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The Urgent Need for an NHS Reform: Adapting to Overlooked Years of Transformation in Healthcare

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KEYWORDS

Healthcare system reform | Health system sustainability | Strategic governance in healthcare | Health System Complexity | Italy | SSN

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By addressing these challenges, the NHS can transform its service delivery mechanisms and maintain its commitment to providing equitable healthcare for all. Overall, to preserve its strengths the Italian healthcare system needs forward-looking reforms that align with the evolving needs of society and medicine.
Keywords: Healthcare system reform, Health system sustainability, Strategic governance in healthcare, Health System Complexity, Italy, SSN.
JEL codes: I1

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Vincenzo Atella: University of Roma Tor Vergata

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Abstract

The Italian National Health Service (NHS) stands at a critical juncture, grappling with the pressing need to reform in response to years of overlooked transformation in the healthcare landscape. Despite significant medical advancements and shifting demographic and epidemiological trends, the NHS has struggled to adapt its institutional structures to meet contemporary demands. Decades of medical innovation have rapidly changed the landscape, yet the NHS's organizational framework has lagged, resulting in inefficiencies and disparities in care. To ensure high-quality, equitable, and sustainable healthcare for future generations, we argue that the NHS must undergo comprehensive reforms. These changes should align healthcare financing, service delivery, and workforce planning with modern medical capabilities and population health needs. A forward-thinking approach is essential, acknowledging the coevolution of healthcare policy and medical science and ensuring that institutional adaptation aligns with the realities of contemporary medicine. By addressing these challenges, the NHS can transform its service delivery mechanisms and maintain its commitment to providing equitable healthcare for all. Overall, to preserve its strengths the Italian healthcare system needs forward-looking reforms that align with the evolving needs of society and medicine.

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1. Introduction[1]

National healthcare systems' ability to deliver services and improve health outcomes relies on the interplay of two main forces. First, policy frameworks set by governments and regulatory bodies shape how these systems are financed, organized, and managed. Second, scientific and technological advances in medicine bring new treatment protocols, pharmaceuticals, medical technologies, and care processes. This interaction creates complex and dynamic balances, which often follows an asymmetric pattern, where medicine advances rapidly, while healthcare institutions and policies change more slowly (Weisbrod, 1991). This disparity creates vulnerabilities, as healthcare systems risk becoming obsolete when they fail to align with modern medical advancements. Several key challenges emerge from this mismatch. For example, new medical technologies require updated reimbursement models, regulatory frameworks, and infrastructure investments. When bureaucratic and political barriers slow these adaptations, we may have delays in policy and infrastructure adaptation and healthcare systems may become inefficient. Furthermore, many cutting-edge treatments are highly effective but come at a premium price. Without cost-containment measures and value-based care models, we can incur in unsustainable escalating healthcare costs (Cutler & McClellan, 2001). Finally, if insurance systems, hospital networks, and physician training programs do not keep pace with medical progress, access to innovative treatments remains unequal (Marmot & Wilkinson, 2006).

While policymakers strive to create stable, efficient, and equitable systems, often the medical field continues to evolve with new discoveries and technological advancements. Historically, medical advancements have outpaced healthcare systems' ability to adapt. This gap creates a divide between scientific possibilities and institutional capabilities, leading to inefficiencies, escalating costs, and disparities in access to care. Adding to the complexity are external factors like demographic, epidemiological, and economic changes have evolved so significantly that existing structures are now outdated.

Many healthcare systems, built in a different era, are now struggling to keep pace with the modern realities of medical science and population health needs. Without substantial reform efforts, these systems risk becoming increasingly inefficient, costly, and inequitable. The future of healthcare depends on bridging the gap between scientific progress and institutional adaptation, ensuring that every individual has access to the most advanced, efficient, and equitable care possible. The need for a comprehensive reform of the healthcare systems is now widely recognized. However, any reform effort must be preceded by a clear understanding of what needs to be reformed and why.

In this article, we will focus on the current Italian National Health Service (NHS), which is significantly more complex than the one addressed by the foundational reform of 1978 and even than that considered during the major revision of Title V of the Constitution in 2001. Over recent decades, substantial innovations have transformed the ways in which patients are managed, leading to an intricate interconnection between healthcare and broader social systems.

Since the 1990s, at least three major paradigm shifts have profoundly altered the healthcare landscape. First, the adoption of the life-cycle approach to health by the World Health Organization introduced a

[1] This study has been possible thanks to funding by the European Union - NextGenerationEU, Mission 4, Component 2, in the framework of the GRINS – Growing Resilient, INclusive and Sustainable project (GRINS PE00000018 – CUP D13C22002160001). The views and opinions expressed are solely those of the author and do not necessarily reflect those of the European Union, nor can the European Union be held responsible for them. I would like to thank Emily Maresch for valuable research assistance.

holistic perspective that considers health outcomes across an individual's entire lifespan. Second, increasing evidence has highlighted the decisive role of lifestyle factors in the onset of chronic diseases, thus elevating the importance of preventive medicine within healthcare strategies. Third, the genomic and exposomic revolutions have driven the emergence of personalized medicine, making it possible to tailor therapies based on individual biological profiles.

These innovations have significantly expanded the boundaries of the healthcare system, making it increasingly dependent on actions and interventions originating from other sectors. As a result, the SSN cannot be considered a closed system; rather, it must interact dynamically with broader societal, environmental, and technological contexts. Consequently, any future reform must incorporate mechanisms of "self-correction"—adaptive features capable of responding to internal and external pressures more dynamically than traditional policymaking cycles allow.

Furthermore, emerging evidence highlights how healthcare needs have evolved significantly over recent decades. The demographic profile of the population has shifted, leading to a growing prevalence of multimorbidity and chronic conditions. Data from official statistics show increasing healthcare utilization patterns: higher numbers of medical visits, diagnostic procedures, prescriptions, and overall healthcare expenditures. Furthermore, the range of therapeutic and diagnostic options available today for managing major chronic diseases—including diabetes, hypertension, neurodegenerative disorders, and cancer—has expanded dramatically compared to the early 1980s.

Despite the many challenges it faces, the SSN continues to perform relatively well when compared to healthcare systems in other advanced economies, particularly those within the OECD. Indicators such as life expectancy and access to essential healthcare services remain strong, underscoring the system's resilience. Nevertheless, critical warning signs are evident. Socioeconomic inequalities in healthcare access and outcomes are widening, financial and human resource sustainability is under increasing strain, and the changing patterns of healthcare demand and supply—fueled by demographic shifts and technological advancements—risk overwhelming existing structures.

These trends, if not adequately addressed through a systemic and forward-looking reform, risk undermining the SSN's founding principles of universality, equity, and solidarity. Thus, the current juncture demands not merely incremental adjustments but a fundamental rethinking of the Italian healthcare model to ensure its sustainability and responsiveness to contemporary and future health challenges.

We will discuss how reforms implemented since the NHS's inception in 1978 have either overlooked medical progress or been introduced too late, hindering their effectiveness in delivering high-quality, efficient services. These persistent disparities have created significant challenges for Italy's healthcare system, including financial sustainability issues, regional disparities in care quality, inefficiencies in service organization, and difficulties in integrating new medical technologies into daily practice. The misalignment between policy reforms and medical advancements has resulted in critical gaps in healthcare accessibility and efficiency, exacerbating existing structural weaknesses.

Given these challenges, the Italian NHS stands at a critical juncture, facing the urgent necessity of reform in response to years of neglected transformation in the healthcare environment. It's increasingly clear that comprehensive reform is essential to ensure its long-term viability. Without structural changes that align healthcare financing, service delivery, and workforce planning with modern medical capabilities and population health needs, the NHS risks becoming inefficient, financially unsustainable,

and unable to provide equitable healthcare for future generations. Addressing this challenge requires a forward-thinking approach that acknowledges the coevolution of healthcare policy and medical science. It is crucial to ensure that institutional adaptation keeps pace with the realities of contemporary medicine and healthcare demands. By implementing these reforms, the NHS can enhance its service delivery mechanisms and maintain its commitment to providing equitable healthcare for all.

In what follows, Section 2 describes the major legislative and structural changes in the Italian NHS since its inception through the key phases based on the centralized model (1978–1992), decentralization and market-oriented reforms (1992–2001),cost-containment efforts (2001–2010), austerity measures following the 2008 financial crisis, and the impact of COVID-19 on healthcare resilience. It also assesses Italy's current healthcare performance by comparing key indicators with those of other OECD countries. Section 3 discusses the major shifts in medical paradigm occurred over the years, introducing the life-cycle perspective in healthcare, that emphasize the role of early-life conditions and lifestyle factors in shaping long-term health outcomes. It also discusses how preventive and patient-centered care models have emerged as critical components of modern healthcare. In Section 4 focuses on the Italian context, describing how healthcare needs have dramatically changed due to population aging and the rising prevalence of chronic diseases, and how these trends are expected to create increasing pressure on the SSN. Section 5 introduces the conceptualization of the healthcare system as a complex adaptive system, discussing the implications of this paradigm shift for governance, coordination among stakeholders, and policy design. Finally, Section 6 argues for the necessity of structural reform, outlining five strategic priorities: workforce strengthening, expansion of preventive services, acceleration of digital health transformation, enhancement of transparency and citizen engagement, and revision of financing models to promote sustainability. It then proposes a phased set of policy recommendations organized into short-, medium-, and long-term actions, with the goal of modernizing the SSN and ensuring its resilience and equity for future generations. Section 7 concludes.

2. The Historical Evolution of the Italian National Health System

Since the 1950s, the modern European welfare state has evolved around the concept of solidarity, although declined differently across the countries. This means individuals contribute based on their ability and receive benefits based on need, with a system designed to protect them "from cradle to grave." It involves wealth transfers from rich to poor, from working-age individuals to children and seniors, and from the healthy to the ill.

The design and structure of a healthcare system play a critical role in determining how medical services are delivered and how effectively health outcomes are achieved. Healthcare systems around the world vary widely in their financing models, organizational frameworks, and delivery mechanisms. In some countries, such as the United Kingdom, publicly funded National Health Service (NHS) models dominate, while in others, such as Germany and France, social health insurance-based models are prevalent (Reinhardt, 2006). The United States follows a predominantly private insurance model, supplemented by large public programs like Medicare and Medicaid. Despite these structural differences, all healthcare systems share three fundamental components that define their functionality:

1. Financing Mechanisms – Healthcare services require funding, which may come from tax revenues, insurance premiums, or out-of-pocket payments by patients.
2. Service Organization and Management – The efficiency of a healthcare system depends on how primary care networks, hospital services, and specialist care are structured.

3. Delivery Efficiency – The ability to mobilize healthcare professionals, infrastructure, and technology to meet population health needs determines how well a system functions (Cutler, 2004).

Concerning Italy, the Italian National Health Service (SSN) was established in 1978, inspired by the principles of universality, equity, and solidarity (France et Al., 2005; Ferré et Al., 2014). Designed to provide comprehensive and accessible healthcare to all citizens, the SSN replaced a fragmented system that had left large portions of the population without adequate coverage (Donatini et Al., 2001). However, when national healthcare systems like the SSN were initially designed, they were structured as simpler models with clear cause-and-effect relationships, reflecting the medical knowledge, demographic structure, and economic conditions of their time (Saltman et Al., 2004). For years, many of these systems followed models conceived before the 1970s, when acute infections and communicable diseases were the primary health threats, life expectancy was lower, populations were younger, and chronic diseases were less prevalent (OECD, 2019). Since then, the world has changed significantly. Populations are aging, chronic diseases have become the leading causes of morbidity and mortality, healthcare costs have risen dramatically, and medical technology has advanced at an unprecedented pace (Weisbrod, 1991; WHO, 2020a).

To tackle these challenges, the SSN has undergone several structural transformations, spurred by economic pressures, regional disparities, and the quest for greater efficiency (Mapelli, 2020). In this section, we explore the historical evolution of SSN reforms, from its inception to the present day. Despite major legislative changes with significant economic implications for healthcare delivery and population health (Tediosi et Al., 2009), the SSN still struggles to evolve at the same pace, leaving gaps in efficiency, sustainability, and alignment with modern healthcare challenges (Cylus et Al., 2015).

2.1 - The evolution of the SSN from 1978 to 2025: a brief overview

The Law No. 833 of December 23, 1978, marked a pivotal moment in Italy's healthcare history. It abolished the previous social security-based system, which had provided coverage primarily through occupation-linked funds, and replaced it with a nationalized public health service. The SSN was designed to ensure that all residents had access to essential healthcare services, funded through general taxation and contributions from both employers and employees (Guzzanti, 1981).

Initially, the system was highly centralized, with the Ministry of Health overseeing national health planning, while Local Health Units (Unità Sanitarie Locali, USLs) were responsible for service delivery at the municipal level. The objective was to eliminate disparities in healthcare access, particularly between the affluent northern regions and the economically weaker southern regions. Despite its ambitious goals, the centralized model soon faced operational inefficiencies, excessive bureaucracy, and growing financial constraints. Rising healthcare expenditures led to concerns about the system's long-term sustainability, prompting policymakers to consider reforms aimed at improving financial efficiency while maintaining universal coverage (Donatini et Al., 2001).

A major shift occurred with Legislative Decree No. 502 of December 30, 1992, later amended by Legislative Decree No. 517 of 1993, which decentralized healthcare governance by transferring greater authority to regional governments. This reform transformed the USLs into Local Health Authorities (Aziende Sanitarie Locali, ASLs), granting them greater financial and managerial autonomy. The rationale behind this move was to increase efficiency, foster competition among providers, and reduce the bureaucratic rigidity that had characterized the earlier model (Fattore, 1999).

The decentralization reforms also introduced quasi-market mechanisms by encouraging greater private sector participation in service provision. Regions were given the flexibility to contract out services to private healthcare providers, provided that these services remained within the publicly funded system. This shift marked a departure from the purely state-run model and laid the foundation for a mixed public-private healthcare landscape.

Despite the intended benefits, decentralization exacerbated regional disparities, as wealthier regions in the north were better equipped to manage healthcare resources efficiently, while the south struggled with underfunding, mismanagement, and higher patient migration to northern hospitals. Moreover, fiscal constraints led to growing reliance on co-payments (ticket sanitari) for certain services, introducing new financial barriers for lower-income populations (France et Al., 2005).

By the early 2000s, rising healthcare expenditures prompted fiscal consolidation measures to curb budget deficits while preserving universal coverage. The 2001 Constitutional Reform (Legge Costituzionale No. 3/2001) further strengthened regional autonomy by granting regions full responsibility for healthcare planning and service delivery. However, this reform also created tensions between national budgetary constraints and regional healthcare spending autonomy, leading to financial imbalances and the emergence of bailout mechanisms for financially distressed regions (Ferré et Al., 2014).

In response to these challenges, the Pact for Health Agreements (Patto per la Salute) between the central government and regional authorities were introduced to improve financial accountability and set spending caps. Additionally, the widespread introduction of Diagnosis-Related Groups (DRGs) in hospital reimbursement mechanisms sought to enhance cost-effectiveness by linking hospital funding to the complexity of cases treated rather than lump-sum allocations (Cappellaro et Al., 2009).

During this period, the expansion of private healthcare providers continued, particularly in specialized care services such as diagnostics, rehabilitation, and elective surgeries. Although this trend improved service availability and reduced waiting times, it also raised concerns about inequalities in healthcare access, as wealthier individuals were increasingly able to bypass long waitlists by paying out-of-pocket for private care (Mapelli, 2012).

The 2008 global financial crisis had profound effects on the SSN, prompting severe austerity measures aimed at reducing public spending. Budget cuts led to hospital closures, staff reductions, and stricter spending limits, particularly in regions already struggling with financial deficits. The Health Stability Pacts (Patti di Stabilità in Sanità) imposed stringent expenditure ceilings, forcing regions to adopt cost-cutting measures that often resulted in reduced service availability and longer waiting times (De Belvis et Al., 2012).

Despite financial constraints, this period also saw advancements in healthcare digitization, with the introduction of electronic health records (EHRs) and some telemedicine initiatives aimed at improving efficiency. However, concerns about healthcare workforce shortages grew, as budgetary constraints led to frozen hiring policies, particularly affecting hospitals in southern regions (Agenas, 2023).

Finally, the COVID-19 pandemic in 2020 exposed longstanding weaknesses in Italy's healthcare system, particularly in terms of hospital capacity, regional disparities, and workforce shortages. The crisis underscored the need for stronger public health infrastructure, greater investment in preventive care, and improved emergency preparedness. In response, the government allocated €20 billion in additional

healthcare funding as part of the National Recovery and Resilience Plan (PNRR), with a focus on expanding primary care networks, digital health initiatives, and hospital infrastructure (Ministero della Salute, 2021a,b). Reforms also aimed to strengthen community-based healthcare, reducing dependence on hospitals and improving access to outpatient and home-care services.

The evolution of the SSN from its centralized inception in 1978 to its current regionally managed, mixed public-private system reflects a continuous balancing act between equity, efficiency, and fiscal sustainability. While decentralization has improved regional autonomy, it has also exacerbated healthcare inequalities, with southern regions facing greater financial and service delivery challenges.

The COVID-19 pandemic has highlighted both strengths and weaknesses of the system, reinforcing the need for increased investment in public health infrastructure and workforce expansion. As Italy navigates post-pandemic recovery, maintaining universal coverage while ensuring economic sustainability remains a key challenge for policymakers.

2.2 – Did the reforming process help improving the Italian SSN?

Based on this evidence it is easy to conclude that the reforms implemented in the Italian National Health Service (SSN) over the past decades have predominantly focused on organizational restructuring and financial sustainability, often overlooking the transformative forces reshaping global healthcare. While efforts have been made to decentralize healthcare governance, introduce market-oriented mechanisms, and enhance cost-effectiveness, these measures have not sufficiently addressed the rapid advancements in medical science, evolving healthcare paradigms, and shifting disease burdens. This issue is not unique to Italy. Many European health systems, including those in Spain, France, and Germany, have implemented cost-containment policies and administrative reorganizations but have struggled to adapt quickly to new medical technologies, the growing role of digital health, and the increasing burden of chronic diseases (OECD, 2021). In Spain, for example, regionalized healthcare management has led to disparities in the adoption of telemedicine and personalized medicine, limiting the potential benefits of innovation (García-Armesto et Al., 2010). Similarly, France's historically hospital-centric model has delayed the shift toward integrated primary care and community-based health services, leading to inefficiencies in managing aging populations and multimorbidity (Chevreul et Al., 2015).

One of the most significant global changes has been the acceleration of medical innovation, including breakthroughs in precision medicine, biotechnology, and digital health (Topol, 2019). However, Italy's healthcare reforms have largely concentrated on administrative decentralization and cost containment, rather than on effectively integrating these advancements into the healthcare system. Similar trends are visible in Germany, where the focus on maintaining a multi-payer insurance-based system has created barriers to the widespread adoption of value-based healthcare models (Busse et Al., 2010). In contrast, Nordic countries have proactively adapted to medical advancements by investing heavily in digital health infrastructure, making Denmark and Sweden leaders in electronic health records (EHRs) and telemedicine adoption. The United Kingdom's NHS, despite facing budget constraints, has made efforts to integrate artificial intelligence (AI) and genomics into care pathways, though financial and political instability have slowed full implementation. Similarly, Finland's "Kanta" digital health system has significantly improved access to patient data and personalized care, highlighting the importance of long-term digital health investment (Vuorenkoski, 2008).[2]

[2] See Atella et Al. (2025) and Atella and Chiari (2025) in this special issue.

Table 1 - Population health and health system performance - OECD 2021 Core indicators

Dimensions	Indicators	Italy		OECD	Worst country	Best country
		Level	Change over time			
Health Status	Life expectancy - Years of life at birth	82,7	+	80,3	73,1	84,5
	Avoidable mortality - Preventable and treatable deaths (per 100 000 people age-standardized)	146,0	+	237,0	665,0	133,0
	Chronic conditions - Diabetes prevalence (o/o adults age-standardized)	6,4	-	7,0	16,9	3,0
	Self-rated health - Population in poor health (% population aged 15+)	8,1	+	8,0	14,0	1,0
Risk factor for health	Smoking — Daily smokers (% population aged 15+)	19,1	+	16,0	28,0	7,2
	Alcohol - Liters consumed per capita (population aged 15+) based on sales data	7,7	-	8,6	12,2	1,4
	Obesity - Population with body mass index (BMI) 230 (% population aged 15+)	12,0	-	19,5	33,5	4,3
	Ambient air pollution - Deaths due to ambient particulate matter especially PM2.5 (per 100 000 people)	40,8	+	29,0	73,0	5,0
Access to care	Population coverage eligibility - Population covered for core set of services (% population)	100,0	=	97,9	72,7	100,0
	Population coverage satisfaction - Population satisfied with availability of quality healthcare (% population)	55,0	=	67,0	39,0	94,0
	Financial protection - Expenditure covered by compulsory prepayment schemes (% total expenditure)	75,5	-	76,0	50,0	86,0
	Service coverage - Population reporting unmet needs for medical care (% population)	1,8	+	2,3	8,1	0,1
Quality of care	Safe primary care - Antibiotics prescribed (defined daily dose per 1.000 people)	15,9	+	13,1	21,7	7,2
	Effective primary care - Avoidable hospital admissions (per 100.000 people age- and sex-standardized)	214,0	+	463,0	827,0	195,0
	Effective preventive care - Mammography screening within the past two years (% of women aged 50-69)	55,9	-	55,1	20,2	83,0
	Effective secondary care - 30-day modality following acute myocardial infarction and ischemic stroke (per 100 admissions for people aged 45 and over age- and sex-standardized)	5,3	+	6,8	23,7	1,7
Health system capacity and resources	Health spending - Total health spending (per capita USD using purchasing power parities)	4291,0	+	5000,0	1200,0	12500,0
	Health spending - Total health spending (% GDP)	9,0	+	9,2	4,3	16,6
	Doctors - Number of practicing physicians (per 1.000 people)	4,1	+	3,7	2,2	6,3
	Nurses - Number of practicing nurses (per 1.000 people)	6,2	+	9,2	1,6	18,9
	Hospital beds - Number of hospital beds (per 1.000 people)	3,1	+	4,3	1	12,8

Note: The symbol "+" indicates an improvement over time, "–" a deterioration over time, "=" no change.

Source: HEALTH AT A GLANCE 2023 © OECD 2023

Better than the OECD average.
Close to the OECD average.
Worse than the OECD average.

Simultaneously, the life-cycle approach and the increasing acknowledgment of lifestyle factors as key health determinants (Marmot, 2005) have transformed modern medicine, highlighting the importance of preventive and patient-centered care. Despite this, many European health systems, including the SSN, have remained predominantly reactive, focusing on acute and hospital-based care rather than prioritizing prevention, early intervention, and comprehensive health promotion (Kickbusch & Payne, 2003). Countries such as the Netherlands and Sweden have made significant strides by embedding preventive measures into primary care and linking health policies to broader social determinants of health. Conversely, countries like Italy and Greece have been slower to adopt this shift, constrained by rigid institutional structures and budgetary limitations (Saltman et Al., 2007).

As already mentioned in the introduction, even with these challenges, the SSN holds its own compared to healthcare systems in other advanced economies, especially those within the OECD. The OECD 2021 Core Indicators reported in Table 1 provides a comprehensive overview of Italy's population health and health system performance in comparison to the OECD average, highlighting key strengths and critical areas for improvement.

In terms of health status indicators Italy performs favorably in several key areas. Life expectancy at birth stands at 82.7 years, above the OECD average of 80.3 years and closer to the best-performing countries. Avoidable mortality is also notably low at 146 preventable and treatable deaths per 100,000 people, significantly better than the OECD average of 237. However, Italy shows poorer performance in diabetes prevalence (6.4%) compared to the best-performing countries, though still close to the OECD average (7.0%). Self-rated poor health is relatively low at 8.1%, comparable to the OECD mean (8.0%).

In terms of risk factors for health, Italy's performance is more mixed. While alcohol consumption is below the OECD average (7.7 vs. 8.6 liters per capita), smoking prevalence (19.1%) and obesity (12%) are slightly worse than the OECD average, indicating persisting behavioral risk factors. The most concerning metric in this category is deaths due to ambient particulate matter (PM2.5), with Italy reporting a rate of 40.8 deaths per 100,000—significantly above the OECD average of 29.0, highlighting ongoing environmental health risks.

In terms of access to care, Italy demonstrates near-universal population coverage for essential services (100%) and a relatively low rate of unmet medical needs (1.8%), both indicators performing better than OECD averages. However, only 55% of the population reports being satisfied with the availability of quality healthcare—considerably below the OECD average (67%), suggesting possible gaps in perceived service quality.

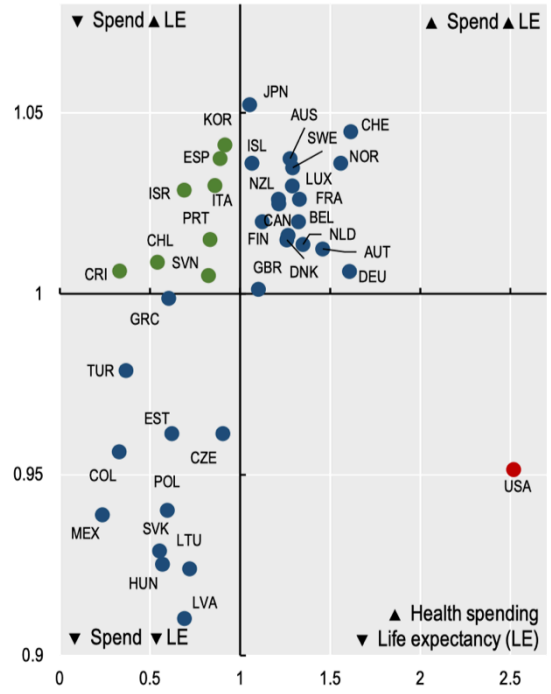
Quality of care indicators present a nuanced picture. Italy shows strong performance in reducing avoidable hospital admissions (214 per 100,000 people), far below the OECD average of 463, indicating effective primary care. However, mammography screening coverage is just 55.9%, only marginally above the OECD average, and lower than best-performing countries. Antibiotic prescription rates remain higher than the OECD average (15.9 vs. 13.1 defined daily doses per 1,000 people), indicating potential overuse and a target for antimicrobial stewardship policies.

Finally, regarding healthcare system capacity and resources, Italy spends slightly below the OECD average on health in per capita terms ($4,291 vs. $5,000) but maintains a higher-than-average percentage of GDP allocated to health (9.0%). While the number of practicing physicians is above average (4.1 per 1,000), the nurse-to-population ratio is substantially below the OECD average (6.2 vs.

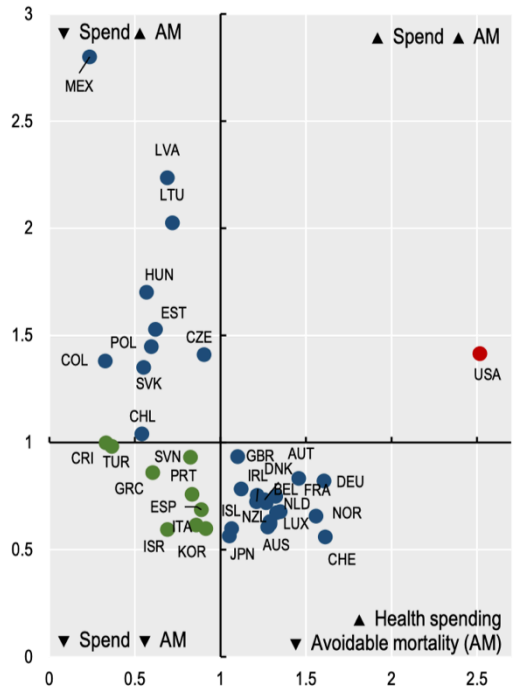
9.2), which may strain care delivery. Hospital bed availability is moderate (3.1 per 1,000), close to the OECD average.

Figure 1 – Health care efficacy comparison: where do we stand now.

A - Life expectancy and health expenditure

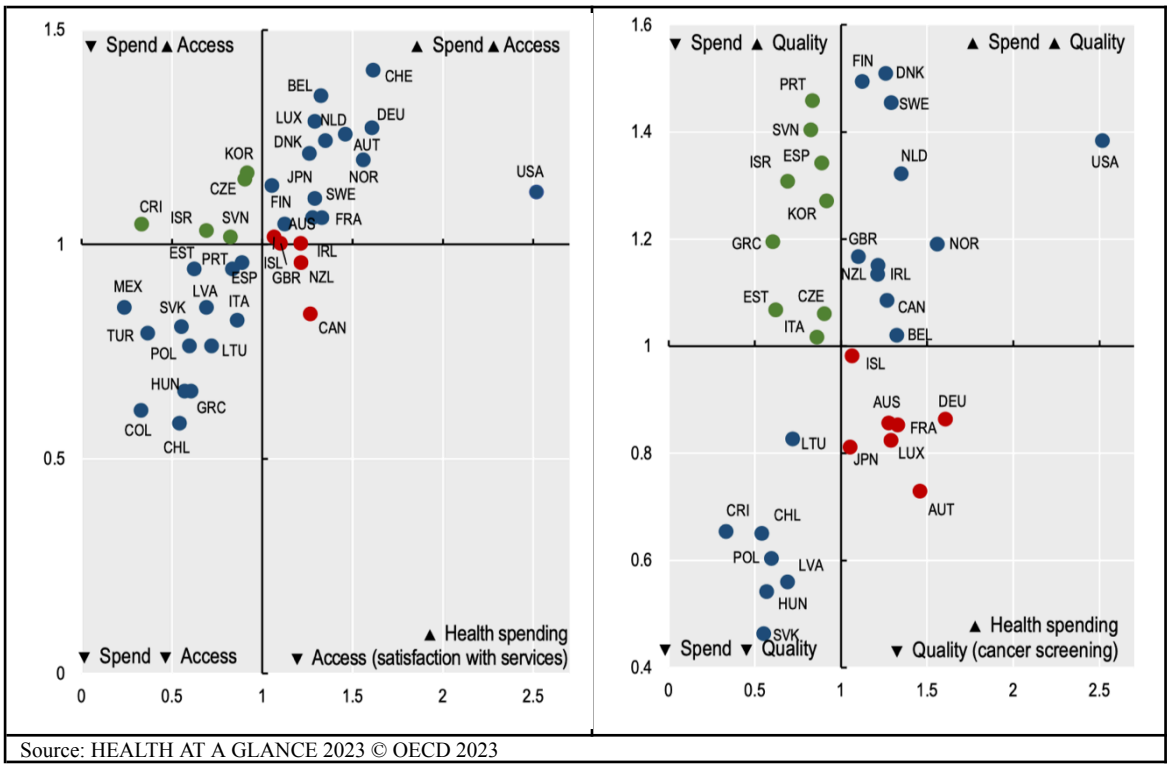


B - Avoidable mortality (preventable and treatable) and health expenditure



C – Satisfaction with availability of quality services and health expenditure

D - Breast cancer screening and health expenditure



Source: HEALTH AT A GLANCE 2023 © OECD 2023

Rather than simply presenting raw data as in Table 1, Figure 1 offers a visual comparative analysis of healthcare system performance across OECD countries in relation to their health expenditure levels.[3] The quadrant diagrams compare key indicators—including life expectancy, avoidable mortality, satisfaction with care quality, and breast cancer screening rates—against per capita health spending. By plotting countries based on their deviation from the OECD average, each graph provides an immediate understanding of the relative efficiency and effectiveness of various healthcare systems.

Italy occupies a particularly interesting position in these graphs. In panel A (life expectancy vs. health expenditure), Italy demonstrates a higher life expectancy than would be expected given its relatively moderate health spending. This placement suggests that Italy's healthcare system achieves commendable outcomes in terms of longevity despite spending less than many OECD peers, highlighting a degree of system efficiency.

In panel B (avoidable mortality vs. health expenditure), Italy again outperforms expectations, recording lower preventable and treatable mortality rates compared to other countries with similar or even higher expenditures. This underlines the strength of Italy's primary and acute care sectors, although it must be noted that regional disparities within the country could partially mask underlying inequalities.

Panel C (satisfaction with healthcare services vs. health expenditure) paints a less favorable picture. Here, Italy falls below the OECD average in terms of population satisfaction with the availability of quality services, despite maintaining reasonable expenditure levels. This dissatisfaction may reflect systemic issues related to waiting times, regional access inequities, and perceived gaps in service quality rather than deficiencies in health outcomes themselves.

[3] It is important to emphasize that these charts do not imply causal relationships but rather depict simple associations between the level of investment in healthcare and the outcomes achieved in terms of public health. Their primary function is to provide an immediate comparison among OECD member countries, highlighting discrepancies and general trends.

Finally, panel D (breast cancer screening vs. health expenditure) shows that Italy's performance is slightly above the OECD average, but not among the top performers. This result suggests that while preventive care measures like screening programs are in place, they have room for improvement in terms of coverage and effectiveness.

Overall, Figure 1 confirms that Italy's SSN achieves solid health outcomes at comparatively moderate costs but reveals structural weaknesses in patient satisfaction and preventive care uptake. These findings reinforce the argument that although the SSN remains fundamentally strong, targeted reforms focusing on quality improvement, preventive services expansion, and equity are urgently needed to sustain and enhance Italy's position among advanced healthcare systems.

3. The Role of Medicine Paradigm Shifts in Shaping Healthcare Systems.

Over the past decades, several paradigm shifts in medicine have transformed the way diseases are understood, diagnosed, and treated. Traditionally, healthcare was reactive and disease-centered, focusing on treating acute illnesses and managing symptoms after they appeared. However, advancements in precision medicine, digital health, and the recognition of lifestyle and environmental factors have led to a shift toward preventive, personalized, and patient-centered care (Hood & Flores, 2012; Topol, 2019). One major transformation has been the rise of precision medicine, which tailors treatments to an individual's genetic, environmental, and lifestyle factors, moving away from a one-size-fits-all approach (Collins & Varmus, 2015). Additionally, the life-cycle approach has gained prominence, emphasizing the impact of early-life conditions on long-term health and the importance of preventive interventions across different life stages (Marmot & Wilkinson, 2006). These changes necessitate a stronger focus on long-term patient management, integrating early detection, chronic disease prevention, and behavioral health interventions (Kickbusch & Payne, 2003).

From a healthcare sustainability perspective, these shifts highlight the need for efficient resource allocation. Preventing disease through lifestyle medicine, digital health monitoring, and community-based care can reduce long-term healthcare costs and alleviate pressure on hospital-based systems (WHO, 2020a). Moreover, the integration of artificial intelligence (AI) and big data analytics enables real-time health tracking and predictive modeling, further optimizing patient management and reducing unnecessary interventions (Jiang et Al., 2017). However, many healthcare systems struggle to fully implement these paradigm shifts, as policy frameworks, reimbursement models, and workforce training remain largely oriented toward traditional, reactive models (OECD, 2021). To ensure long-term sustainability and efficiency, health systems must adopt value-based care models, prioritize preventive and personalized medicine, and invest in digital health infrastructure to support this evolving landscape (Porter & Lee, 2013).

The recognition that health outcomes are shaped by cumulative exposures and behavioral patterns across an individual's lifespan has fundamentally transformed both theoretical models of health and the organization of healthcare systems. The life-cycle approach, which views health as a dynamic process influenced by biological, social, and environmental determinants across different life stages, has significantly influenced the design of preventive and patient-centered healthcare systems. In parallel, the acknowledgment of lifestyle factors—such as diet, physical activity, tobacco and alcohol consumption, and psychosocial stress—has shifted healthcare strategies away from reactive, disease-centric models toward preventive, holistic, and interdisciplinary frameworks.

The conceptual foundation of the life-cycle approach was established in early epidemiological research that demonstrated how early-life conditions influence long-term health outcomes. Over the decades, this perspective evolved into a fundamental principle in public health, preventive medicine, and healthcare policy, ultimately reshaping the structure and management of healthcare systems worldwide. This essay explores the origins and historical development of these two paradigms, tracing how they have influenced theoretical frameworks, healthcare organization, and policy-making.

3.1 - Early Foundations: The Origins of the Life-Cycle Approach in Health Research

The first formal discussions of the life-cycle approach in health research can be traced back to the early 20th century, when epidemiologists began to explore the long-term effects of early-life conditions on adult health. The work of Kermack, McKendrick, and McKinlay (1934) was among the first to propose that mortality trends could be linked to early-life exposures rather than being solely determined by contemporary risk factors. Their analysis suggested that health shocks experienced in childhood could have latent effects, manifesting as chronic diseases decades later.

In the 1940s and 1950s, research on fetal programming began to emerge, setting the foundation for what would later become the developmental origins of health and disease (DOHaD) hypothesis. The work of Ciocco et Al. (1941) provided early evidence that exposures accumulated from childhood to adulthood contributed to adult disease risk. However, it was not until the 1980s and 1990s that the life-cycle perspective gained significant traction, largely due to the groundbreaking work of David Barker.

Barker's research, particularly the Barker Hypothesis (1989, 1995), demonstrated a clear link between low birth weight and the risk of developing cardiovascular disease, diabetes, and metabolic disorders in adulthood. His studies on historical birth cohort data showed that adverse prenatal and early childhood environments predisposed individuals to long-term health risks. This body of work fundamentally challenged the dominant paradigm of disease causation, which had previously focused almost exclusively on adult lifestyle factors such as smoking, diet, and exercise, without considering the cumulative impact of early-life exposures (Barker, 1998).

The WHO formally incorporated the life-course perspective into its health policy framework in the 1990s, recognizing that effective health interventions must target multiple life stages rather than focusing solely on adult health behaviors (WHO, 2015a). The Minsk Declaration on the Life-Course Approach (2015) further reinforced this concept, advocating for integrated healthcare policies that address risk factors from gestation through old age (WHO, 2015b).

The World Health Organization's (WHO) life course approach has significantly influenced the management of patients by healthcare professionals. This comprehensive framework underscores the interconnectedness of health determinants throughout an individual's lifespan, advocating for interventions that account for the cumulative impact of biological, behavioral, and environmental factors from preconception to old age. By emphasizing critical periods, transitions, and the socio-economic contexts that shape health trajectories, the life course approach aims to optimize health outcomes while reducing disparities and health inequalities (WHO, 2015a).

The core premise of the life course approach is that health is not a static condition, but a dynamic process shaped by accumulated experiences and exposures. Unlike traditional healthcare models that often focus on episodic treatment, this approach encourages healthcare providers to adopt a more

holistic and longitudinal perspective. For instance, the recognition that childhood malnutrition can predispose individuals to chronic diseases such as diabetes and cardiovascular disorders in adulthood underscores the importance of early nutritional interventions (Barker, 1998). Similarly, evidence suggests that socioeconomic disadvantages and adverse childhood experiences (ACEs) can have profound long-term health implications, leading to an increased risk of mental health disorders, metabolic conditions, and lower life expectancy (Blane et Al., 2008). This insight has prompted healthcare providers and policymakers to integrate social determinants of health into patient care strategies, moving beyond mere disease treatment to a broader focus on preventive and supportive healthcare policies (Marmot & Wilkinson, 2006).

In clinical practice, the life course approach has revolutionized patient care, leading to a shift towards personalized, anticipatory, and preventive medical strategies. There is now greater awareness of the significance of early-life conditions and their long-term consequences, prompting medical practitioners to emphasize timely interventions, risk assessments, and continuity of care. This is particularly evident in maternal and pediatric healthcare programs, where prenatal and early childhood interventions are now designed to optimize developmental trajectories and minimize future health risks. For example, prenatal nutrition programs and neonatal screening initiatives are increasingly prioritized, given their potential to significantly influence health outcomes later in life (Ben-Shlomo & Kuh, 2002). Similarly, early childhood developmental monitoring and cognitive assessments help identify and address deviations promptly, preventing long-term impairments.

Beyond pediatric care, the life course perspective has also redefined the management of non-communicable diseases (NCDs). Traditionally, NCDs were largely treated in adulthood, with healthcare interventions focusing on symptom management rather than prevention. However, life course epidemiology has revealed that many NCDs have early-life origins. Evidence from cohort studies suggests that fetal undernutrition, childhood obesity, and early-life exposure to environmental pollutants are strongly associated with later-life risks of diabetes, hypertension, and cardiovascular diseases (Kuh & Shlomo, 2004). Consequently, modern healthcare policies have shifted towards targeted, life-stage-specific interventions aimed at mitigating NCD risk factors from infancy through old age. Encouraging healthy dietary patterns, promoting physical activity in early life, and reducing childhood exposure to harmful environmental toxins are now viewed as critical strategies for preventing late-life morbidity.

From a healthcare system perspective, the life course approach has prompted significant structural changes. There is now an increased emphasis on continuity of care and interdisciplinary coordination, ensuring that healthcare services are integrated across different life stages and transitions. This has led to comprehensive reforms in health service delivery, particularly in countries that have adopted universal healthcare models. The integration of maternal, pediatric, adolescent, adult, and geriatric care into cohesive healthcare frameworks ensures that individuals receive context-appropriate medical support at every stage of life (Blane et Al., 2008). Additionally, community-based interventions addressing social determinants of health have gained traction, recognizing that education, employment, social networks, and economic stability play crucial roles in shaping health outcomes. For example, policies promoting workplace wellness programs, affordable housing, and early childhood education have been directly influenced by life course research findings (WHO, 2015a).

One of the most profound contributions of the life course approach is its emphasis on health equity. By highlighting how disadvantages can accumulate over time and across generations, it provides a

framework for understanding and addressing health disparities (Marmot & Wilkinson, 2006). Research has shown that individuals born into low-income environments face significantly higher risks of developing chronic diseases, experiencing mental health challenges, and suffering from premature mortality due to accumulated socio-economic stressors (Frankel et Al., 1999). This perspective has shaped public health policies worldwide, leading to targeted interventions designed to improve healthcare access, enhance early-life health support, and implement poverty reduction strategies.

The integration of the exposome concept into the life course approach has further enriched this model by accounting for the totality of environmental exposures across an individual's lifetime. According to the Springer book on the life course approach, the exposome framework provides a comprehensive understanding of how environmental, social, and biological exposures interact to shape long-term health outcomes (Atella and Piano Mortari, 2025). This research has prompted advancements in medical screening, risk assessment, and precision medicine, allowing healthcare professionals to track individualized exposure histories and tailor medical interventions accordingly. For instance, physicians can now integrate biomarker data, genetic predisposition analyses, and environmental risk profiles to develop personalized preventive strategies, reducing the long-term burden of chronic diseases.

3.2 - The Rise of Lifestyle Medicine and Its Integration into Healthcare Systems

While early epidemiological studies had already recognized the role of behavior in disease prevention, the systematic integration of lifestyle factors into healthcare policies gained momentum in the mid-to-late 20th century. The publication of the Framingham Heart Study in the 1950s and 1960s provided some of the first large-scale empirical evidence linking modifiable lifestyle factors—such as smoking, diet, and physical inactivity—to cardiovascular disease risk (Dawber et Al., 1951). This study was instrumental in demonstrating that lifestyle modifications could reduce disease incidence, thereby laying the groundwork for behavioral interventions in preventive medicine.

The landmark publication of the 1979 U.S. Surgeon General's Report on Health Promotion and Disease Prevention further cemented the role of lifestyle medicine in shaping healthcare systems. This report highlighted that chronic diseases were largely preventable through behavioral interventions, emphasizing the need for health education, nutrition programs, and physical activity promotion (U.S. Department of Health, Education, and Welfare, 1979).

By the 1980s and 1990s, the global burden of disease had shifted dramatically from infectious diseases to non-communicable diseases (NCDs), such as heart disease, diabetes, and obesity. The WHO, in response to this epidemiological transition, launched several international initiatives focused on reducing NCD risk through lifestyle interventions. The Ottawa Charter for Health Promotion (1986) marked a turning point, advocating for health-promoting environments, lifestyle-based interventions, and interdisciplinary healthcare strategies (WHO, 1986).

The increasing recognition of lifestyle-related risk factors also led to the development of multidisciplinary approaches in healthcare, integrating nutritionists, behavioral psychologists, exercise physiologists, and public health specialists into patient management strategies. The introduction of national dietary guidelines, smoking cessation programs, and workplace wellness initiatives in the 1990s and 2000s further reflected this shift.

The integration of lifestyle-related guidelines—spanning physical activity, sleep hygiene, nutrition, smoking cessation, substance use management, and mental health practices—into medical practice

represents a critical yet unevenly progressing aspect of modern clinical care. This process relies on translating public health evidence into actionable frameworks, which are then implemented within routine clinical settings. Historically, research and policymaking efforts have focused on specific domains, achieving success in some areas like smoking cessation and diabetes prevention but facing greater challenges in integrating domains such as sleep and mental health. Examination of this topic demonstrates the significant interplay between epidemiological evidence, policymaking, and implementation science.

The Smoking, Nutrition, Alcohol, and Physical Activity (SNAP) framework, developed in Australia in 2001, exemplifies an early structured attempt to integrate lifestyle factor risk management into general practice (Harris and Powell Davies, 2005). SNAP utilized national policies to promote systemic behavior change, supported by evidence-based guidelines, tools, and workforce capacity-building within general practice settings. However, implementation has been described as fragmented and inconsistent due to barriers such as organizational limitations, insufficient resources, and financial constraints (Harris and Powell Davies (2005), Harris, Amoroso & Laws (2008)). For example, while SNAP facilitated the rollout of programs like the Lifescripts initiative and the 45- to 49-year health checks, structured integration across practices remained incomplete, particularly in terms of broader team-based approaches and referral networks (Harris, Amoroso & Laws (2008)). This reflective exploration of SNAP highlights not only its historical significance in the policy-to-practice continuum but also the persistent challenges of scaling prevention-oriented healthcare interventions.

Among the most systematically integrated domains is smoking cessation, which achieved early widespread clinical incorporation following foundational public health milestones such as the 1964 Surgeon General's report and subsequent evidence linking smoking to increased morbidity and mortality. Primary care adoption of smoking cessation strategies was accelerated by the introduction of clinician-focused frameworks such as the "5 A's" method introduced in the mid-2000s (Harris and Powell Davies (2005), Calnan and Williams (1993)). Similarly, coronary heart disease (CHD) prevention efforts in the 1990s emphasized opportunistic general practitioner (GP)-driven integration of smoking cessation and hypertension screening into clinical practice, though systematic approaches remained limited during this period (Calnan and Williams, 1993). As adoption advanced, smoking cessation served as a model for lifestyle-based guideline translation, combining pharmacological interventions with standardized counseling (Harris and Powell Davies (2005), Calnan and Williams (1993)).

Physical activity represents another domain where evidence has gradually transitioned into clinical guidelines and implementation efforts. The SNAP framework prioritized physical activity promotion alongside other behavioral risks (Harris and Powell Davies, 2005), while targeted programs like the Physical Activity Clinical Champion (PACC) program in England focused on engaging healthcare professionals to promote physical activity as a key component of chronic disease prevention (Eastwood, et Al. (2023)). Global frameworks such as the U.S. Preventive Services Task Force (USPSTF) recommendations (2017) reinforced the growing emphasis on behavioral counseling for diet and physical activity to reduce cardiovascular risk, yet implementation across primary care remains uneven due to systemic barriers and varying levels of provider engagement (US Preventive Services Task Force, 2017). Despite robust evidence confirming the preventative benefits of physical activity, real-world integration of these guidelines into clinical practice continues to face structural and behavioral challenges (Eastwood, et Al. (2023), Dunn (2009)).

Diabetes prevention has been another exemplary area for transitioning evidence into action, underscored by the efforts surrounding the Diabetes Prevention Program (DPP). Starting in the 1990s, structured programs like the DPP moved from controlled trials demonstrating the efficacy of lifestyle change in preventing diabetes onset to scaled interventions in healthcare and community settings by the mid-2010s (Venditti (2017)). These programs provided models for integrating behavior modification, such as improvements in diet and physical activity, into routine care, reflecting a deeply translational approach. However, scaling and adapting these interventions across diverse populations and settings—such as Hispanic/Latino communities—continue to present logistical and funding challenges (Venditti (2017)).

By contrast, nutrition and sleep show much slower adoption into clinical workflows. Despite the presence of the *Dietary Guidelines for Americans* since the mid-20th century, practical application of nutritional counseling in primary care remains inconsistent. Low rates of dietary assessment by general practitioners—only 22% report routinely assessing diet, compared to 56% assessing smoking—highlight this gap (Denney-Wilson, et Al. (2010), Mosher, et Al. (2016)). Similarly, the integration of sleep health into clinical practice is relatively underexplored, though growing evidence links sleep disturbances to chronic disease risk, such as cardiovascular and metabolic conditions (Harris and Powell Davies (2005)).

Emerging areas of integration include mental health, where recent frameworks, such as the Royal Australian and New Zealand College of Psychiatrists' 2020 guidelines, represent a shift toward embedding lifestyle interventions—such as dietary, physical activity, and sleep recommendations—into care for mood disorders (Opie, et Al. (2021)). While still at an early stage, this represents an effort to systematically apply chronic disease prevention models, like those developed for diabetes, to psychiatric care. This domain remains a challenge, with substantial work required to address barriers like stakeholder alignment and workforce capacity (Opie, et Al. (2021)). Furthermore, the complexity of implementing multi-domain approaches, such as combining physical activity, sleep, and dietary interventions, underscores systemic gaps in interdisciplinary collaboration across medical specialties.

Across all lifestyle domains, common barriers hinder guideline implementation in clinical workflows. Systemic challenges include limited time, uneven provider training, and gaps in referral pathways (Harris and Powell Davies (2005), Harris, Amoroso & Laws (2008), Denney-Wilson, et Al. (2010).). Moreover, while frameworks like SNAP, DPP, and USPSTF recommendations provide valuable policy-driven blueprints, real-world scalability is constrained by underfunded prevention activities, competing clinical priorities, and inconsistent incorporation into reimbursement systems (Harris and Powell Davies (2005), Venditti (2017)). Efforts like the PACC program and diabetes-focused initiatives highlight the potential for structured capacity-building and stakeholder engagement to address these challenges (Harris, Amoroso & Laws (2008), Eastwood, et Al. (2023), Venditti (2017)).

3.3 - Integration of Preventive and Personalized Healthcare

One of the defining changes brought about by the life-course approach is the integration of preventive care and personalized medicine into healthcare systems. Traditionally, medical interventions were largely focused on curing existing diseases, but with growing evidence that early-life exposures shape long-term health trajectories, healthcare policies now emphasize early intervention and prevention (Barker, 1998). For instance, the adoption of screening programs for metabolic diseases in infants, prenatal care initiatives, and school-based nutrition programs illustrates how early-life interventions can shape long-term health outcomes. By embedding these preventive measures into healthcare systems,

the complexity of monitoring, coordinating, and implementing longitudinal healthcare strategies has increased significantly. Similarly, personalized medicine has emerged as a crucial component of modern healthcare, leveraging genomics, exposome research, and AI-driven diagnostics to tailor treatments to individuals based on their lifetime health trajectories. These advancements require healthcare systems to manage vast amounts of longitudinal data, integrate multidisciplinary expertise, and ensure equitable access to precision medicine technologies—all of which contribute to system complexity (Atella and Piano Mortari, 2025).

3.4 - A Shift from Reactive to Preventive Models

As said before, advancements in precision medicine, digital health, and the recognition of lifestyle and environmental factors have led to a shift toward preventive, personalized, and patient-centered care leading to profound changes in the way patients are managed. Previously, healthcare systems were predominantly structured around curative models, emphasizing hospital-based treatment and acute care services. However, the adoption of preventive care and early-life interventions has necessitated a transformation toward community-based, integrated healthcare networks (Marmot & Wilkinson, 2006).

One of the most significant structural shifts has been the development of primary care models that emphasize prevention and long-term patient engagement. Many countries have adopted chronic disease management programs, where patients with conditions such as hypertension, diabetes, and cardiovascular disease receive comprehensive lifestyle intervention plans alongside pharmacological treatments (Topol, 2019). The emergence of electronic health records (EHRs) and big data analytics has further facilitated the longitudinal tracking of patient health behaviors, allowing physicians to monitor lifestyle changes, detect early disease risk, and personalize medical recommendations (Atella and Piano Mortari, 2025). Telemedicine, wearable technology, and AI-driven health monitoring tools have played an increasingly prominent role in preventive healthcare, enabling real-time tracking of physical activity, sleep patterns, and dietary habits. However, the large-scale integration of these approaches into European healthcare systems remains a complex challenge, requiring structural reforms in policy, workforce training, financial incentives, and care delivery models.

The literature on healthcare reform and preventive medicine in Europe highlights various efforts to strengthen primary healthcare (PHC) as a mechanism for patient-centered and prevention-oriented care. Some studies explicitly document the integration of lifestyle medicine into healthcare structures, while others focus more broadly on systemic transformations that create enabling conditions for prevention-focused models. For instance, Kalediene and Vaiciunas (2023) provides a direct example of structural integration by analyzing Lithuania's policy mandating the inclusion of lifestyle medicine professionals within primary care teams. This directive represents one of the most concrete policy-driven adoptions of lifestyle medicine in Europe, offering insights into regulatory changes, workforce adaptation, and health system restructuring.

Other studies explore structural shifts in European healthcare systems that, while not explicitly tied to life cycle or lifestyle medicine, align with key principles of prevention and patient-centered care. Several papers examine primary healthcare reform as a foundation for preventive care, including case studies from Estonia, Poland, Slovenia, and broader European trends (Van Ginneken and Polin (2022), Polin and Quentin (2022), Polin, Scarpetti et Al. (2022)). These studies document efforts to enhance multidisciplinary care, strengthen prevention programs, and improve care coordination, all of which can support life cycle and lifestyle medicine integration. Additionally, systematic barriers and enablers for

reform—such as funding misalignment, workforce shortages, and governance challenges—are extensively discussed in Polin and Quentin (2022), De Schutter et Al., (2023) and Knai et Al. (2014), shedding light on the structural constraints that must be addressed to facilitate long-term, prevention-oriented care models.

Despite these advances, explicit discussions of life cycle and lifestyle medicine remain limited outside of Lithuania's example (Kalediene and Vaiciunas, 2023). The broader landscape of European healthcare reform primarily revolves around health system strengthening for chronic disease prevention, with frameworks such as care coordination, multimorbidity management, and integrated PHC models being dominant themes (Nagyova-Rajnicova and Bowman-Busato (2013), Goodwin and Ferrer (2013)). While these studies provide valuable insights into European trends toward patient-centered care, they seldom engage in direct discussions on formalizing life cycle or lifestyle medicine strategies at a national or regional level.

In summary, the literature reveals a growing movement towards preventive and patient-centered care in European healthcare reforms, with PHC playing a central role. However, while structural changes conducive to life cycle and lifestyle medicine are taking shape, only limited examples exist of their direct implementation (Kalediene and Vaiciunas, 2023). Further research is needed to bridge this gap, exploring policy frameworks, financial models, and workforce adaptations that can facilitate the seamless integration of these paradigms across diverse European healthcare contexts.

4. The Evolution of Healthcare Needs in Italy

Since the origin of the SSN in 1978, healthcare needs in Italy have undergone a profound transformation, shaped by significant demographic, epidemiological, and technological shifts. One of the most salient changes has been the marked aging of the population and Italy now ranks among the countries with the highest proportion of elderly citizens worldwide, with over 23% of its population aged 65 and older, a figure projected to rise further in the coming decades (ISTAT, 2023). This transition has a long story. According to the United Nations estimates, in 1950 children and adolescents aged 0 to 19 made up 35.4 percent of the Italian population, whereas today they account for only 17.5 percent. The sharpest decline occurred between 1980 and 1995, when the under-19 population fell from 30 to 21 percent. People aged 20 to 39 have also declined, from 35 percent of the population to 21 percent, with a marked drop beginning in 1995. The 40–59 age group represented 22 percent of the population in 1950 and now accounts for 31 percent, with a nearly constant increase over time. Turning to the older age groups, individuals aged 60 to 79 made up less than 23 percent in 1950 and now represent about 31 percent, showing a continuous rise. Similarly, those over 80, who were around 1 percent of the population seventy years ago, now constitute approximately 7.5 percent.

More interestingly, as highlighted by ISTAT (2024), demographic changes have accelerated markedly since 2000, driven by a complex mix of socio-economic, technological, and cultural factors. Previously stable trends like birth and death rates have experienced significant shifts. The decline in birth rates, partly due to fewer potential parents after decades of fertility decline, illustrates this. The COVID-19 pandemic's impact on mortality, particularly among the elderly, further emphasizes the rapid pace of demographic transformation. The effects of population aging are now unmistakable. Between January 1, 2004, and January 1, 2024, the average age in Italy increased from 42.3 to 46.6 years. The old-age index—defined as the ratio of the elderly (aged 65 and over) to the young (aged 0–14)—has reached

199.8%, an increase of more than 64 percentage points over the past two decades. Meanwhile, the adult and youth population (aged 16–64) has declined by nearly 2 million individuals: as of January 1, 2024, there were 36.87 million residents in this age group, representing 62.5% of the total population—a 2.5% decrease compared to 2004. Children and adolescents (0–15 years old) now number 7.77 million (13.2% of the population), nearly 1 million fewer than in 2004. Conversely, the population aged 65 and older has grown by more than 3 million people, reaching 14.36 million in 2024 (24.3% of the population), an increase of 5.1 percentage points over 20 years. More than half of this group is now aged 75 and over, accounting for 7.44 million individuals, or 12.6% of the total population—a 3.8 percentage point rise since 2004.

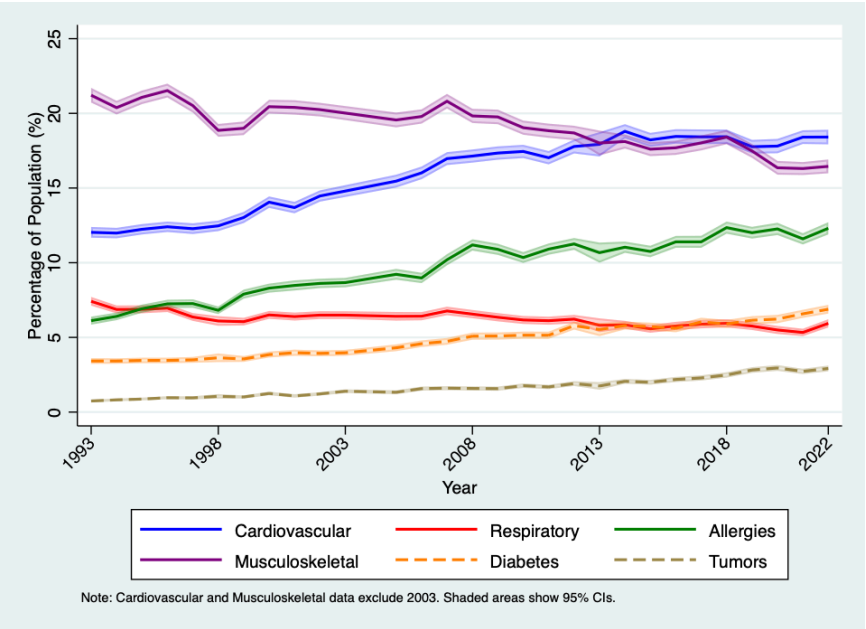
This demographic transition is accompanied by an epidemiological shift from acute infectious diseases to chronic, non-communicable diseases (NCDs) such as cardiovascular illnesses, diabetes, neurodegenerative disorders, and cancer, which now account for approximately 80% of total mortality (OECD, 2021). The burden of chronic diseases has intensified significantly. According to the *Health Search–CSD Foundation Report 2023*, approximately 40% of the adult Italian population is affected by at least one chronic condition, and nearly 20% suffer from multiple chronic diseases (multimorbidity). Hypertension, type 2 diabetes, chronic obstructive pulmonary disease (COPD), and ischemic heart disease represent the most prevalent conditions recorded in general practice databases (Health Search, 2023). Particularly concerning is the increasing trend in multimorbidity, especially among individuals aged 65 and older, but increasingly visible even in younger populations due to the rise of lifestyle-related risk factors such as obesity, sedentary behavior, and smoking. The report also highlights a persistent underdiagnosis of some chronic conditions, such as early-stage kidney disease and mild cognitive impairment, suggesting that the real burden might be even greater than currently estimated. These trends not only increase the complexity of clinical management but also escalate the demand for continuous care, integrated service delivery, and personalized interventions.

Another interesting set of evidence to understand the demographic and epidemiological evolution of the Italian population over a longer period (1993-2022) is the one provided by the ISTAT's Multiscopo surveys (see Figure 2).[4] The analysis of chronic disease prevalence reveals a general upward trend for several major conditions. Cardiovascular diseases, already a leading cause of death (Ojeda-Granados et Al., 2024), have shown a clear upward trend. Cardiovascular diseases increased steadily from the mid-1990s until around 2010, after which they stabilized at a higher prevalence level, indicating a long-term rise. Allergies show a particularly pronounced increase, nearly doubling from approximately 6% in the early 1990s to 12% by 2022, suggesting heightened incidence or improved recognition over time. This increase may be linked to environmental changes, lifestyle factors, and improved diagnostic

[4] The *Indagini Multiscopo dell'ISTAT* ("Multipurpose Surveys") are nationwide, cross-sectional household surveys first launched in 1993. Conducted every year on a sample of approximately 20,000 households, they combine a core set of questions with rotating modules on topics including health status, living conditions, employment, and social participation. Their broad scope and consistent methodology make them a cornerstone for monitoring long-term trends in demography, health, and socio-economic conditions across Italy's regions. Results from these surveys inform both national and regional policymaking, guiding interventions in public health, social services, and labor market programs. In 2004 the survey has not been conducted. However, it is worth mentioning that these prevalence estimates are based on self-reported data, which may be subject to reporting biases such as underreporting or misclassification. As a result, they may not align with patterns observed in clinically recorded datasets such as Health Search, which rely on general practitioners' diagnostic records and may capture different aspects of disease burden.

practices (Nocerino et Al., 2024). Diabetes also displays a sustained upward trajectory, rising from around 2.5% to nearly 6% across the three decades. Tumors, while remaining the least prevalent condition among those examined, increased gradually from under 2% to around 3%, reflecting a slow but consistent growth. Overall, these diseases have exhibited persistent growth in prevalence, underscoring shifts in public health patterns and possibly changes in diagnostic practices, environmental exposures, or demographic dynamics. These patterns align well with the broader epidemiological transition toward chronic conditions.

Figure 2 – Trends in Chronic Disease Prevalence in Italy (1993-2022)



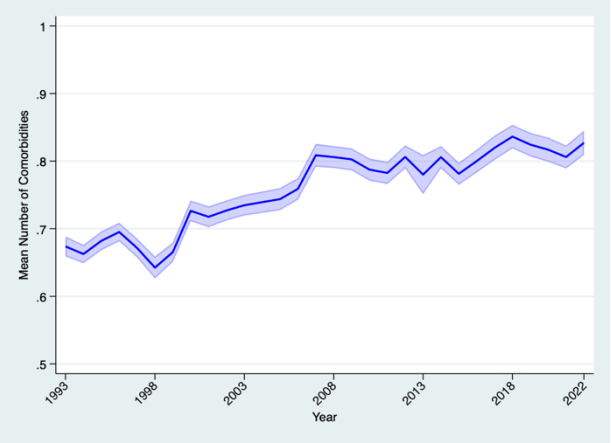
Source: Indagine multiscopo AVS, ISTAT, various years.

In contrast, respiratory diseases maintained a relatively stable prevalence throughout the period, fluctuating only slightly around 5–6%, suggesting a slight declined over time, possibly reflecting improvements in air quality and work safety measures such as the banning of asbestos in 1992 (Ferrante, 2024). Musculoskeletal disorders, despite being the most prevalent condition across the timeframe, show a decline beginning around 2010, following a period of relative stability. Since the survey only asks about "arthrosis/arthritis" and "osteoporosis", it may underestimate the full burden (e.g., back pain, tendinitis). The observed decline may reflect better prevention and management—expanded physical therapy, improved treatments, minimally invasive surgeries—and stricter ergonomic and workplace regulations.

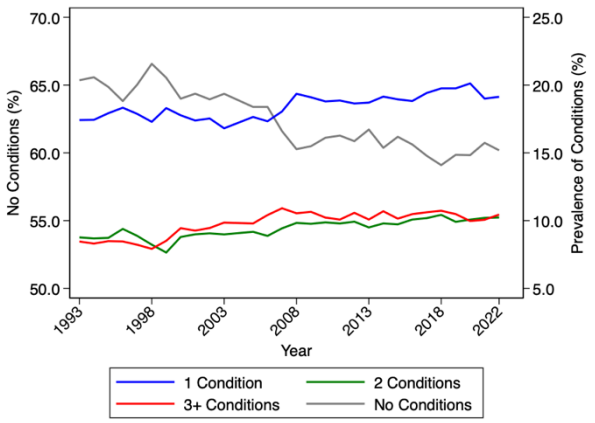
The data collectively indicate a growing burden of chronic diseases within the population, characterized by an increasing number of individuals affected by multiple coexisting conditions, a phenomenon widely recognized as multimorbidity. This escalation is emblematic of deeper demographic and epidemiological shifts, notably population aging and increased life expectancy, compounded by the sustained prevalence of modifiable risk factors such as sedentary lifestyles, suboptimal nutrition, and environmental hazards. These factors jointly contribute to the complex health challenges confronting contemporary societies.

Figure 3 - Average Number and prevalence of comorbidities in the adult population (≥18 years).

Panel (a)



Panel (b)



Source: Indagine multiscopo AVS, ISTAT, various years.

Empirically, this pattern can be seen using data derived from ISTAT's Multiscopo surveys. Figure 3 Panel (a) illustrates the trajectory of the average number of chronic diseases reported among the Italian population over the past three decades. Specifically, the mean number of chronic conditions per individual has risen from under 0.7 in 1993 to exceed 0.8 by 2023, signaling a measurable increase in disease burden at the population level. Furthermore, Panel (b) delineates the prevalence trends of individuals experiencing one, two, and three or more chronic conditions. To enhance interpretability, this panel employs a dual-axis format: the left vertical axis represents the proportion of individuals without any chronic condition, while the right vertical axis captures the prevalence of those with one or more chronic diseases. Over the analyzed period, the proportion of individuals free of chronic conditions has declined markedly from 66.6% in 1993 to approximately 58.5% in 2022, implying that a growing segment of the Italian population contends with at least one chronic illness. Concurrently, the prevalence of individuals with a single chronic condition has increased, from 17.1% in 1993 to 19.5% in 2022. More striking are the rises observed among those with multimorbidity: prevalence of individuals with two chronic diseases has more than doubled, from 8.3% to 10.8%, while those with three or more conditions have increased from 4.2% to 5.7%. These trends underscore the intensifying complexity of health care needs and highlight the imperative for targeted public health interventions and resource allocation strategies aimed at managing multimorbidity effectively.

These findings align with the results reported by Atella et Al. (2019), who documented an increasing trend in the prevalence of major chronic diseases between 2005 and 2014. Specifically, their analysis revealed that the prevalence of chronic conditions such as dyslipidemia, vascular disease, acute ischemia, and arthritis more than doubled across the study population. Concurrently, the proportion of individuals reporting no chronic pathologies decreased from 25.8% in 2005 to 23.5% in 2014. While the proportion of patients reporting a single chronic disease remained relatively stable, the proportion exhibiting two or more comorbidities demonstrated a marked increase, rising from 20.2% in 2005 to 28% in 2014.

These numbers are also in line with evidence from epidemiological studies, administrative databases, and national health surveys that underscores the growing burden of chronic illness across the population. Gini et Al. (2013), analyzing chronic disease prevalence in the context of the VALORE project, compared estimates from Italian administrative health databases with data from general practice and national surveys. They found increasing prevalence rates for a wide array of chronic conditions—including diabetes, ischemic heart disease, heart failure, and chronic obstructive pulmonary disease (COPD). The study also revealed systematic underreporting in administrative datasets compared to general practice records, with diabetes prevalence estimates ranging from 6.1% to 8.8%, and higher rates observed in the latter. This suggests that the true burden of chronic illness may be significantly underestimated by current surveillance systems.

Environmental factors have also played a significant role in shaping chronic disease trends. Conti et Al. (2023), in an analysis based on the Global Burden of Disease Study, investigated the health impacts of air pollution in Italy between 1990 and 2019. Although age-standardized mortality rates for pollution-related diseases have declined, the absolute number of cases has risen due to population aging, which increases susceptibility to cardiovascular and respiratory conditions. This reinforces the notion that demographic change, rather than improvements in environmental quality alone, is driving the growing chronic disease burden.

Complementing these findings, the Italian National Institute of Statistics (ISTAT) has reported a consistent rise in the proportion of older adults living with multiple chronic conditions. According to ISTAT (2020), the share of individuals aged 65 and over with at least one chronic disease has grown steadily, highlighting the increased demand for long-term care, specialized services, and integrated care models capable of addressing the complexities of multimorbidity in older populations.

Simultaneously, remarkable advances in medical science and technology have expanded therapeutic and diagnostic opportunities. Innovations in genomics, imaging technologies, remote monitoring, and personalized medicine have broadened the spectrum of possible interventions, offering more precise and individualized treatments (Collins & Varmus, 2015). However, these advances come with the dual challenge of managing higher care complexity and sustaining affordability.

Understanding these intertwined trends is essential for anticipating future pressures on the Italian SSN and for designing reforms that can sustain its founding principles of universality, equity, and solidarity. Without strategic adaptation, the SSN risks facing growing mismatches between the healthcare services it provides and the evolving needs of its population. Future healthcare models must shift focus from disease-centered acute care to integrated, preventive, and chronic care management frameworks (Kruk et Al., 2018). Furthermore, investments in digital health solutions, strengthening of primary care networks, and the expansion of long-term care services will be critical to ensuring system sustainability.

Speculating forward, failure to adequately address the chronic disease burden could not only erode health outcomes but also exacerbate regional disparities, increase economic strain on families and the state, and diminish public satisfaction with the healthcare system. Conversely, reforms informed by a clear understanding of these trends offer an opportunity to build a healthcare system that is more resilient, efficient, and responsive to the needs of future generations.

5. The Transformation of Healthcare Systems into Complex Systems

As already mentioned in the introduction, the effectiveness of national healthcare systems in delivering services and improving population health is determined by the interplay of two key forces. Policy frameworks, established by governments and regulatory bodies, shape the financing, organization, and management of these systems. Simultaneously, scientific and technological advancements in medicine are continuously introducing new treatments, pharmaceuticals, medical technologies, and care processes. While policymakers strive to create stable, efficient, and equitable systems, the medical field is constantly evolving through scientific discovery and technological innovation. This interaction between the institutional structures that govern healthcare and the scientific advancements that define medical practice is inherently dynamic.

A critical challenge arises when these two forces do not evolve at the same pace. Historically, medical progress tends to advance more rapidly than the capacity of healthcare systems to adapt.[5] This discrepancy can lead to gaps between what is scientifically possible and what is institutionally feasible, resulting in inefficiencies, rising costs, and disparities in access to care. Over the past four decades, the external conditions surrounding national healthcare systems have undergone profound transformations.

Originally designed in a historical context characterized by relatively stable demographic trends, predictable epidemiological patterns, and modest technological innovation, many healthcare systems operated under linear models of service delivery. However, the dramatic shifts brought about by rapid population aging, the rise of chronic and multifactorial diseases, technological revolutions in diagnostics and treatment, and growing economic pressures have rendered these traditional structures increasingly inadequate. Healthcare systems have evolved from relatively linear organizations into complex, dynamic ecosystems that interact with broader social, technological, and environmental forces. In this new landscape, simple, top-down management approaches are no longer sufficient. It has become increasingly clear that substantial reform discussions must be initiated to redesign healthcare delivery mechanisms capable of navigating the complexities of contemporary health needs. In the next section, we will explore in greater detail how this transformation from linear to complex systems challenges traditional governance models and demands a new approach to healthcare system design.

Historically, healthcare systems have been viewed as linear, hierarchical structures, much like mechanistic systems. These systems were believed to operate through specific cause-and-effect relationships. However, continuous technological and organizational advancements have significantly enhanced the quality of patient care, prompting a shift from this "mechanistic" perspective. In recent years, a new approach has emerged in scientific literature, framing healthcare activities within the context of complex systems theory. Here, "complexity" is often vaguely defined, encompassing meanings that range from "not simple" to "complicated" to "intractable" (Kannampallil et Al., 2011).

This evolving perspective views healthcare systems as complex entities governed by non-linear interactions, self-organization, and emergent phenomena. They serve as prime examples of human organizations that integrate diverse professional and disciplinary traits in high-stakes environments. Simon (1962, 1973) defines complexity in terms of the interrelations among a system's components, with complexity increasing as the number of components and their interactions grow. While a system

[5] More information is provided in the Atella and Chiari (2025) in this special issue.

may be deemed "complicated" due to its sheer number of components, it becomes "complex" through the intricate and unique relationships among those components. [6]

One key consequence of this complexity is "computational difficulty" or "computability." This refers to the cognitive, computational, temporal, or physical resources required to navigate and operate within these systems. For external observers, understanding complex systems is challenging due to the intricate interplay of their components. Unfortunately, this complexity can lead to the oversight of important aspects, posing risks to end-users.

Several factors have contributed to the increasing complexity of healthcare systems, notably technological innovations and the digital revolution, which have added numerous components and interrelations. Once a critical threshold is reached, the complexity tends to sustain itself, drawing in new actors, sectors, and disciplines. According to Toth (2010), healthcare systems have undergone three distinct phases over the past 40 years, each prompting a reevaluation of their structure and objectives.

The first phase began in the 1980s, driven by liberal cultural values and a belief in the market's ability to foster economic development. This led to transformations involving the separation of service purchase and provision and competition among various entities. The 1990s marked the second phase, emphasizing integration and regulation. The excesses of competition were balanced by regulatory measures, highlighting the need to explore other paths that address the unique nature of healthcare systems. Finally, the early 2000s ushered in a third phase prioritizing service quality and patient rights. During this period, as Vrooman (2013) notes, external factors to healthcare systems were increasingly examined as determinants in designing welfare policies.

Among policymakers, there's now a growing belief that a population's health is influenced by multiple factors, including a country's financial conditions, individual and family income levels, genetics, diet, education, lifestyles, and the socio-demographic and environmental characteristics of each region, as well as the resources and programs devoted to healthcare. This perspective suggests that health outcomes result from the interaction of these diverse elements, leading to phenomena that are often unexpected and difficult to comprehend through a reductionist lens focused on typical categories.

This shift in perspective means that the boundaries of healthcare systems are no longer externally defined by policymakers. Instead, they become endogenous, linked to the socio-economic structure of countries, political systems, cultural influences on social actors (such as professionals, citizens, and decision-makers), and the characteristics and strategies of the third sector and profit-driven enterprises. This transition also sets the stage for moving the center of the care process from hospitals to the community, which goes beyond merely consolidating community-based activities.

As Bertin (2014) points out, shifting towards community care adds complexity to healthcare systems due to the new relationships formed between doctors and patients, among various professionals, and between healthcare workers and community actors. Including the community within healthcare systems broadens the scope of action, introducing new challenges that weren't previously present. The community itself is an open system, shaped by the social dynamics of local contexts. Bertin (2014) notes that the complexity of factors influencing demand for health and social services often relates to social distress conditions that don't fit neatly into traditional medical frameworks.

[6] This interrelation among components of complex systems manifests as properties or characteristics of the system, such as non-decomposition and emergence, non-linear behavior, and, in some cases, self-organization. See Rittel (1973) and Simon (1962, 1973) for more information on these concepts.

This multidimensional approach involves various actors, many operating outside of traditional healthcare systems, yet working within the same field. Their interactions don't follow a hierarchical structure but develop through a network logic characterized by complexity and territorial openness. In this setting, roles and power dynamics become more flexible, shaped by material and symbolic exchanges. Consequently, the political dimension and the role of local authorities gain importance in strategic and operational decisions, influencing service management and the configuration of the territorial system. Thus, the healthcare system emerges as a complex adaptive system, continuously evolving and adapting based on experiences, communication, information, and environmental influences.

The gradual nature of many changes in healthcare systems often obscures structural breaks that could signal the need for new paradigms. These changes impose various costs, not always monetary, but often related to shifts in positional rents—which many stakeholders try to avoid. This combination of factors has led to the persistent perception of healthcare systems as linear hierarchical structures, where mechanical approaches can result in unintended consequences. While the output of a mechanical system can be controlled by adjusting its parts, a complex system behaves variably depending on initial conditions and feedback.

Modern healthcare systems are evolving into increasingly complex structures across all levels and care disciplines. For instance, just a decade ago, a family doctor or hospital specialist operated in an environment where clinical problems could largely be addressed with university-acquired knowledge and skills. Today, such a paradigm is outdated, and policymakers must plan for highly complex scenarios. The emerging realization is the "complexity of complexity," where healthcare systems are interconnected with other complex systems, and their problems and solutions are intertwined. This evolving "hyper-structure" leads us to consider the existence of an "ecosystem" where different complex systems coexist and interact through various "platforms" that form relationships between different "agents". A platform is a network of relationships through which various actors are connected and contribute, both directly and indirectly, to the delivery of products and services within the healthcare system. Therefore, to fully understand the functioning of the complex healthcare system, it is necessary to grasp both the structure of the Ecosystem (namely, the actors and stakeholders involved) and the mechanisms through which the different service platforms offered by the healthcare system integrate these actors. This is crucial as different healthcare service platforms engage different sets of actors within the Ecosystem.

A concrete example that helps illustrate this concept is the prevention platform, where multiple complex systems interact (healthcare, communication, education, the food and tobacco industries, the fitness industry, scientific societies, regulatory authorities, institutions, and policymakers), involving a wide array of agents. Consider, for instance, the work of scientific societies in defining and implementing a prevention campaign, the communication activities necessary to make the campaign effective, the educational efforts within schools to instill key prevention concepts, the role of regulatory bodies in facilitating or encouraging specific behaviors (such as the classic case of smoking bans in public spaces), and the responsibilities of food and tobacco companies to increase transparency regarding product ingredients and their health impacts (e.g., clearly displaying nutritional information on food products). Lastly, the organizational role of the healthcare system itself is critical in implementing preventive activities. A recent example of a platform involving multiple complex

systems—with outcomes that would have been difficult to predict just a few years ago—is the case of mandatory vaccination campaigns.

This new organizational perspective allows for imagining relationships or plans that were previously kept separate. It redefines the healthcare system as a dynamic structure, not merely a sum of its parts.

6. The Need for Structural Reform in a System Lagging Behind Medical, Technological, and Socioeconomic Changes

Advances in medical treatments, digital health solutions, and personalized medicine have reshaped healthcare capabilities, while an aging population and rising healthcare costs have placed increasing strain on public resources. However, the institutional reforms introduced over the decades have failed to adequately incorporate these external forces, either by neglecting their impact entirely or by implementing changes too late. As a result, the Italian healthcare system remains structurally misaligned with modern healthcare demands, leading to inefficiencies, regional disparities, and growing concerns about long-term sustainability. Many policy interventions have either ignored the impact of technological and scientific progress or have been introduced with significant delays, making them ineffective in addressing evolving patient needs (Ferré et Al., 2014). While robotic surgery, AI-based diagnostics, and digital health platforms have become standard in many advanced healthcare systems, Italy has struggled to implement these tools on a system-wide scale due to bureaucratic inertia, funding constraints, and regional disparities. Additionally, the adoption of telemedicine and remote monitoring, which could greatly improve access to care—especially in underserved areas—has been slow and inconsistent across regions (Ministero della Salute, 2021a,b).

Furthermore, economic and demographic pressures have intensified, yet the Italian NHS remains underfunded and understaffed, particularly in primary and elderly care. Italy has one of the oldest populations in Europe, with increasing demand for chronic disease management, home-based care, and geriatric services. However, the healthcare system has remained largely focused on hospital-based care, failing to adequately expand community and primary care networks to meet the growing burden of aging-related conditions (Ferré et Al., 2014).

Financial constraints have also contributed to the system's inefficiencies. The economic crises of the 2000s and austerity measures in the following years led to budget cuts, hiring freezes, and reduced investments in healthcare infrastructure.[7] These financial policies have made it even more difficult to integrate new medical technologies and innovative care models into the public healthcare system, further exacerbating delays in adaptation (De Belvis et Al., 2012).

Given these longstanding challenges, it is becoming increasingly clear that Italy's NHS requires a comprehensive and forward-thinking reform to align with modern healthcare realities. The country must prioritize investment in digital health, workforce expansion, and the integration of new treatment methodologies. Additionally, financing models should be restructured to ensure that innovation in healthcare delivery does not remain concentrated in wealthier regions while leaving others behind. Without such reforms, the Italian healthcare system will continue to struggle with inefficiencies, inequities, and growing financial instability. As healthcare systems worldwide continue to evolve, Italy must take decisive action to modernize its NHS, ensuring that it remains sustainable, equitable, and capable of meeting the health needs of future generations.

[7] See Atella, Cincotti, D'Amico, et Al. (2025) in this special issue.

For many national healthcare systems that were initially designed over 40 years ago, the pace of external changes—demographic shifts, technological progress, economic pressures, and epidemiological transitions—has exceeded the ability of existing structures to adapt. As a result, the time has come to engage in serious discussions about comprehensive healthcare reforms. Governments and policymakers must begin rethinking healthcare financing, service delivery, and workforce planning to ensure that healthcare systems remain responsive, cost-effective, and equitable in the face of rapid medical advancements.

6.1 Key Features of a Future-Ready Healthcare System and Policy Reforms

A sustainable SSN must incorporate self-correcting mechanisms, allowing it to adapt dynamically to rapid changes. To protect population health, future reforms should prioritize *1)* integrative and preventive care models, *2)* adoption of dynamic "self-correction" mechanisms, *3)* widespread adoption of personalized medicine, *4)* robust digital health infrastructures and systematic strengthening of human resources, and *5)* building resilience against future shocks, such as pandemics.

Integrative and preventive care. Encouraging healthy behaviors like nutritious eating, regular exercise, and quitting smoking can prevent these diseases (Diez et Al., 2016). While there are evidence-based programs (EBPPs) to prevent chronic diseases, their real-world application is limited. Community settings such as churches, schools, social services, local institutions, and workplaces are integral to daily life and present opportunities for implementing these preventive programs. By focusing efforts in these areas, we can reach high-risk populations who face barriers to health improvement. Implementation research is vital to understanding how organizational contexts affect the success of these programs. Despite challenges, research shows opportunities for prevention beyond traditional healthcare settings, emphasizing stakeholder involvement, strategic partnerships, and customizing approaches to fit specific organizational needs (Mazzucca et Al., 2021).

In contemporary healthcare, prevention is increasingly recognized as a cornerstone for achieving sustainable health outcomes and improving population well-being. Many of the most prevalent chronic diseases—including cardiovascular diseases, type 2 diabetes, certain cancers, and neurodegenerative conditions—are largely preventable through early interventions targeting modifiable risk factors (Fontana, 2008). Dietary patterns, physical activity, and lifestyle modifications have a critical role in significantly reducing the incidence and progression of these illnesses by influencing metabolic and molecular pathways associated with aging and chronic disease development (Fontana & Partridge, 2015).

Moreover, prevention should be understood within a "life-course" perspective, where health interventions begin early and extend across all stages of life. Preventive strategies must focus not only on individual behavior but also on broader systemic factors such as food systems, urban planning, and public health policies that can facilitate healthy living environments. This comprehensive vision moves beyond reactive models of care toward a proactive approach centered on maintaining physiological function, delaying biological aging, and reducing the cumulative burden of disease. Investing in preventive medicine has the potential to substantially decrease healthcare costs associated with managing chronic diseases, particularly in aging populations. Without a strong emphasis on prevention, healthcare systems risk becoming unsustainable under the growing weight of non-communicable diseases and associated disabilities (Atella et Al., 2019).

Dynamic "self-correction" mechanisms in governance. Future healthcare governance models must embed dynamic "self-correction" mechanisms. Traditional static governance approaches are insufficient to address the complexity and unpredictability of contemporary health challenges. Systems must develop real-time monitoring, feedback loops, and adaptive policymaking tools that allow for rapid adjustment of strategies based on emerging evidence (Frenk et Al., 2010). Embedding self-learning capacities into healthcare governance, akin to the concept of Learning Health Systems (Institute of Medicine, 2013), enables continuous quality improvement, error correction, and innovation adoption without systemic paralysis.

Adoption of personalized and precision medicine. Advances in genomics, proteomics, and data analytics now allow for the tailoring of medical interventions to individual biological profiles, improving effectiveness and minimizing adverse effects (Collins & Varmus, 2015). Personalized medicine transforms healthcare from a reactive, generalized model to one that is predictive, preventive, and precise. Future healthcare systems must integrate omics data with clinical practice, supported by robust ethical frameworks and data governance structures to ensure patient trust and equity in access to these advanced therapies.

Investment in healthcare workforce development and digital infrastructure. The growing complexity of care demands a workforce trained in interdisciplinary skills, including digital health literacy, genomics, and chronic disease management (World Health Organization, 2022). Simultaneously, investments must focus on building digital infrastructures that guarantee data interoperability, cybersecurity, and the seamless integration of telemedicine and artificial intelligence tools (European Commission, 2021). Digital technologies have revolutionized remote healthcare by integrating telemedicine, telehealth, and mobile health, allowing medical services to be delivered across distances without physical visits (Chaturvedi et Al., 2025). The demand for accessible healthcare, especially in underserved areas, is driving growth in remote healthcare solutions. AI has further enhanced virtual healthcare by improving patient engagement, real-time monitoring, and diagnostic accuracy. Key AI applications, like AI-enabled diagnostics, predictive analytics, and teleconsultation platforms, are being evaluated for their ability to overcome traditional remote healthcare limitations (Esteva, et Al., 2019). Without empowering the workforce and upgrading digital capabilities, healthcare systems risk failing to deliver on the promise of innovation.

Strengthening resilience to future health crises. The COVID-19 pandemic has starkly illustrated the vulnerabilities of health systems globally. Building resilience involves reinforcing public health surveillance, ensuring surge capacity in hospitals, securing supply chains, and fostering cross-sectoral collaboration (Kluge et Al., 2020). Resilient systems must be capable of absorbing shocks, maintaining critical functions under stress, and learning from crises to emerge stronger.

Together, these features form the foundation of a healthcare model that is proactive rather than reactive, capable of navigating complexity, technological advancement, and future uncertainties while maintaining a commitment to universal health coverage and equity.

6.2. Policy Recommendations and Reform Priorities for the SSN

Building a resilient, equitable, and sustainable Italian National Health Service (SSN) in the face of evolving demographic, epidemiological, and technological challenges requires a phased and strategic approach to reform. Based on current evidence and international best practices, five major priorities are proposed: (1) workforce development and retention strategies; (2) scaling up preventive health

programs; (3) accelerating the digital transformation of healthcare services; (4) improving citizen engagement and healthcare quality transparency; and (5) revising financing models to ensure sustainable, equitable healthcare funding.

Short-Term Actions (within 3 years). In the immediate term, policy efforts should focus on legal and organizational adjustments necessary to create an enabling environment for broader reform. These include legislative updates to facilitate telemedicine adoption, health data interoperability, and regional harmonization of healthcare quality standards (European Commission, 2023). Pilot programs should be initiated to test integrated care models, particularly for chronic disease management, and to deploy digital health platforms that link primary, secondary, and tertiary care providers. Furthermore, specific measures to address healthcare workforce shortages, such as fast-track hiring and upskilling programs in underserved regions, are urgent to stabilize service delivery (OECD, 2023).

Medium-Term Strategies (within 5–7 years). Over the medium term, reforms must aim at systemic integration. This includes the full operationalization of regional equity plans to reduce disparities in health outcomes and service accessibility between northern and southern regions of Italy (ISTAT, 2023). A national preventive health platform should be developed to scale up screening programs, vaccination coverage, and early detection initiatives, fully integrated into primary care services. Strategic investments in digital infrastructure must move beyond pilots to achieve nationwide interoperability of Electronic Health Records (EHRs) under the European Health Data Space (EHDS) framework, enhancing real-time information sharing and clinical decision support (European Commission, 2022). Finally, it is important to implement "Value-Based Healthcare" models to align incentives with health outcomes rather than service volume (Porter & Teisberg, 2006). Value-based healthcare models prioritize health outcomes over service volume, aligning incentives to enhance societal wellbeing (Smith, 2023). In health systems, societal wellbeing is seen as an aggregate measure of life satisfaction, integrating goals such as health improvement, responsiveness, financial protection, efficiency, and equity. A public economics perspective highlights how key actors—patients, providers, purchasers, and policymakers—contribute to this value at different levels. By shifting from narrow, actor-specific objectives to a holistic approach, value-based models ensure that policy levers align efforts across the system to maximize overall health system value and societal wellbeing.

Long-Term Vision (2030 and beyond). By 2030, the SSN must align itself with European health integration initiatives and embody a healthcare system that is resilient, equitable, and sustainable. This vision requires continuous investment in innovation—from precision medicine to AI-driven diagnostics—alongside sustainable financing models that reward value and outcomes rather than volume (Porter & Lee, 2013). Citizen engagement must evolve into institutionalized participatory governance, where patients contribute systematically to the design and evaluation of services. Preventive health must be deeply embedded across sectors, recognizing the critical interplay between social determinants, health behaviors, and medical care (Kruk et Al., 2018).

Ultimately, achieving a future-proof SSN demands a shift in paradigm: from reactive care to proactive health promotion, from fragmented services to integrated networks, and from short-term fixes to a long-term strategic commitment to public health as a fundamental societal pillar.

7. Conclusion

The Italian National Health Service (SSN) stands at a decisive crossroads. Although it has historically achieved impressive outcomes—particularly in terms of universal access and life expectancy compared to other OECD countries—the cumulative evidence presented in this article demonstrates that the system is increasingly strained by structural inefficiencies, growing inequalities, and changing external pressures. The demographic aging of the population, the rising prevalence of chronic diseases, the acceleration of technological innovation, and citizens' evolving expectations of care collectively challenge the current organization, financing, and governance of the SSN.

What emerges clearly is that the SSN, designed in a markedly different historical context, is no longer fully aligned with Italy's contemporary health needs. Regional disparities, fragmented information systems, insufficient focus on prevention, and workforce shortages exacerbate vulnerabilities and threaten the sustainability of universal coverage. Without bold and coordinated reforms, the risk is a progressive deterioration in access, quality, and equity—core values that have underpinned the SSN since its inception.

The path forward requires an integrated and phased reform strategy. In the short term, legal adjustments, pilots for integrated care, and investments in digital health platforms must lay the foundation for change. In the medium term, systemic reforms are necessary to strengthen regional equity, reinforce preventive services, and embed citizen engagement and transparency into the health system's governance. Long-term efforts must aim to align Italy with broader European initiatives, such as the European Health Data Space, while ensuring a sustainable financing model that supports innovation, value-based care, and the management of chronic conditions.

Beyond technical adjustments, however, what is needed is a cultural shift: from a healthcare model centered predominantly on the treatment of illness to one that prioritizes health promotion, prevention, and active citizenship. This transformation will require not only policy leadership and political will but also broad societal engagement. Italy's future success will depend on its capacity to embrace a vision of health as a shared societal good—one that demands collective responsibility, continuous innovation, and a strong commitment to equity.

Reforming the SSN is not merely a technical or financial necessity; it is a societal imperative. If Italy can mobilize the resources, strategic vision, and institutional coherence required for this transformation, it has the opportunity to secure a resilient, inclusive, and future-ready healthcare system that will serve generations to come. Seizing this moment for decisive reform will not only preserve the SSN's founding values but transform Italy's healthcare into a global benchmark for innovation, solidarity, and sustainability.

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