefèvre T. Precision and personalized medicine: what their current definition says and silences about the model of health they promote. Implication for the development of personalized health. Front Sociol. 2023;8:1112159.

21. Department of Health – Abu Dhabi. (2024). Healthy longevity medicine clinic standard (Version V1; Document Ref. No. DOH/SD/HLMCS/HCF/V1/2024). Abu Dhabi: Department of Health.

22. Dhemba, J. Challenges faced by older persons in Eastern and Southern Africa and implications for social work practice. Soc. Work Soc. 2023;21(2).

23. Fan S, Kelly DE, Beltrame MH, et al. African evolutionary history inferred from whole genome sequence data of 44 indigenous African populations. Genome Biol. 2019;20(1):82.

24. Frontiers | personalizing medicine in Africa: current state, progress and challenges. Available from: https://www.frontiersin.org/journals/genetics/articles/10.3389/fgene.2023.1233338/full. Accessed March 23, 2026.

25. George OG, Akinwale OE. Personnel brain-drain syndrome and quality healthcare delivery among public healthcare workforce in Nigeria. Arab Gulf J Sci Res. 2022;41(1).

26. Ghaffari F, Dehghan-Nayeri N, Navabi N, Seylani K. Evaluation of the Master's curriculum for elderly nursing: a qualitative study. Clin Interv Aging. 2016; 11:1333–42.

27. Gil-Gonzalez D, Carrasco-Portiño M, Vives-Cases C, Agudelo-Suárez AA, Castejon Bolea R, Ronda-Pérez E. Is health a right for all? An umbrella review of the barriers to health care access faced by migrants. Ethn Health. 2015;20(5):523–41.

28. Goetz LH, Schork NJ. Personalized medicine: motivation, challenges, and progress. Fertil Sterility. 2018;109(6):952–963.

29. Gomez F, Hirbo J, Tishkoff SA. Genetic variation and adaptation in Africa: implications for human evolution and disease. Cold Spring Harb Perspect Biol. 2014;6(7):a008524.

30. Gomez-Olive, F. X., Houle, B., Kohler, I. V., Payne, C. F., Langa, K. M., & Kohler, H. P. (2024). Aging in Africa: The health and well-being of older adults in a period of rapid demographic change. The Lancet Healthy Longevity, 5(2).

31. Grenvik, A., & Pinsky, M. R. (2009). Evolution of critical care medicine. Critical Care Clinics, 25(1), 1–11.

32. Gyasi RM, Yeboah AA, Mensah CM, Ouedraogo R, Addae EA. Neighborhood, social isolation and mental health outcome among older people in Ghana. J Affect Disord. 2019;259:154–63.

33. H3Africa Working Group on Ethics. Harnessing Genomic Technologies Toward Improving Health in Africa: Opportunities and Challenges. Recommendations for the H3Africa Initiative to the Wellcome Trust and the National Institutes of Health. Published online January 2011.

34. He W, Aboderin I, Adjaye-Gbewonyo D. Africa aging: 2020. Washington, DC: US Government Printing Office; 2020

35. Hewitt RE. Biobanking: the foundation of personalized medicine. Curr Opin Oncol. 2011;23(1):112–119.

36. Ikeorji CR. Caregiving practices for older persons in Africa: changing trends and implications for transformative social work. J Soc Dev Afr. 2024;39(1):72–100.

37. Iyare AE, Imafidon E, Abudu KU. Ageing, Ageism, cultural representations of the elderly and the duty to care in African traditions. In: Essays on contemporary issues in African philosophy. Cham: Springer International Publishing; 2021. p. 281–99.

38. Jagger C. Trends in life expectancy and healthy life expectancy. Newcastle University Institute for Ageing and Institute of Health & Society, Government Office for Science, 2015.

39. Jagger C, Matthews FE, Wohland P, et al. A comparison of health expectancies over two decades in England: results of the cognitive function and ageing study I and II. Lancet 2016;387:779–86.

40. Kazeem, A., & Adedini, S. A. (2023). Trends and determinants of healthy life expectancy in Africa: A systematic review. Journal of Aging and Health, 35(5-6), 312-325.

41. Kennedy, B.K., et al. "Geroscience: Linking Aging to Chronic Disease." Cell, vol. 159, no.4, 2014, pp. 709–713.

42. Kingston A, Wohland P, Wittenberg R, et al. Is late-life dependency increasing or not? A comparison of the cognitive function and ageing studies (CFAS). Lancet 2017;390:1676–84.

43. Kohli N, Chawla SK, Banerjee A, Srinete TP. Aging in developing societies: issues and challenges. Psychol Dev Soc. 2020;32(2):153–75.

44. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, Pate M. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Glob Health. 2018;6(11):e1196–252.

45. Lategan LOK. A public health ethics framework for the geriatric community: a South African perspective. 2021. Doctoral dissertation, University of Free State.

46. Letseka M, Letseka MM. Basotho community elders' views on botho/ubuntu as a moral concept. Indilinga Afr J Indigen Knowl Syst. 2021;20(2):141–53.

47. López-Otín, C., Blasco, M. A., Partridge, L., Serrano, M., & Kroemer, G. (2023). Hallmarks of aging: An expanding universe. Cell, 186(2), 243–278.

48. Malakar Y, Lacey J, Twine NA, McCrea R, Bauer DC. Balancing the safeguarding of privacy and data sharing: perceptions of genomic professionals on patient genomic data ownership in Australia. Eur J Hum Genet. 2024;32(5):506–512.

49. Manyonganise M. Oppressive and liberative: a Zimbabwean woman's reflections on Ubuntu. Verbum et Ecclesia. 2015;36(2):7.

50. McAlister FA, Laupacis A, Armstrong PW. Finding the right balance between precision medicine and personalized care. CMAJ. 2017;189(33): E1065–E1068.

51. Meric-Bernstam F, Farhangfar C, Mendelsohn J, Mills GB. Building a personalized medicine infrastructure at a major cancer center. J Clin Oncol. 2013;31(15):1849–1857.

52. Moore E, Kelly G. Struggles over elder care in South Africa. Dev South Afr. 2024;41(6):1062–77.

53. Moyle W, Clarke C, Gracia N, Reed J, Cook G, Klein B, Richardson E. Older people maintaining mental health well-being through resilience: an appreciative inquiry study in four countries. J Nurs Healthc Chronic Illn. 2010;2(2):113–21.

54. Mpofu L, Moyo I, Mavhandu-Mudzusi AH. Exploring sociocultural factors and ubuntuism for women living with HIV in rural Zimbabwe. Curationis. 2024;47(2):2627.

55. Muin J K. The shift from personalized medicine to precision medicine and precision public health: words matter! | blogs | CDC. Available from: https://blogs.cdc.gov/genomics/2016/04/21/shift/. Accessed 23 March 2026.

56. Munung, N. S., de Vries, J., & Pratt, B. (2021). Genomics governance: Advancing justice, fairness and equity through the lens of the African communitarian ethic of Ubuntu. Medicine, Health Care and Philosophy, 24(3), 377–388.

57. Naidoo K, Waggie F, van Wyk JM. A review of geriatric care training in the undergraduate nursing and medical curricula at the University of KwaZulu-Natal, South Africa. Afr J Health Prof Educ. 2020;12(3):130–3.

58. Nzima D, Maharaj P. Long-term care for the elderly in sub-Saharan Africa: an analysis of existing models. In: Health and care in old age in Africa. Edited by Pranitha Maharaj. Routledge; 2020, p. 41–60.

59. Ogunyemi AO, Balogun MR, Ojo AE, Welch SB, Onasanya OO, Yesufu VO, Hirschhorn LR. Provider and facility readiness for age-friendly health services for older adults in primary health care centres in southwest, Nigeria. PLOS Glob Public Health. 2023;3(8): e0001411.

60. Omotoso OE, Teibo JO, Atiba FA, Oladimeji T, Adebesin AO, Babalghith AO. Bridging the genomic data gap in Africa: implications for global disease burdens. Global Health. 2022;18(1):103.

61. Organisation for Economic and Co-Operative Development. A good life in old age? Monitoring and improving quality in long-term care, 2013.

62. Oyinlola O. Addressing the challenges of dementia care in Nigeria: a call for a comprehensive national strategy. Public Health Chall. 2024;3(2): e186.

63. Pani-Harreman KE, Bours GJJW, Zander I, et al. Definitions, key themes and aspects of 'ageing in place': a scoping review. Ageing Soc 2020;161:1–34.

64. Ramos E. Genetic counseling, personalized medicine, and precision health. Cold Spring Harb Perspect Med. 2020;10(9):a036699.

65. Raspa M, Moultrie R, Toth D, Haque SN. Barriers and facilitators to genetic service delivery models: scoping review. Interact. J. Med. Res. 2021;10(1):e23523.

66. Rattan, S. I. S. "Seven Knowledge Gaps in Modern Biogerontology." Biogerontology, vol. 25, no. 1, 2024, pp. 1–8.

67. Rotimi Charles N, Jorde Lynn B. Ancestry and disease in the age of genomic medicine. N Engl J Med. 2010;363(16):1551–1558.

68. Rudnicka E, Napierała P, Podfigurna A, Męczekalski B, Smolarczyk R, Grymowicz M. The World Health Organization (WHO) approach to healthy ageing. Maturitas. 2020;139:6–11.

69. Rutagumirwa SK, Hutter I, Bailey A. "We never graduate from care giving roles"; cultural schemas for intergenerational care role among older adults in Tanzania. J Cross Cult Gerontol. 2020;35(4):409–31.

70. Schatz E, Madhavan S, Collinson M, Gómez-Oliv. FX, Ralston M. Dependent or productive? A new approach to understanding the social positioning of older South Africans through living arrangements. Res Aging. 2015;37(6):581–605.

71. Schlebusch CM, Jakobsson M. Tales of human migration, admixture, and selection in Africa. Annu Rev Genomics Hum Genet. 2018;19 (1):405–428.

72. Science direct. Geography of genetics and genomics research funding in Africa – science direct. Available from: https://www.sciencedirect.com/science/article/abs/pii/S2211816017300558 Accessed March 23, 2026.

73. Scott, A.J., Ellison, M. & Sinclair, D.A. The economic value of targeting aging. Nat Aging 1, 616–623 (2021).

74. Solanki, G., Kelly, G., Cornell, J., Daviaud, E., & Geffen, L. Population ageing in South Africa: Trends, impact, and challenges for the health sector. South Afri. Heal. Rev. 2019;2019(1), 175–182.

75. Ssensamba JT, Mukuru M, Nakafeero M, Ssenyonga R, Kiwanuka SN. Health systems readiness to provide geriatric friendly care services in Uganda: a cross-sectional study. BMC Geriatr. 2019;19:1–13.

76. Tanyi, P. L., & Pelser, A. Towards an "age-friendly-hospital": Older persons' perceptions of an age-friendly hospital environment in Nigeria. Cog. Med. 2020;7(1), 1853895.

77. Theron LC, Theron A. Positive adjustment to poverty: How family communities encourage resilience in traditional African contexts. Cult Psychol. 2013;19(3):391–413.

78. Thor, D., Barzilai, D., Lyu, YX. et al. From sick care to healthspan: educating the longevity physician for health maintenance and health promotion. Biogerontology 27, 22 (2026).

79. Tishkoff SA, Williams SM. Genetic analysis of African populations: human evolution and complex disease. Nat Rev Genet. 2002;3(8):611–621.

80. Towfighi A, Orechwa AZ, Aragón TJ, et al. Bridging the gap between research, policy, and practice: lessons learned from academic–public partnerships in the CTSA network. J Clinical Transl Sci. 2020;4(3):201–208.

81. United Nations. Transforming our world: the 2030 agenda for sustainable development. New York: United Nations; 2015.

82. United Nations 2019. Department of Social and Economic Affairs. World population ageing 2019 highlights.

83. U.S. Census Bureau. International Database. 2019. https://www.census.gov/data-tools/demo/idb/#/dashboard?dashboard_page=country&COUNTRY_YR_ANIM=2026 Accessed 22 March 2026.

84. Won CW, Kim S, Swagerty D. Why geriatric medicine is important for Korea: lessons learned in the United States. J Korean Med Sci. 2018;33(26): e175.

85. World Health Organization. Framework for countries to achieve an integrated continuum of long-term care. 2021.

86. World Health Organisation. Mental health of older adults. 2023. https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults Accessed 22 March 2026.

87. World Health Organisation. WHO calls for urgent transformation of care and support systems for older people. 2024. https://www.who.int/news/item/01-10-2024-who-calls-for-urgent-transformation-of-care-and-support-systems-for-older-people Accessed 22 March 2026.

88. Yu N, Chen F-C, Ota S, et al. Larger genetic differences within Africans than between Africans and Eurasians. Genetics. 2002;161(1):269–274.