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Supplement: Aging Well in an Aging Society: Italy at the Forefront of Population Aging: Introductory Article

Aging well in an aging society: Italy at the forefront of global aging and the Age-It Research Program

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Abstract

Objectives: Italy, one of the world's super-aged societies, faces profound demographic transformations amid relevant regional disparities in sociodemographic trends, institutional structures, and economic conditions. These features make it an ideal laboratory to study both the challenges and opportunities of population aging. This article introduces Age-It, a Research Program designed to leverage Italy's position at the forefront of global aging to advance transdisciplinary research and inform evidence-based policies and practices on aging.

Methods: Age-It adopts a life course perspective encompassing individual, family, and societal levels. It conceptualizes "aging well" as the outcome of multi-agent, multi-context processes unfolding from early life through old age. Furthermore, Age-It moves beyond a multidisciplinary approach by fostering true cross-fertilization between biomedical, sociodemographic, and technological sciences. Structured as an umbrella initiative, the program brings together multiple interlinked projects that address diverse dimensions of aging through transdisciplinary and collaborative research.

Results: The program addresses key limitations in Italy's current aging research and policy landscape: fragmented data, disciplinary silos, and weak connections between research and policymaking. By integrating biomedical, technological, and socioeconomic perspectives into structured, theory-driven research centers (Spokes), Age-It provides a coordinated and innovative platform for studying aging.

Discussion: Leveraging Italy's unique demographic profile and internal heterogeneity, Age-It promotes sustainable aging by harnessing the opportunities embedded in demographic change. The program ranges from the biology of aging to mental and physical health prevention, long-term care, labor market dynamics, and social participation—ultimately aiming to reshape how aging is perceived and managed in aging societies.

Keywords: Population aging, Longevity, Aging process, Multimorbidity, Life course

Rethinking research on aging: Italy as a "natural laboratory"

Population aging is a major and unprecedented 21st-century phenomenon. Global aging is driven by the reductions in fertility (aging from the bottom) and improvements in survival (aging from the top), ultimately resulting in a rising share of older people over the total population. In high-income countries, international migration has partially slowed the pace of population aging; however, most of these societies are still heading toward increasingly aged demographic structures in the short-to-medium term. This demographic shift is driving complex, interconnected changes across society, labor markets, welfare systems, and cultural and political institutions, placing high-income countries in largely uncharted territory. Although aging itself is not a new human experience, aging *within an aging society* undoubtedly is.

Italy is leading global aging: nearly 25% (a quarter of the population) is 65 or older, and 7.7% is 80 or older (https://www.istat.it). This position as a trendsetter in global aging reflects a combination of exceptionally high life expectancy—83.4 years at birth and 21.2 years at age 65 in 2024—and persistently low fertility rates, reaching a record low of 1.18 children per woman in 2024. These megatrends, combined with extraordinary regional disparities (North vs. South, coastal vs. inland, rural vs. urban) and limited scope for expanding public welfare spending, make Italy an ideal "natural laboratory"—a blueprint for developing and implementing integrated approaches to population aging. With no precedent model to follow, Italy offers a unique context for designing, testing, and adopting novel solutions across prevention policies, health and long-term care (LTC) provision, labor market arrangements and work organization, political agendas, and social engagement and inclusion in later life.

Many characteristics of Italy's social, institutional, economic, and demographic context are partially or largely shared by other aging societies. For example, the strong informal care responsibilities traditionally placed on families in Italy closely resemble family dynamics in rapidly aging societies across Eastern and Southeastern Asia, such as South Korea, China, and Japan. Similarly, the pressures that population aging places on the sustainability of pension systems are not unique to Italy but are common to many high-income countries with mature welfare systems. Likewise, the growing number of older individuals is challenging the resilience of health care systems worldwide, prompting strategic investments in healthy aging and the compression of morbidity, regardless of specific welfare regimes. Hence, the Italian case can speak to many other aging countries and societies in the world.

Despite notable contributions by scholars and research groups in the fields of biology, geriatrics, and population sciences, Italy has yet to establish itself as an international reference point in aging research. Furthermore, its capacity to design and successfully implement national policies that promote active and healthy aging has remained limited. Even more constrained have been the efforts to advance a vision of population aging that empowers individuals and social actors to seize the socioeconomic opportunities arising from this profound demographic shift. Structural bottlenecks have hampered the advancement of research on aging in Italy: (i) the prevalence of discipline-specific analytical frameworks, (ii) the scattered availability of data, (iii) the difficulty in translating the various scientific studies into policies, besides (iv) an overly pessimistic view of the process of population aging and its consequences. These limitations are clearly interrelated. Likewise, the less-than-optimal opportunities for public-private and academic and professional collaboration have so far limited the scope for transferring new research findings into instruments, policies, and practices or for contributing to a coherent national active and healthy aging strategy.

To effectively address these challenges, the Age-It Research Program (Aging Well in an Aging Society)—one of the largest research initiatives ever funded on aging—represents an ambitious €115 million investment supported by the National Recovery and Resilience Plan of the European Commission and the Italian Ministry of Research, implemented over an intensive 3-year period (2023–2025). This supplement issue illustrates the breadth and depth of Age-It's scientific agenda.

Rooted within a life course research framework, Age-It identifies 10 core challenges and thematic "spokes" that guide its research focus: understanding demographic drivers through a data science approach; advancing our knowledge of the biology of aging; investigating the complexity of older subjects, with specific focus on multimorbidity (MM) and frailty; mapping and addressing life course trajectories for active aging; exploring institutional, medical, and technological solutions to improve LTC system sustainability; analyzing the Silver Economy in terms of labor and welfare; investigating the most consequential cultural and political dimensions of aging societies; developing interventions and technologies for age-related conditions; advancing gerontechnologies to foster and support healthy aging; and mainstreaming aging through future-oriented policymaking. These spokes, their specific research agendas, methods, and results, are the subject of dedicated articles in this supplement issue.

Complementing its thematic areas, Age-It also pursues four cross-cutting activities that are integral to its mission: education and lifelong learning; innovation and technology transfer; data management and data banking; and co-creation, valorization, and exploitation of results. Two of these cross-cutting activities—namely, education and lifelong learning, and co-creation, valorization, and exploitation of results—are also featured in this supplement, offering a comprehensive overview of the program's holistic approach. A final article closes the supplement by discussing the directions and extent to which population aging is changing the foundations of life course research.

Age-It is built around three key premises. First, although global aging is often framed as a societal "challenge," it also presents unprecedented opportunities to foster inclusive and sustainable well-being (Gietel-Basten, 2021; Gietel-Basten et al., 2024; Lutz, 2013; Scott, 2024). At the individual level, the World Health Organization emphasizes that aging should not be seen merely as a period of decline and dependency but as a stage in the life course in which individuals can leverage their experience and capacities to remain valuable contributors to society (World Health Organization, 2015). Age-It fully embraces this perspective, advocating for policies and strategies grounded in the "healthy aging" framework, aimed at maintaining and enhancing functional ability to support well-being in later life. Second, it does not define a single research project but rather a Research Program. This distinction is important because a project typically has a well-defined scope and a specific research question. In contrast, a research program like Age-It is designed to be broader, transdisciplinary, and long-term, addressing the complexities of aging through multiple interconnected studies. Age-It operates as an umbrella initiative, bringing together researchers from various disciplines to support multiple projects, each investigating different dimensions of aging, from health disparities to workforce participation, from social inequalities to policy interventions, and from biomarkers of aging and age-related conditions to the new challenges for the health care system, for example, MM and frailty. Finally, Age-It marks a significant advancement in aging research by moving from a *multidisciplinary* approach—where multiple disciplines work in parallel, each addressing a shared issue—to a truly *interdisciplinary* one. Interdisciplinary research is understood here as the active integration of concepts, frameworks, and methods across disciplines to develop a cohesive analytical approach, enabling a more holistic and innovative study of aging. As a further step, Age-It goes beyond interdisciplinarity to embrace *transdisciplinarity* by promoting collaboration not only across academic disciplines but also with nonacademic stakeholders—such as policymakers, professionals, civil society actors, and citizens.

Through this supplement, we invite readers to explore Age-It's transdisciplinary strategies to transform demographic change into opportunities for an inclusive, healthy, and sustainable society. Italy's demographic and regional diversity make it a compelling case study, whereas the insights and frameworks developed through Age-It offer potentially transferable examples for addressing aging-related challenges globally, from Europe to the United States and East Asia.

The Age-It Research Program and the future of aging

Theoretical and empirical foundations

Age-It recognizes the dynamic nature of aging through a holistic perspective, adopting a life course approach at the individual, family, and societal levels. Key life course principles underpin this approach (Bernardi et al., 2008; Mayer, 2009): cumulative contingencies, whereby previous experiences shape a person's current status; linked lives, in which events in one domain influence other life domains and the life courses of related individuals; and historical time period, reflecting how the time in which individuals live moderates the timing and sequencing of key life transitions. Within this overarching life course framework, we do not rely on a single theory. Instead, we recognize that aging research requires multiple theoretical perspectives from diverse disciplines, with existing approaches complementing rather than replacing one another.

Age-It implements a problem-solving, evidence-based approach to aging research, leveraging advances in artificial intelligence (AI) and the growing availability of medical, behavioral, and social (big) data. The project is guided by the vision that promoting a sustainable and inclusive aging society requires solutions grounded in scientific evidence, codesigned from the bottom up, and effectively implemented. To achieve this, Age-It has brought together a network of around 500 experts and more than 400 doctoral and postdoctoral researchers across diverse fields, including biomedicine, economics, education, psychology, sociodemography, and technology, fostering meaningful interdisciplinary collaboration. The program also integrates expertise beyond academia, drawing on knowledge from more than 50 stakeholder organizations from the insurance, health care, and pharmaceutical sectors, as well as non-governmental organizations (NGOs) representing older people, their families, and caregivers.

Conducting innovative research in this context requires establishing shared languages and common analytical frameworks. For example, an interdisciplinary team integrated insights from economics, psychology, and neurology to examine how Parkinson's disease influences financial decision-making in older adults (Taddeini et al., 2025). Or, as another example, social and political sciences integrate with knowledge from geriatrics and general medicine to monitor and identify early signs of social withdrawal, sleep disorder, and depression among informal caregivers of patients with Alzheimer's and other types of dementia (Silvani et al., 2024). Cavapozzi et al. (2025) and Belloni et al. (2025) highlight the bidirectional links between work and health. On one side, working conditions and occupation-specific stressors shape labor market participation and labor supply, with cumulative effects that may lead to long-term health deterioration. On the other side, health status is a crucial determinant of whether individuals continue working or retire at older ages. Another example of Age-It interdisciplinarity involves a research team of psychologists and engineers who measured the impact of immersive virtual reality (VR) experiences on spatial memory, a key determinant of cognitive function, demonstrating how VR tools can be used to train the mind and slow functional decline, particularly in individuals at risk of dementia (Palombi et al., 2025). These are just a few selected examples illustrating how Age-It bridges disciplines to generate innovative perspectives on aging;

additional cases are presented in the diverse articles collected in this supplement.

The Hub and Spoke model

Age-It embraces a "Hub and Spoke" model (Figure 1). At the center, the coordination Hub focuses on three main activities by: (1) providing the overall administrative and scientific coordination; (2) ensuring that Age-It activities complement relevant national and regional priorities and programs (such as National Research Plan, National and Regional Operative Programmes) within the framework of the European Union strategies; and (3) promoting Age-It key outcomes beyond the local and national level.

The Research Program then identifies four cross-cutting themes and outreach activities that stem from the Age-It Hub: (i) education and learning; (ii) co-creation, innovation, and technology transfer; (iii) data management and data banking; and (iv) valorization and exploitation of results. Each of these streams is overseen by a dedicated scientific board, ensuring rigorous guidance and strategic coordination across the program.

The surrounding Spokes represent 10 thematic research centers. They identify relevant challenges and potential areas of intervention for a better identification of actions and social solutions that allow individuals to age well and to build an inclusive aging society. The first challenge is that of having a full understanding of the macro- and micro-demographic drivers of aging, adopting a data science approach to inform and underpin decision-making (Spoke 1: The Demography of Ageing. A Data Science Approach to Decision-Making). Addressing and facing population aging necessitates a focus on some pivotal thematic challenges: improving our understanding of the biology of aging (Spoke 2: Improving the Understanding of the Biology of Ageing), of the of the clinical heterogeneity and complexity of older adults, with specific consideration of MM and frailty (Spoke 3: Clinical and Environmental Factors, Functional Status and Multimorbidity: Stratifying Progression and Prognosis of Diseases, Frailty and Disability), of the life course trajectories of active and healthy aging (Spoke 4: Trajectories for Active and Healthy Ageing: Behavioural and Psychological Determinants), and of the processes and dynamics of (formal and informal) care provision (Spoke 5: Care Sustainability in an Ageing Society). Population aging will also drive fundamental changes in welfare systems, labor markets, consumption behaviors, everyday activities, and, more broadly, the economic system—we refer to these interconnected domains as the Silver Economy (Spoke 6: The Silver Economy. Work, Participation, and Welfare at Older Ages). The political and cultural characteristics of many high-income societies are also expected to be significantly affected by population aging (Spoke

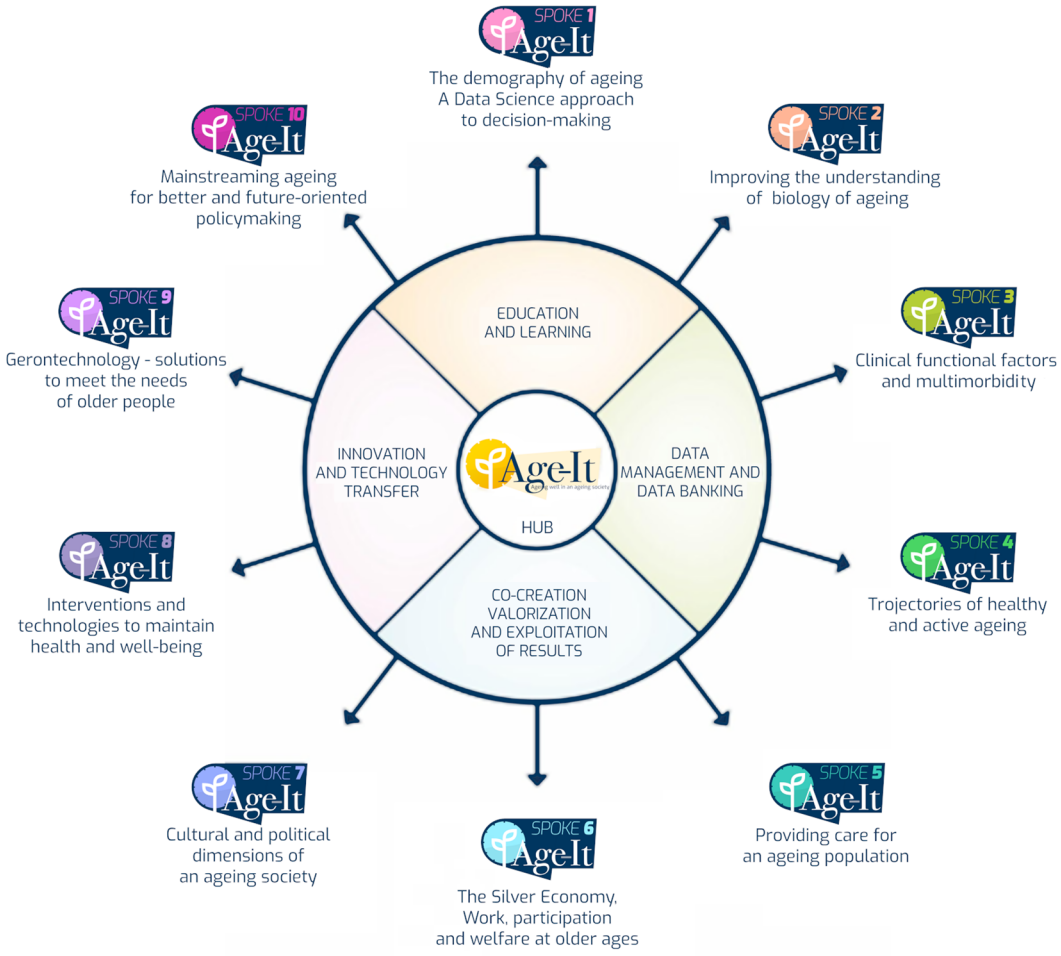

Figure 1. The Age-It model: Hub, Spokes, and cross-integration themes.

7: Cultural and Political Dimensions of Ageing Societies). Additional overarching Spokes address: the importance of interventions and technologies to reduce the burden of age-related diseases, disorders, and disabilities (Spoke 8: Interventions and Technologies to Reduce the Burden of Age-related Diseases, Disorders, and Disabilities), the technological developments toward meeting the (new) needs of older people (Spoke 9: Advanced Gerontechnologies for Active and Healthy Ageing). A final Spoke focuses on mainstreaming and rethinking aging-related policymaking (Spoke 10: Mainstreaming Ageing by Building Institutional Mechanisms for Better and Future-Oriented Policy Making).

Advancing research on aging in Italy: the 10 Spokes

In the overall organization across the 10 Spokes, Age-It embraces a life course perspective (Albertini & Vignoli, 2025). Although many research activities focus on older individuals or patients, Age-It acknowledges that the foundations of successful—or unsuccessful—aging are laid much earlier in life. Cumulative disadvantage due to poverty, poor nutrition, limited access to health care, and broader social inequalities shapes aging trajectories long before individuals reach old age. This awareness permeates the program as a whole. For instance, Spoke 1 analyzes the demography of aging through a life course lens, considering not only longevity but also fertility and migration patterns; Spoke 4 focuses on the lifelong determinants of healthy aging; and Spoke 6 investigates the cumulative processes leading to economic insecurity in later life. Similarly, Spoke 5 addresses care needs across the life course, whereas more biomedically oriented Spokes (2 and 3) and technology-focused Spokes (8 and 9) avoid limiting their analyses to older adults or patients alone. Life course and intergenerational perspectives are also central to the political and institutional work of Spokes 7 and 10, which explicitly focus on promoting generational fairness in aging societies. Together, these contributions underscore Age-It's commitment to anticipating the needs of future cohorts by addressing aging as a process shaped across the entire life span.

Spoke 1: The demography of ageing

Providing scholars and policymakers with accurate data to understand current and anticipate future societal needs and resource allocations is a fundamental task of scientific research on global aging. In this context, demographic research plays a pivotal role, offering essential insights into the challenges and opportunities emerging from trends in fertility, mortality, and migration (Gietel-Basten et al., 2022; Guetto et al., 2025; Strozza et al., 2024a, 2024b; Vignoli et al., 2020, 2022). Spoke 1 advocates that the focus on the negative—at times depicted as catastrophic—consequences of population aging has overshadowed more constractive perspectives. As emphasized in Alderotti and colleagues (2025), this Spoke proposes the notion of "positive demography," which focuses on viewing demographic changes through a lens that highlights the opportunities of contemporary population dynamics, while simultaneously proposing proactive solutions for addressing the challenges they present. We are likely to live longer and in better health; the gap between desired and actual fertility can be narrowed with appropriate policy interventions; and, at least in the short term, migration can alleviate aging problems and accelerate demographic renewal. Positive demography also means that, to further address the needs of a growing number of older individuals, we must support the young and help them prepare for the long future that awaits them. Beyond shifting from a deficit-based to a positive demography approach, analyzing the interconnections between key life domains—such as family and health—is crucial for advancing cutting-edge research on aging societies and addressing the complex challenges they present (Pittavino et al., 2024; Vignoli et al., 2025). This perspective requires a transdisciplinary view on population aging and the collection of finer-grained, multidimensional, and longitudinal data. Unlocking the potential of such novel data sources as big population microdata, digital trace data, and geospatial data relies on our ability to create methods and establish disciplinary standards to tackle emerging challenges, such as understanding data access and assessing their representativeness (Breen & Feehan, 2025).

Spoke 2: Improving the understanding of the biology of ageing

Population aging is the result of decreased fertility and increased longevity. From a biological perspective, human aging stems from changes at the cellular and molecular level (Dillin et al., 2002; Guarente et al., 2024). Spoke 2 works to gain a better understanding of the biology of aging by exploring their most fundamental mechanisms, with the aim of eventually promoting a successful and sustainable approach to individual and population aging (Chiti et al., 2025). The research conducted in the framework of Spoke 2 aims at (i) shedding light on the mechanisms that control cell and organismal aging and on how context-dependent molecular networks contribute to limiting tissue damage, promoting repair and, ultimately, longevity; (ii) identifying underlying biological pathways and relevant biomarkers of potential unsuccessful aging, and thus producing novel knowledge on cellular senescence, mitochondrial dysfunction, proteostasis, and inflammatory responses; and finally (iii) validating potential therapeutic targets emerging from the activities within this spoke. The ambition is to translate findings from these research activities into actionable interventions to reduce the burden of age-related diseases and disorders.

Spoke 3: Clinical and environmental factors, functional status, and multimorbidity: stratifying progression and prognosis of diseases, frailty, and disability

Spoke 3 moves from the cellular to the individual level. The article by Iacoviello and colleagues (2025) identified the increasing occurrence of MM and frailty among the older population as important challenges to the health care system and the socioeconomic sustainability of an aging society. MM prevalence increases with age and is associated with negative outcomes such as functional limitations and disability, reduced quality of life, and increased mortality (Skou et al., 2022). Patients with MM account for a disproportionately high share of the health care workload, particularly in high-income countries, and they represent a challenge for health systems (Pearson-Stuttard et al., 2019). At the same time, delivering effective care for older adults with MM is particularly complex due to the large heterogeneity of phenotypes and individual responses to treatments. Spoke 3 provides state-of-the-art,

novel knowledge about the biological, social, and environmental (i.e., climate and pollution) determinants of MM and frailty. This, in turn, allows the development and testing of personalized care recommendations, ultimately enhancing the well-being and quality of life of older adults and contributing to improving the resilience of the health care system. The innovative methodological approaches to MM and frailty explored by Age-It scholars include the utilization of AI techniques to develop multiparametric algorithms that combine biological and clinical data and allow to improve the ability to predict the functional and cognitive trajectories of multimorbid older patients.

Spoke 4: Trajectories for active and healthy ageing (behavioural and psychological determinants)

Successful aging is shaped by the interplay of cognitive, behavioral, nutritional, and social determinants, influenced by environmental and technological shifts across the life course. Spoke 4 fosters that a comprehensive, lifelong approach, encompassing physical activity, mental engagement, social participation, and nutrition, can mitigate frailty and enhance quality of life. Emerging research highlights the importance of cognitive health and social engagement in preserving autonomy and delaying cognitive decline (Hertzog et al., 2008; Stern, 2012). Lifelong learning and mentally stimulating activities contribute to cognitive resilience, whereas strong social networks reduce the risk of depression and neurodegenerative disorders. Additionally, behavioral factors, including regular physical activity and tailored nutritional strategies, play a pivotal role in supporting functional capacity (Bojang & Manchana, 2023; Nelson et al., 2007). On this backdrop, the integration of digital technologies into health promotion introduces both opportunities and challenges (Pilotto et al., 2024). Mobile health applications, wearable devices, and online platforms can enhance disease prevention, health monitoring, and motivation for lifestyle changes, yet disparities in digital literacy and access remain significant barriers for older populations (Czaja et al., 2018). Within this framework, Paoli and colleagues (2025) contribute to advancing knowledge on aging trajectories, guiding the development of evidence-based interventions that integrate cognitive, social, and technological determinants. By leveraging a One Health perspective, the article fosters innovative, inclusive strategies to enhance mobility, independence, and healthy aging. Ultimately, these efforts aim to establish a multimedia repository of best practices, equipping policymakers and health care systems with tools to support aging populations and promote a proactive, personalized approach to health across the life course.

Spoke 5: Care sustainability in an ageing society

Collecting high-quality data to deepen our understanding of aging, reframing population aging as both an achievement and an opportunity, and advancing knowledge of the biology of aging are critical steps to prevent and mitigate key individual-level consequences—and to effectively prepare for this far-reaching macro-demographic transformation. Under current circumstances, however, it is possible to foresee that, particularly in the next few decades, with the baby boomer generation entering later life, many societies will witness an increasing demand for LTC. This challenge is addressed within Spoke 5 (Albertini et al., 2025). Traditionally in Italy, and in a number of Southern and Eastern European countries, this demand has been met through: (i) a limited provision of public health and social care services; (ii) the prioritization of financial support to older individuals with LTC needs; (iii) a limited range of services by volunteer and not-for-profit organizations; (iv) a heavy reliance on informal care, primarily shouldered by (female) partners and adult children; and, among middle- and high-class families; (v) the outsourcing of care and housekeeping services to privately hired, low-paid caregivers with a migration background (Pavolini & Ranci, 2008; Saraceno & Keck, 2010). Despite Italian families' resilience in providing informal care, the ongoing sociodemographic transformations have pushed Italy's existing "care equilibrium" to its limits. Spoke 5 activities focus on four main tasks, aiming at providing the knowledge and policy measures, as well as technological instruments to increase the social-economic sustainability of the Italian LTC system. These activities are: (i) providing an updated portrait and data stream, which allow to quickly detect the most significant gaps between LTC needs and resources, across both different geographical areas of the country and different social strata; (ii) creating a series of tools that integrate technological, medical, psychological, and sociological approaches to monitor and preserve the well-being of both informal and formal caregivers—and, consequently, their care recipients; (iii) building an online training and information platform, also including ad hoc specialized chatbots based on AI tools to provide caregivers with basic skills and support to help them providing a better quality and more effective support, while also preserving their own physical, mental, and social well-being; (iv) promoting knowledge exchange, mutual policy learning, and data sharing at all policy levels as well as among profit and not-for-profit stakeholders involved in the provision of LTC.

Spoke 6: The silver economy. Work, participation, and welfare at older ages

With the progressive aging of high- and middle-income societies, we may expect significant changes in how labor markets, consumption behaviors and patterns, pension systems—and more in general the welfare state—work (Coile et al., 2014; Gruber & Wise, 2009). Using international data sets, Spoke 6 examines key dimensions of the Silver Economy. In particular, the researchers involved in this Spoke developed a multidimensional indicator of "fragility at work" to analyze how individuals' health status influences labor market participation and the likelihood of early retirement. Their results support (i) the very heterogeneous relation between health and labor market participation across the different occupations; (ii) the significant negative health effects of the cumulative exposure to poor working conditions—particularly regarding physical conditions, skills and discretion, and working prospects; (iii) the very different trends and changes in fluid and crystallized intelligence toward the end of an individual working life—a difference that bears important consequences for policies aiming at retaining older workers. The studies conducted in the framework of Spoke 6 have also underlined the importance of addressing the significant gender- and geography-based differences in economic conditions experienced by pensioners, with very limited access to essential economic resources for older retired women in Italy, and older individuals residing in the Southern regions.

Spoke 7: Cultural and political dimensions of ageing societies

Population aging reshapes not only labor markets, welfare systems, and economies but also the ways in which age groups interact within the social, political, and cultural fabric of a

country (Bidadanure, 2021; Walsh et al., 2017). Spoke 7 tackles these shifting intergenerational dynamics while addressing the pervasive challenge of ageism (Ungar et al., 2024), which undermines inclusion across health care, welfare systems, public policy, and public narratives. One major contribution of Spoke 7 introduces a comprehensive index of intergenerational justice for EU countries (Galasso et al., 2025), extending beyond distributive fairness to include status, relational equality, and political equality. Findings reveal striking disparities: older generations often benefit from greater distributive fairness, whereas younger groups report stronger social connectedness and lower isolation. These insights underscore the need for policies that both balance resource allocation and address the risks of social isolation across generations. More broadly, Spoke 7 highlights how tackling ageism and intergenerational inequalities is essential to maintaining social cohesion and trust in aging societies. It demonstrates that sustainable demographic transitions require not only economic adjustment but also renewed cultural narratives and political frameworks that value all age groups.

Spoke 8: Interventions and technologies to reduce the burden of age-related diseases, disorders, and disabilities

The article by Okoye and colleagues (2025) examines the multifactorial causes of age-related disabilities and the need for multidimensional clinical and technological interventions targeting multiple risk factors within Spoke 8. By implementing multidomain interventions (MDIs), this Spoke aims to promote active aging and prevent cognitive and functional decline in older adults across various Italian settings (Ngandu et al., 2015). The project includes three key studies: a randomized trial comparing tailored MDIs to self-guided interventions in community-dwelling older adults; an evaluation of technology-supported MDIs in hospitalized patients with post-discharge monitoring; and an assessment of MDIs in nursing home residents compared to standard care. Biomarkers are used across studies for risk stratification and health monitoring. A core component is the development of a data platform integrating machine learning and wearable devices for real-time monitoring, early diagnosis, and therapy optimization, ensuring General Data Protection Regulation compliance. Additionally, a cost-effectiveness analysis assesses societal impacts across the three studies, providing crucial evidence to inform aging policies.

Spoke 9: Advanced gerontechnologies for active and healthy ageing

Spoke 9 conceives innovative, disruptive, and usable technologies for aging well by pursuing the following activities: (i) development of AI and robotic sensing technologies to provide support for prevention, early disease detection, and health monitoring (e.g., wearable sensors for physiological signal monitoring and ultra-portable echography, to be used also in home environment); (ii) elaboration of big data analysis applications to fuse information from different sensors to develop tailored actions (e.g., clinical protocols and technologies, targeted therapeutic procedures, and interventions); (iii) implementation of innovative care models, products, and services based on ICT, in different environments like home, hospital, community (e.g., integration of developed technologies on intelligent platforms, new methods, and AI models for the psychophysiological assessment of subjects, tools to facilitate daily life activities). Sorrentino et al., (2025) explore the potential of digital biomarkers—physiological and behavioral indicators collected via digital devices—for enhancing cognitive and physical assessment in older adults. Focusing on technologies such as social robots and VR, the authors reviewed 431 studies and analyzed 19 relevant papers to map current applications and identify crucial research directions. Findings show that digital biomarkers are used to monitor cognitive performance and rehabilitation in VR environments, assess gait and thermodynamics through robotic systems, and track upper-body movements in physical therapy. Despite encouraging applications, the study highlights key limitations, including low technological readiness, narrow sensory inputs, and limited temporal data (Cavedoni et al., 2020; De Gaspari et al., 2024; Piau et al., 2019). Addressing these gaps is essential for advancing sensor-based diagnostics and rehabilitation in aging populations.

Spoke 10: Mainstreaming aging by building institutional mechanisms for better and future-oriented policymaking

Finally, Spoke 10—strongly intertwined with all other Spokes—addresses the political responses to aging (Catalano et al., 2025). In Italy, a disparate set of public institutions responds to the health and social needs of older adults, which makes it often cumbersome for them and their families to navigate such a system, with potential negative repercussions for their health and well-being, in addition to consequences for the consumption (at times inappropriate) of health care services (Pavolini & Ranci, 2008). This Spoke aims to: (i) suggest strategies to increase the inclusion of underrepresented populations and synergies between national and regional programs; (ii) provide policymakers with effective tools to improve the implementation of health promotion and prevention programs targeting older adults (e.g., clinical guidelines); (iii) improve policies aimed to provide a defined boundary between acute care and therapeutic obstinacy; and (iv) understand how the needs of the aging population are satisfied with the current institutional responses and how organizations can improve their responses.

Advancing research on aging in Italy: cross-cutting and outreaching activities

Living in societies characterized by increasing longevity requires preparing all citizens for later life by developing the knowledge and skills needed to prevent illnesses and promote health. Educational research is essential to identify and address these needs across different groups, including younger and older adults, professionals, volunteers, family caregivers, helpers, and policymakers (Sala et al., 2020). The tasks of the Learning, Education, and Active Aging Board (LEAA)—composed of a team of experts spanning the fields of education, sociology, and psychology—focus on (i) reviewing existing national policies and best practices aimed at increasing Italian society's readiness to meet the challenges and exploit the opportunities connected with increasing longevity and (ii) translating findings, tools, and results from the Age-It Program into implementable and scalable educational solutions directed to both the general and the aging population. The contribution of the LEAA team in this supplement issue

(Boffo et al., 2025) describes the results of the first of these tasks: using a mixed-methods design, it presents the most relevant practices and activities, implemented across Italy, aimed at promoting older people's learning, training, and participation. The study reveals the existence of a large range of significant and efficient practices; on the other hand, it also highlights the huge heterogeneity in the availability of such measures across different geographical and social contexts, the very different skills and reach of the different institutional actors promoting educational activities, and the limited sharing of knowledge between these actors.

The Data Management Board (DMB), composed of a team of experts encompassing data producers, data users, administrative staff, and legal experts across the Age-It partners, is in charge of developing and constantly updating the data management plan and of coordinating the overall Age-It data banking governance. Within the Age-It initiative, several new data collections are being conducted. The DMB also defines the specific activity plan deployed to collect and treat new data across the Age-It Research Program (e.g., validation, translation, digitalization, anonymization, and creating metadata).

The Innovation & Technology Transfer Board (ITB) drives the promotion of innovation across the Program by identifying and supporting solutions that achieve higher levels of technological and social readiness in line with Age-It's core objectives. Its mandate is to translate Age-It's research outcomes into tangible value for both the market and society, making knowledge transfer an integral part of the innovation process. The ITB seeks to bridge the critical gap between pilot or prototype initiatives and economically sustainable, widely adopted solutions. In doing so, it also fosters collaborative networks between research and industry, encouraging cross-fertilization of expertise and the exchange of data, needs, and new ideas.

The Stakeholders and Dissemination Board oversees the design and continuous update of the dissemination plan. It brings together a key group of public and private institutions that are particularly attuned to the challenges and opportunities of population aging. These stakeholders, drawn from government, NGOs, research, and industry, were actively engaged from the outset in an *incremental participatory* process. Although their interests span different facets of aging, they share a common commitment to developing effective solutions for the well-being of older people. The Board embodies Age-It's co-creation ethos, ensuring that research outcomes are shaped in close collaboration with societal actors—a strategy described in detail in Chiatti and colleagues (2025).

The age of Age-It: finding a path toward aging well in an aging society

Italy is currently one of the oldest countries in the world because of its long history of low mortality and very low fertility. In this context, migration presents both opportunities and challenges: it can help counter population aging by bringing in young workers and potential parents in real time (Billari, 2022), yet as many immigrants grow old in their host countries, it also exposes gaps in active aging policies, which are largely designed for natives. Both increased fertility and enhanced immigration are unlikely—at least in the foreseeable future—to substantially offset the pace of population aging. In light of this, it is increasingly urgent to reorient short- and midterm societal strategies toward fostering conditions for healthy, active aging and the compression of morbidity, while recognizing and valuing the new roles older adults can play, such as civic engagement or environmental stewardship (Strozza et al., 2024a, 2024b). This shift offers a powerful organizing principle, grounded in both biological and demographic considerations, with far-reaching implications for family life, workforce participation, health care systems, LTC arrangements, and the sustainability of pension schemes.

We believe that the implementation of Age-It is already proving transformative for aging research in Italy. Age-It integrates key insights from the biomedical, technological, and socioeconomic domains into theoretically informed Spokes. The outcomes of the Program are represented by a stream of studies, policies, measures, and interventions that transcend disciplinary and sectoral silos and embrace integration between different fields of knowledge, approaches, and institutional actors. This overall picture is more insightful than the combined input of its individual elements. In addition, Age-It's scientific findings call for a rethinking of the research agenda of gerontology and the social sciences (Albertini & Vignoli, 2025). Rising longevity, changing social and cultural contexts of later life, and the resynchronization of individual and family trajectories challenge traditional life course research. In particular, the work-related tripartite segmentation of life courses must be revisited; postponed educational, family, and work transitions need to be reconceptualized as new norms of longer and healthier lives; and new tools are required to address family beanpolization, and the growing role of extended and non-kin networks.

Although Age-It aspires to advance the way we study aging and to promote transformative policies to prepare young adults for a long future ahead and to empower older adults, we acknowledge that achieving a fully unified theoretical and practical approach is a long-term, hard-to-grasp, and ambitious achievement to be fully reached within the short 3-year time span of the Research Program. Naturally, many of the goals discussed in the articles of this supplement issue will be realized over the years and decades to come. Our commitment to fostering a transdisciplinary and inclusive research environment is matched by a realistic awareness of the structural challenges ahead. Political inertia, cultural resistance, and institutional constraints can pose significant barriers to integration and implementation. Rather than assuming linear progress, Age-It recognizes the importance of iterative learning, adaptive strategies, and sustained dialogue across disciplines and sectors. It aims at initiating a process of significant change in aging-related research and policymaking, rather than fully implementing and concluding it in the short span of just three years.

In all, Age-It is inherently evolutionary. Unlike a project that reaches completion once its objectives are met, a Research Program like Age-It adapts and expands over time, integrating new research questions and methodologies as societal challenges evolve. This flexibility allows for continuous knowledge production and engagement with emerging policy debates on aging. The new research approaches, technological and institutional innovations, and transdisciplinary collaborations brought about by the Age-It consortium do not end with the Program. As a final goal of Age-It, an Italian Institute of Aging—Istituto Italiano sull'Invecchiamento (III)—will be established. We expect that the Institute will have a significant impact on the economic, social, and cultural system of Italy, as it will hopefully modify the national approach to aging, impinging on the demographic, socioeconomic, and health policies.

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Conflict of interest

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Data availability

This is an editorial that does not report data, so the preregistration and data availability requirements are not applicable.

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