DEPARTMENT OF INTERNATIONAL AND EUROPEAN ECONOMIC STUDIES

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

SDG-Based Transformation to support Longevity

Phoebe Koundouri

Conrad Felix Michel Landis

Working Paper Series

25-36

May 2025

SDG-Based Transformation to support Longevity

Phoebe Koundouri,

School of Economics and ReSEES Research Laboratory, Athens University of Economicsand Business; Department of Technology, Management and Economics, Denmark Technical University (DTU); Sustainable Development Unit, Athena RC; Academia Europea

phoundouri@aueb.gr

Conrad Felix Michel Landis

ReSEES Research Laboratory, Athens Universityof Economics and Business; Sustainable Development Unit, Athena RC

conrad@aueb.gr

Abstract

This paper investigates how progress toward the United Nations Sustainable Development Goals (SDGs) supports longevity across the European Union by analyzing the relationship between key longevity indicators and the SDG framework. Longevity is understood not merely as increased life expectancy but as the capacity to live longer lives in good health, with economic security, autonomy, and social inclusion. Drawing on Eurostat's "Ageing Europe" indicators, we identify 14 Key Performance Indicators (KPIs) spanning six dimensions: population developments, housing and living conditions, health and disability, working and retirement, pensions and income, and social inclusion. Using the most recent data for EU-27 countries, we apply cross-sectional regressions to examine how these KPIs correlate with national SDG scores.

The analysis reveals strong and statistically significant associations between several longevity KPIs—particularly life expectancy at birth and age 65, healthy life years at age 65, and self-perceived health status—and SDGs related to health (SDG 3), gender equality (SDG 5), reduced inequalities (SDG 10), education (SDG 4), and partnerships (SDG 17). Digital inclusion and participation in lifelong learning also emerge as key enablers of sustainable longevity, showing broad linkages to innovation, social cohesion, and economic resilience. The findings suggest that longevity is a deeply multidimensional phenomenon, shaped by structural policies far beyond healthcare. The SDGs provide a coherent and measurable framework for aligning policies and investments toward inclusive, healthy, and resilient ageing. This paper contributes to a

growing body of evidence demonstrating that sustainable development and longevity are mutually reinforcing agendas.

1. Introduction

Longevity, as a defining demographic and socio-economic shift of the twenty-first century, extends far beyond the basic notion of increased life expectancy. It calls for a comprehensive re-evaluation of how individuals, institutions, and economies are structured. As people live longer, often healthier lives, the implications stretch across a broad range of sectors—from the workplace and education to financial planning and healthcare.

The economic and financial dimensions of longevity demand particular attention. For businesses, the challenge lies in adjusting to a workforce that is not only older but also more diverse in its needs and expectations. Retirement is no longer a fixed endpoint but rather a transition, sometimes stretched over decades. This evolution forces a rethink of employment policies, benefits systems, and corporate culture. Companies must create more flexible work environments that accommodate lifelong learning and second or even third careers. In this context, human capital cannot be measured merely by age but must instead reflect the ongoing accumulation of skills and experience. The business models of the past, predicated on a relatively linear life course—education, work, retirement—are increasingly outmoded (Klimczuk, 2021).

From a macroeconomic standpoint, increasing longevity has profound implications for productivity, public finances, and intergenerational equity. An ageing population alters the dependency ratio, putting pressure on pension systems and healthcare services. Yet it also presents an opportunity: older adults represent a growing consumer segment with distinct preferences, habits, and aspirations. The "silver economy" emerges as a critical growth area, encompassing everything from age-friendly technology to new forms of housing, travel, and preventive healthcare (European Commission, 2018). Governments and investors alike must anticipate these shifts, ensuring that infrastructure and policy frameworks are responsive to the changing demographic structure.

Financial markets are already reacting to the challenges and opportunities posed by longer lifespans. Investment strategies must account for the greater duration of retirement and the increased variability in health and income over time. Traditional models of saving and disbursement are insufficient when individuals must plan for potentially thirty or more years without employment income. Asset managers, insurers, and pension funds are being forced to innovate, developing products that offer both security and flexibility. The focus shifts toward sustainability—not only environmental

or social, but financial longevity at both the individual and institutional levels (Geneva Association, 2025).

Education, too, must evolve in response to demographic realities. Lifelong learning has become not a luxury, but a necessity. As careers extend and morph, individuals require access to upskilling and reskilling opportunities throughout their lives. This demands a recalibration of how education is funded, delivered, and integrated with the broader economy. Universities and training providers must think in terms of continuous engagement, while employers need to foster environments where learning is ongoing and embedded into professional development (Boissonneault & Rios, 2021).

The social implications of longevity are equally profound. Living longer reshapes intergenerational dynamics, alters traditional family roles, and introduces new considerations around caregiving and social cohesion. Policy must account for the distribution of risks and resources across age groups, guarding against social fragmentation. The cultural narrative around ageing requires transformation—moving away from decline and dependence, toward empowerment and continued contribution. Thriving in later life should not be the preserve of the affluent or the fortunate, but a standard accessible to all (World Health Organization, 2020).

Supporting longevity through sustainable development requires a fundamental rethinking of the systems that underpin modern life—healthcare, education, employment, urban design, and social protection. The Sustainable Development Goals (SDGs), as a globally endorsed framework, provide a multidimensional blueprint for this transformation. They encourage policies and investments that promote long-term human well-being while balancing environmental and economic sustainability. SDG 3, which focuses on good health and well-being, is particularly central to the longevity agenda. However, a truly supportive framework for extended lifespans must go further, integrating goals related to lifelong education (SDG 4), decent work and economic growth (SDG 8), reduced inequalities (SDG 10), and sustainable cities and communities (SDG 11). In doing so, the SDGs offer a platform for cross-sectoral alignment that can ensure people not only live longer lives, but do so with dignity, security, and purpose (Scott, 2022).

Longevity also demands a reconfiguration of social and economic systems that remain too often short-term in their design. The SDGs, by contrast, are explicitly long-term and intergenerational in their scope, seeking not only to address present inequalities and vulnerabilities but to anticipate future needs. This aligns with the core premise of the longevity economy: the future is not a linear extension of the past. Instead, it is a landscape requiring adaptive governance and investment. For instance, sustainable

infrastructure and universal healthcare access are not merely welfare issues, but critical enablers of productivity and resilience in ageing societies. Similarly, the promotion of inclusive urban environments supports both ageing in place and intergenerational solidarity—key components of well-being in later life (United Nations, 2023).

Importantly, the SDGs embed a principle of equity that is indispensable to the vision of thriving longevity. Without deliberate attention to disparities in income, gender, and geographic access, increased lifespans risk exacerbating social divides rather than closing them. A long life must be a good life for all, not just for those with the means to navigate complexity. The SDG framework enables a governance language and sets of metrics through which progress toward that ideal can be evaluated and directed. It anchors the pursuit of longevity within a broader ethical commitment to justice, cohesion, and planetary stewardship assuring that the transformation required to support longer lives is itself sustainable in the deepest sense (World Health Organization, 2020).

2. Economic Longevity

The concept of the longevity economy captures a profound transformation in how societies must respond to the implications of increased human lifespans. Rather than simply observing that people are living longer, this framework compels a rethinking of how economic structures, labor markets, investment strategies, and social institutions must evolve. As life expectancy continues to rise across the globe, the longevity economy presents itself not as a peripheral trend but as a central axis around which modern economic and social policy must pivot (AARP & Oxford Economics, 2013).

A central component of this transformation is the reorganization of economic life to support longer and more dynamic personal trajectories. In a context where individuals may live well into their eighties and nineties, the traditional model of a linear life—education, work, retirement—proves increasingly inadequate. Instead, societies must enable cyclical patterns of work, learning, caregiving, and reinvent. Flexible employment systems that allow for phased retirement or second careers are critical, as are educational models that promote continuous skill development across the life course (Formosa, 2019). Pension frameworks must be adapted to support increasingly diverse and prolonged working lives (OECD, 2020), and markets must expand to meet the rising demand for goods and services that cater to older adults—from healthcare to digital inclusion and housing solutions (Gratton & Scott, 2016).

This demographic shift also reshapes the landscape of investment and capital allocation. Financial systems must adjust to the longer time horizons over which individuals will save, spend, and require services. Key growth sectors now include health technology, long-term care, age-inclusive design, and lifelong learning platforms (World Economic Forum, 2023). In parallel, urban infrastructure must evolve to promote safe mobility, social interaction, and independence for ageing populations (Beard & Bloom, 2015). These developments underscore the need for new economic metrics and financial tools that reflect the risks and opportunities of an ageing world.

Far from diminishing economic vitality, an ageing society can be a source of innovation and enhanced productivity. Older adults possess valuable experience, emotional intelligence, and institutional knowledge that can strengthen team dynamics and decision-making processes. Rather than being phased out, their contributions can be adapted and extended through policy, education, and technological support (OECD, 2020). This view redefines productivity to account for qualitative dimensions such as mentorship, knowledge transfer, and social capital. Recognizing the economic value of older adults as both contributors and consumers demands systemic change in how value is measured and supported (Calasanti & Slevin, 2006).

To fully realize the benefits of longevity, social and institutional transformations are essential. Public policy must be recalibrated to provide adequate protection and opportunity across an extended lifespan, particularly in areas such as social security, health coverage, and adult education (WHO, 2020). At the organizational level, companies need to foster age-inclusive cultures that support learning, flexibility, and intergenerational collaboration. Culturally, there must be a decisive shift away from ageism towards narratives that recognize the ongoing capabilities and social contributions of older individuals (Formosa, 2019). Such shifts are not only ethical imperatives but strategic necessities for inclusive growth.

The longevity economy is ultimately about more than just the passage of time. It is about the quality and meaning of the years that are added. Thriving in older age requires social participation, economic security, good health, and purposeful engagement. This vision compels a cross-sectoral reimagining of how society functions—one that bridges economics, public health, education, and cultural norms. If approached with foresight and coordination, the longevity economy offers a path toward shared resilience and prosperity, not just for older individuals, but for all generations.

3. A KPI-Based Analysis from the Ageing Europe Framework

Longevity, the ability not only to live longer but to live longer, healthier, and more fulfilling lives, is emerging as a central goal in Europe's demographic and social development. As the proportion of older adults grows, societies face both opportunities (e.g. active ageing, intergenerational solidarity) and challenges (e.g. health system strain, pension sustainability).

The UN Sustainable Development Goals (SDGs) offer an integrated agenda to support longevity across multiple dimensions. The Eurostat "Ageing Europe" report provides robust Key Performance Indicators (KPIs) across six domains to monitor these changes and guide policy. These KPIs are not just statistical tools, they are levers for social transformation, enabling progress tracking across health, economic security, social participation, and well-being.

3.1 Population Developments: The Foundations of Longevity

The most fundamental aspect of longevity is captured in the statistics related to demographic change. Increasing life expectancy at birth and at age 65 reflects improved public health, medical care, and living standards. However, the number of healthy life years (HLY) remains an even more meaningful measure. HLY captures how many years a person can expect to live without disability or serious illness. A higher HLY indicates that ageing is accompanied by functional independence and fewer health burdens.

Other essential KPIs such as the median age of the population and the old-age dependency ratio signal how ageing will impact social structures and economic systems. The growing proportion of individuals aged 80 and over also reflects increasing survival, but often with intensified care needs. These demographic indicators are directly aligned with SDG 3, which promotes good health and well-being, and with SDG 10 and SDG 11, which address inequality and the development of age-inclusive cities. Together, they shape the policy context for supporting the early and sustained conditions of healthy and inclusive longevity.

3.2 Housing and Living Conditions: Built Environments for a Long Life

Longevity depends not only on personal health but also on the physical environment in which people age. Secure and affordable housing is a major determinant of well-being in later life. The housing cost overburden rate, particularly among those aged 65 and over, reveals the economic pressures older individuals face in maintaining adequate shelter. A high-cost burden can lead to housing insecurity and social exclusion.

The share of elderly living alone is another critical KPI. While living alone can reflect independence, it often correlates with isolation and vulnerability to health risks. Overcrowding rates and severe housing deprivation further highlight disparities in housing quality and access to basic amenities such as heating, sanitation, and accessibility features—particularly important for those with mobility challenges.

These KPIs reveal the deep intersection between housing and longevity, especially for older adults with limited income or declining physical function. They correspond to SDG 1, which targets poverty reduction, SDG 11, which emphasizes adequate housing and sustainable communities, and SDG 3, which recognizes the links between environmental and physical health. The design and retrofitting of homes, the integration of age-friendly urban planning, and the provision of community services are all essential components of a built environment that supports longevity.

3.3 Health and Disability: Health-Span as the True Measure of Longevity

While life expectancy remains a vital demographic measure, it is the quality of those added years—what might be called health-span—that defines the success of longevity. Key KPIs such as self-perceived health status, chronic disease prevalence, and activity limitations (as measured by the GALI index) offer insight into the lived experience of ageing. These indicators reveal whether older adults are maintaining autonomy, avoiding debilitating conditions, and accessing the care they need.

Healthcare utilization statistics, including frequency of doctor visits and hospital admissions, shed light on both system responsiveness and population need. Importantly, data on long-term care coverage captures the availability and accessibility of services necessary to support daily life for those with functional limitations. Mental

health measures, such as the prevalence of depression or loneliness among the elderly, are increasingly recognized as essential to holistic health.

These KPIs connect directly to SDG 3, which emphasizes both physical and mental well-being, and to SDG 10, which addresses disparities in health access and outcomes. Gender dimensions are equally important, as women typically live longer but with more years in poor health, reinforcing the relevance of SDG 5. Addressing health in ageing societies thus requires more than treating disease; it involves promoting preventive care, mental well-being, social inclusion, and long-term care systems designed for resilience.

3.4 Working and Retirement: Economic Participation in Later Life

As retirement ages shift and the economic contributions of older adults become more recognized, the role of work in longevity has gained increasing attention. The employment rate of older adults, particularly in the 55–64 and 65–74 age brackets, is a key KPI that signals both the inclusiveness of labor markets and the physical and mental capacity of older individuals to remain active. A higher effective retirement age often reflects positive developments such as better health and greater demand for experienced workers, though it may also result from insufficient pension income.

Participation in lifelong learning among older individuals is another vital indicator, supporting adaptability, mental engagement, and continued economic participation. Conversely, high rates of unemployment or inactivity due to illness in this age group may reflect systemic barriers or inadequate support for active ageing.

These indicators align with SDG 8, which promotes inclusive and productive employment, SDG 4, which emphasizes lifelong learning, and SDG 10, which calls for the removal of barriers to economic opportunity. Supporting longevity in the workforce involves not only pension reform, but also the cultivation of age-friendly work environments, lifelong skill development, and flexible transition models that preserve dignity and economic security.

3.5 Pensions, Income and Expenditure: Financial Security for a Long Life

Adequate income in retirement is essential for enabling autonomy, choice, and stability in old age. The at-risk-of-poverty rate for those aged 65 and over remains a crucial KPI for assessing economic vulnerability. Pension adequacy, often measured by the replacement rate of first pension income to last salary, is another central indicator of whether older people can maintain their living standards after leaving the workforce.

Income comparisons between the elderly and the general population highlight intergenerational equity or disparity, while material and social deprivation rates capture a more holistic view of poverty, beyond income alone. Data on household expenditures reveals specific vulnerabilities—such as high medical costs or energy poverty—that can undermine well-being even when formal incomes appear adequate.

These KPIs are central to SDG 1, which calls for an end to poverty, SDG 10, which promotes social and economic equity, and SDG 8, which concerns sustainable economic systems including pensions. Achieving longevity with financial security requires policies that address both the adequacy and sustainability of public pension systems, while also supporting alternative income sources and targeted assistance for the most vulnerable.

3.6 Social Life and Opinions: Social Inclusion and Mental Well-being

Beyond physical health and economic security, longevity must be understood as a social experience. Indicators such as the frequency of social interactions with friends and family, and participation in volunteering or civic life, offer insights into whether older people are meaningfully integrated into their communities. These social KPIs have direct implications for mental health, life satisfaction, and the perception of value and belonging.

Digital skills and internet use among those aged 65 and over are emerging as key inclusion indicators. Without digital access, older individuals are at risk of exclusion from essential services, information, and social networks. High rates of loneliness and low scores on life satisfaction indices are increasingly recognized as public health concerns.

These indicators are most closely linked to SDG 3, particularly the target on mental health, as well as SDG 11 and SDG 16, which emphasize inclusive communities and participatory governance. Promoting longevity thus requires strategies that extend far beyond healthcare or pensions. They involve strengthening community bonds, promoting digital literacy, and ensuring that older people have opportunities to contribute and be heard.

Table 1 reports all key KPIs across the different aspects of Longevity, as well as the data sources and their coverage.

Table 1 Longevity KPIs and Sources by Longevity Aspect

Aspect	KPI	Description	Most Recent (Years)	Source
Population Developments	1,2 - Life Expectancy at Birth **and** Age 64	An average number of years a person is expected to live, at birth and at age 65, under current mortality conditions.	2023	Eurostat (demo_mlexpec)
Population Developments	3 - Old-age Dependency Ratio	The ratio of people aged 65 and over to those aged 15-64, expressed per 100 people of working age.	2024	Eurostat (demo_pjanind)
Housing and Living Conditions	4 - Housing Cost Overburden Rate (65+)	Share of elderly living in households that spend more than 40% of their income on housing.	2024	Eurostat (ilc_lvho07a)
Housing and Living Conditions	5 - Share of Elderly Living Alone	Proportion of people aged 65+ living in single-person households.	2024	Eurostat (ilc_lvps30)
Health and Disability	6- Self-perceived Health Status (65+)	Share of elderly rating their health as good or very good.	2024	Eurostat (hlth_silc_01)
Health and Disability	7, 8 - Healthy Life Years at Birth **and** Age 64 (HLY)	Expected number of years to be lived in good health, based on self-reported activity limitations.	2022	Eurostat (hlth_hlye)
Working and Retirement	9- Employment Rate (55–64)	Percentage of people in these age groups who are employed.	2024	Eurostat (lfsi_emp_a)
Working and Retirement	10- Participation in Lifelong Learning (55–74)	Share of people aged 55–74 participating in education and training in the four weeks prior to the survey.	2024	Eurostat (trng_lfs_01)
Pensions, Income and Expenditure	11- At-risk-of-poverty Rate (65+)	Share of elderly with income below 60% of national median equivalized income.	2024	Eurostat (ilc_li02)
Pensions, Income and Expenditure	12- Pension Adequacy (Replacement Ratio)	Ratio of first pension income to last labor earnings, indicating how well pensions replace income from work.	2024	Eurostat (ilc_pnp3)
Social Inclusion	13- Digital Skills **and** Internet Use (65+)	Proportion of elderly using the internet and possessing basic digital skills.	2019	Eurostat (isoc_sk_dskl_i , isoc_r_iuse_i)
Social Inclusion	14 -Frequency of contact with family, relatives or friends (>64)	Share of elderly reporting feeling lonely most of the time.	2022	Eurostat (ilc_scp11)

4. SDG Transformations to Support Longevity

To explore the relationship between SDG indicators and the Longevity KPIs in the EU27 region, we use cross sectional regressions for the most recent year, SDG and Longevity data are available.

Cross-sectional regressions provide a robust methodological approach for exploring the relationship between SDG indicators and longevity KPIs across the EU-27 countries at a specific point in time. This approach allows for the comparison of how variations in SDG-related outcomes—such as income inequality, healthcare access, education, and digital inclusion—correspond to differences in key measures of longevity, including life expectancy, healthy life years, and at-risk-of-poverty rates among older populations. Unlike time series analysis, which may be constrained by limited observations and confounding time-related trends at the aggregate EU level, cross-sectional analysis captures spatial heterogeneity and offers a clearer picture of how different national contexts and policy environments influence ageing outcomes.

For all Longevity KPIs (j=1,..,14) and all SDG Goals (k=1,..,17) we do perform cross-sectional regressions (equation 1) of the most recent value for the KPI for the EU27 countries (i=1,...,27) to the most recent scores for SDG Goals 1 to 17.

$$SDG_i^k = \alpha + \beta KPI_i^j + \varepsilon_i \ (equation\ 1)$$

SDG scores and KPIs are normalized to Z scores through the following transformations:

$$SDG_i^k = \frac{SDG_i^k - \frac{\sum_{i=1}^{27} SDG_i^k}{27}}{\sqrt{\frac{\sum_{i=1}^{27} SDG_i^k - \frac{\sum_{i=1}^{27} SDG_i^k}{27}}{26}}} \ (equation\ 2)$$

$$KPI_i^j = \frac{KPI_i^j - \frac{\sum_{i=1}^{27} KPI_i^j}{27}}{\sqrt{\frac{\sum_{i=1}^{27} KPI_i^j - \frac{\sum_{i=1}^{27} KPI_i^j}{27}}{26}}} \ (equation\ 3)$$

Also the Longevity KPIs are controlled for directionality like the handling of SDG indicators in SDR reports (SDSN, 2024). Table 2 presents the sensitivities of all Longevity KPIs relative to SDGs. Newey West p values are reported in parentheses, three, two and one star denote significance at 1%, 5% and 10% level respectively.

Table 2 in the paper presents the results of cross-sectional regressions that assess the sensitivities of various longevity KPIs to the 17 Sustainable Development Goals (SDGs) across EU-27 countries. The most significant findings show that life expectancy at both birth and age 65 is very strongly associated with SDG 3 (Good Health and Well-being), with high coefficients (0.92 and 0.87 respectively) and strong statistical significance at the 1% level. These KPIs also show robust and significant positive relationships with SDGs related to education (SDG 4), gender equality (SDG 5), inequality reduction (SDG

10), sustainable cities (SDG 11), responsible consumption (SDG 12), climate action (SDG 13), life on land (SDG 15), and partnerships (SDG 17).

Self-perceived health status of people aged 65 and over is similarly sensitive to a wide range of SDGs, notably SDGs 1, 2, 3, 5, 10, 11, 12, 13, 15, 16, and 17, with most relationships statistically significant at the 1% or 5% level. This suggests a strong

Table 2 Sensitivities of Longevity KPIs versus SDG scores

	SDG-1	SDG-2	SDG-3	SDG-4	SDG-5	SDG-6	SDG-7	SDG-8	SDG-9	SDG-10	SDG-11	SDG-12	SDG-13	SDG-14	SDG-15	SDG-16	SDG-17
Life Expectancy at Birth	0,40**	0,22	0,92***	0,51*	0,53**	0,00	0,02	0,08	0,68***	0,31	0,50**	0,37**	0,41**	0,57***	0,72***	0,16	0,40**
	(0,013)	0,103	0,000	0,067	0,018	0,992	0,908	0,630	0,000	0,175	0,041	0,010	0,019	0,000	0,000	0,273	0,016
Life Expectancy at 65	0,32**	0,18	0,87***	0,53**	0,54***	0,01	0,03	0,12	0,65***	0,20	0,51**	0,34**	0,36**	0,59***	0,71***	0,16	0,32**
	(0,041)	(0,215)	(0,000)	(0,033)	(0,005)	(0,952)	(0,868)	(0,464)	(0,000)	(0,383)	(0,032)	(0,018)	(0,044)	(0,000)	(0,000)	(0,261)	(0,041)
Old-age Dependency Ratio	0,48***	0,16	0,17	0,00	0,05	0,32*	0,48**	0,17	0,04	0,24	0,24	0,49***	0,62***	0,07	0,40**	0,14	0,15
	(0,008)	(0,263)	(0,395)	(0,993)	(0,760)	(0,077)	(0,018)	(0,472)	(0,820)	(0,154)	(0,258)	(0,001)	(0,000)	(0,783)	(0,026)	(0,458)	(0,372)
Housing Cost Overburden Rate	0,15	0,28	0,01	0,03	0,02	0,32**	0,19	0,06	0,28	0,01	0,13	0,02	0,10	0,01	0,18**	0,08	0,25
	(0,205)	(0,242)	(0,905)	(0,850)	(0,933)	(0,040)	(0,364)	(0,840)	(0,159)	(0,897)	(0,259)	(0,900)	(0,439)	(0,918)	(0,015)	(0,747)	(0,372)
Share of Elderly Living Alone	0,27	0,05	0,12	0,08	0,21	0,17	0,23	0,27	0,17	0,33	0,13	0,28**	0,03	0,58***	0,09	0,43***	0,23
	(0,125)	(0,832)	(0,521)	(0,740)	(0,136)	(0,297)	(0,200)	(0,249)	(0,345)	(0,113)	(0,456)	(0,048)	(0,725)	(0,000)	(0,636)	(0,009)	(0,249)
Self-perceived Health Status	0,48***	0,47***	0,74***	0,28	0,50***	0,09	0,01	0,15	0,68***	0,40**	0,37**	0,54***	0,60***	0,31**	0,67***	0,33**	0,56***
	(0,001)	(0,000)	(0,000)	(0,127)	(0,007)	(0,558)	(0,962)	(0,255)	(0,000)	(0,014)	(0,020)	(0,001)	(0,003)	(0,045)	(0,000)	(0,026)	(0,000)
Healthy Life Years at Birth	0,16	0,05	0,12	0,02	0,21	0,48*	0,24	0,14	0,03	0,13	0,22	0,13	0,01	0,37*	0,01	0,52**	0,04
	(0,178)	(0,782)	(0,566)	(0,944)	(0,294)	(0,065)	(0,249)	(0,530)	(0,873)	(0,528)	(0,218)	(0,469)	(0,924)	(0,064)	(0,964)	(0,011)	(0,856)
Healthy Life Years At 65	0,26	0,28**	0,63***	0,37	0,53***	0,10	0,05	0,15	0,59***	0,13	0,27	0,33**	0,34*	0,43***	0,43***	0,12	0,54***
	(0,206)	(0,046)	(0,000)	(0,221)	(0,006)	(0,708)	(0,841)	(0,283)	(0,000)	(0,367)	(0,155)	(0,026)	(0,051)	(0,000)	(0,001)	(0,372)	(0,000)
Employment Rate (55–64)	0,05	0,06	0,05	0,20	0,29	0,24	0,42*	0,14	0,21	0,01	0,17	0,17	0,05	0,01	0,07	0,37**	0,22
	(0,746)	(0,745)	(0,808)	(0,264)	(0,111)	(0,168)	(0,063)	(0,314)	(0,259)	(0,944)	(0,457)	(0,413)	(0,828)	(0,955)	(0,673)	(0,031)	(0,283)
Participation in Lifelong Learning (55–74)	0,04	0,27*	0,53***	0,35**	0,67***	0,46***	0,59***	0,23***	0,61***	0,41***	0,33	0,40**	0,24	0,04	0,46***	0,55***	0,56***
	(0,828)	(0,072)	(0,001)	(0,012)	(0,000)	(0,000)	(0,000)	(0,008)	(0,000)	(0,005)	(0,186)	(0,025)	(0,213)	(0,794)	(0,003)	(0,000)	(0,000)
At-risk-of-poverty Rate (65+)	0,62***	0,22	0,53***	0,23	0,38***	0,16	0,08	0,24	0,49***	0,81***	0,33*	0,32**	0,37**	0,30*	0,24	0,33**	0,38**
	(0,000)	(0,209)	(0,000)	(0,161)	(0,009)	(0,123)	(0,506)	(0,202)	(0,005)	(0,000)	(0,095)	(0,032)	(0,018)	(0,086)	(0,288)	(0,023)	(0,018)
Pension Adequacy (Replacement Ratio)	0,26	0,05	0,18	0,02	0,01	0,19	0,21	0,20	0,20	0,09	0,24	0,26	0,11	0,41***	0,14	0,14	0,00
	(0,116)	(0,657)	(0,356)	(0,884)	(0,949)	(0,130)	(0,130)	(0,143)	(0,210)	(0,546)	(0,172)	(0,265)	(0,599)	(0,004)	(0,516)	(0,604)	(0,990)
Digital Skills and Internet Use (65+)	0,31**	0,44***	0,67***	0,38**	0,70***	0,48***	0,15	0,31	0,78***	0,47**	0,55**	0,59***	0,56***	0,07	0,51***	0,74***	0,71***
	(0,036)	(0,000)	(0,000)	(0,011)	(0,000)	(0,000)	(0,554)	(0,126)	(0,000)	(0,017)	(0,011)	(0,000)	(0,004)	(0,731)	(0,004)	(0,000)	(0,000)
Frequency of contact with family, relatives or friends (>64)	0,13	0,42***	0,35**	0,25*	0,55***	0,52***	0,09	0,48*	0,57***	0,47***	0,39**	0,41*	0,35*	0,31	0,19	0,70***	0,58***
	(0,556)	(0,004)	(0,013)	(0,098)	(0,000)	(0,001)	(0,712)	(0,054)	(0,000)	(0,002)	(0,034)	(0,071)	(0,083)	(0,117)	(0,342)	(0,000)	(0,000)

interconnection between perceived well-being in later life and broader dimensions of sustainable development. Healthy life years at age 65 also show significant associations with many of the same goals, especially SDGs 3, 5, 9, 13, 15, and 17.

Participation in lifelong learning (aged 55–74) shows consistently high and statistically significant coefficients with SDGs 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16, and 17, confirming the importance of education and inclusion policies for productive and meaningful ageing. Likewise, digital skills and internet use in older populations are significantly related to more than half of the SDGs, most notably SDGs 3, 4, 5, 6, 9, 10, 11, 12, 13, 15, 16, and 17, demonstrating that digital inclusion is a critical enabler of sustainable longevity.

Interestingly, the at-risk-of-poverty rate among people aged 65 and over is significantly and negatively associated with key SDGs such as SDG 1 (No Poverty), SDG 3, SDG 5, and SDG 10, confirming the link between economic vulnerability in older age and gaps in social development. Meanwhile, the old-age dependency ratio is positively and significantly linked with several SDGs, including SDG 1, SDG 7, SDG 12, SDG 13, and SDG 15, suggesting that environmental and energy systems are also relevant to how ageing pressures evolve.

Overall, the results of Table 2 confirm a broad and statistically significant connection between progress on the SDGs and improved outcomes in longevity, health, financial security, and social inclusion. They demonstrate that longevity is not just a health or demographic issue but a multidimensional phenomenon that is deeply intertwined with the overall sustainability and inclusiveness of society.

Figure 1 presents a Sankey diagram of the sensitivities denoted in Table 2 focusing only on the significant (1 or 5%) results.

Among them, Life Expectancy at Birth and Life Expectancy at Age 65 stand out, each with several strong positive relationships, particularly with SDG 3 (Good Health), SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities), all of which are highly relevant for healthy ageing. These KPIs signal not only increased lifespan but also reflect broader societal investments in health systems, social inclusion, and equality.

Self-perceived Health Status (65+) also displays a high weight, as it is significantly linked with a broad range of SDGs, including SDGs 1, 3, 5, 10, 11, 12, 13, 15, and 17. Its strength lies in capturing both objective and subjective dimensions of well-being in later life, making it a particularly sensitive and policy-relevant indicator for assessing the lived experience of older adults in different national contexts.

In the same group, Healthy Life Years at Age 65 is another high-weight KPI, reflecting how many years an individual can expect to live in good health beyond age 65. Its strong links with SDGs related to health, education, climate, and biodiversity suggest that the quality—not just the length—of later life is shaped by multi-dimensional, long-term policy frameworks.

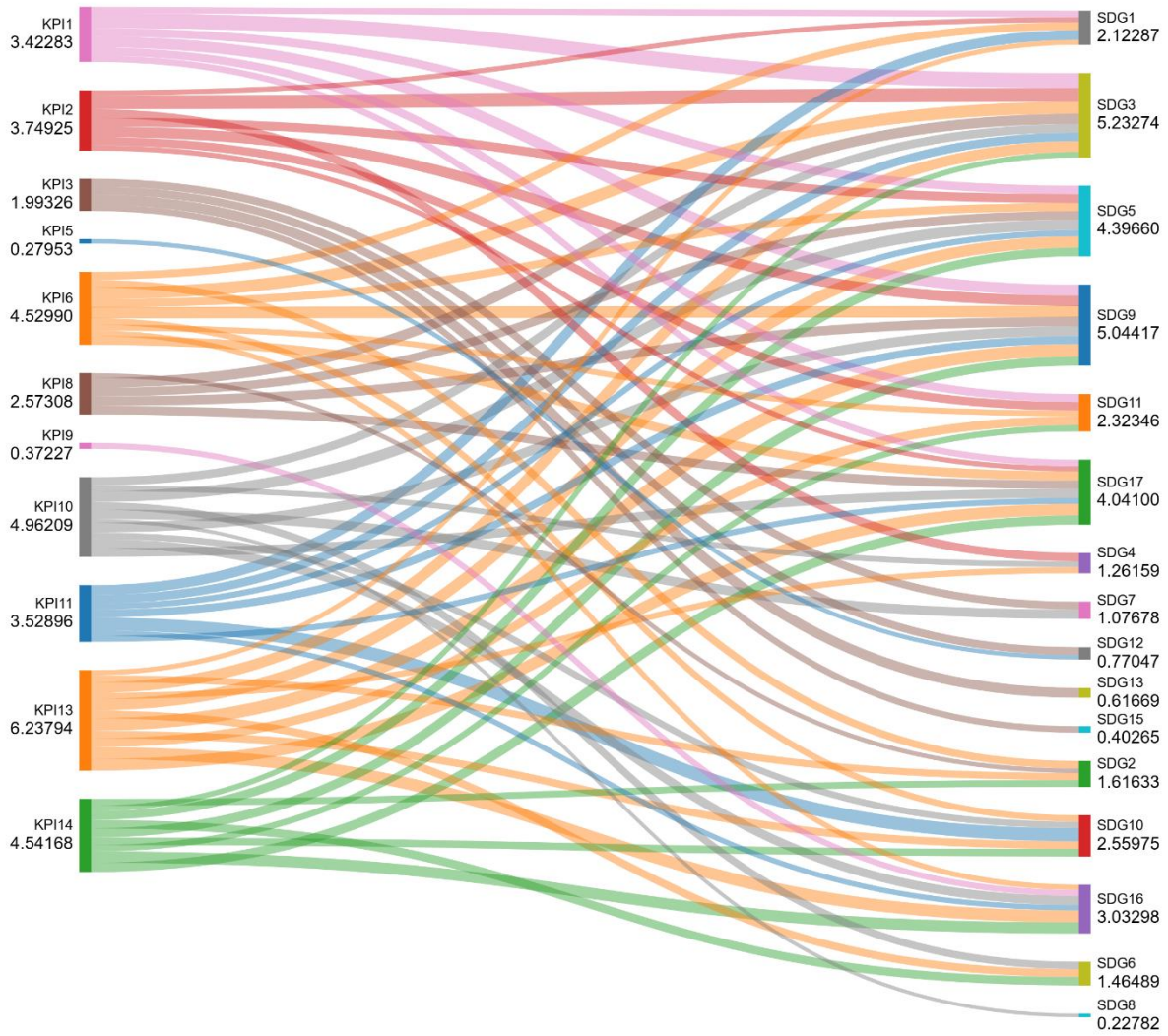

Figure 1 Mapping – Longevity KPIs to SDGs

Finally, Digital Skills and Internet Use among people aged 65+ is prominently weighted, revealing how digital inclusion is no longer a peripheral issue but a central determinant of participation, access to services, and autonomy in ageing societies. It is tied to over half of the SDGs, especially those concerned with infrastructure,

innovation, inclusion, and education, reinforcing that longevity-supportive development must be technologically inclusive.

Overall, these high-weight KPIs serve as critical entry points for SDG-aligned policies and illustrate that longevity is a cross-cutting phenomenon deeply embedded in the social, economic, environmental, and technological fabric of modern societies.

5. Conclusion

The Sustainable Development Goals (SDGs) provide a powerful and multidimensional roadmap for enabling societies to respond to population ageing not as a crisis, but as a transformational opportunity. When we align the Ageing Europe longevity KPIs with the SDG framework, we obtain not only an integrated platform for evaluating progress but also clear empirical evidence on where and how sustainable development supports longer, healthier, and more fulfilling lives.

Our cross-sectional analysis across EU-27 countries reveals that key longevity KPIs—especially life expectancy at birth, life expectancy at age 65, healthy life years at age 65, and self-perceived health status (65+)—are strongly and significantly associated with multiple SDG goals, most notably SDGs 3 (Good Health and Well-being), 5 (Gender Equality), 10 (Reduced Inequalities), and 17 (Partnerships for the Goals). These findings confirm that longevity is shaped by a wide set of social and structural determinants, extending far beyond healthcare alone.

Moreover, the digital inclusion of older adults, captured through the KPI for digital skills and internet use (65+), emerges as a powerful enabler of sustainable longevity. It shows high statistical significance with more than half of the SDGs, reinforcing that digital access is now essential for civic participation, healthcare access, education, and social connectivity in later life. Similarly, participation in lifelong learning (55–74) correlates strongly with education, employment, and innovation-related SDGs, validating the critical role of ongoing skill development for economic and personal autonomy in older age.

References

AARP & Oxford Economics. (2013). *The longevity economy: Generating economic growth and new opportunities for business*. AARP. https://www.aarp.org/content/dam/aarp/home-and-family/personal-technology/2013-10/Longevity-Economy-Generating-New-Growth-AARP.pdf

Beard, J. R., & Bloom, D. E. (2015). Towards a comprehensive public health response to population ageing. *The Lancet*, *385*(9968), 658–661. https://doi.org/10.1016/S0140-6736(14)61461-6

Calasanti, T. M., & Slevin, K. F. (2006). *Age matters: Realigning feminist thinking*. Routledge. https://www.routledge.com/Age-Matters-Re-Aligning-Feminist-Thinking/Calasanti-Slevin/p/book/9780415952248

European Commission: Directorate-General for Communications Networks, Content and Technology, Oxford Economics, Technopolis, Worthington, H., Simmonds, P. et al., The silver economy – Final report, Publications Office, 2018.

Eurostat, (2020), Ageing Europe - looking at the lives of older people in the EU, https://ec.europa.eu/eurostat/statistics explained/index.php?title=Ageing_Europe_-_looking_at_the_lives_of_older_people_in_the_EU

Formosa, M. (2019). Active ageing through lifelong learning: The University of the Third Age. In S. Westwood (Ed.), *Ageing, diversity and equality: Social justice perspectives* (pp. 53–66). Routledge. https://www.researchgate.net/publication/334138129

Geneva Association. (2025). Insurance and the Longevity Economy: Navigating protection in the era of 100-year lives. https://www.genevaassociation.org/sites/default/files/2025-02/insurance_and_longevity_report_1902_final.pdf

Gratton, L., & Scott, A. (2016). *The 100-year life: Living and working in an age of longevity*. Bloomsbury Publishing. https://www.bloomsbury.com/us/100year-life-9781472930170/

Klimczuk, A. (2021). The Silver Economy as a Constructive Response in Public Policy on Aging. In I.B. Bojanić & A. Erceg (Eds.), Strategic Approach to Aging Population: Experiences and Challenges (pp. 19–35). J.J. Strossmayer University of Osijek.

OECD. (2020). *Promoting an age-inclusive workforce: Living, learning and earning longer*. OECD Publishing. https://www.oecd.org/en/publications/promoting-an-age-inclusive-workforce_59752153-en.html

Sachs, J.D., Schmidt-Traub, G., Mazzucato, M. *et al.* Six Transformations to achieve the Sustainable Development Goals. *Nat Sustain* **2**, 805–814 (2019). https://doi.org/10.1038/s41893-019-0352-9

Scott, A. (2022). The Sustainable Development Goals and a Longevity Agenda. UN DESA Voice. https://desapublications.un.org/un-desa-voice/sdg-blog/december-2022/sustainable-development-goals-and-longevity-agenda

United Nations. (2023). World Population Ageing 2023: Challenges and opportunities of population ageing. https://www.un.org/development/desa/pd/content/world-population-ageing-2023

World Economic Forum. (2023). *Living longer, better: Understanding longevity literacy*. https://www.weforum.org/publications/living-longer-better-understanding-longevity-literacy/

World Health Organization. (2020). *Decade of healthy ageing: 2020–2030*. https://www.who.int/initiatives/decade-of-healthy-ageing