SUSTAINABILITY OF HEALTHCARE FINANCING IN GREECE

Georgios Mavridoglou[1,*] and Georgios Gourzoulidis[1]
[1]PhD, University of the Peloponnese, School of Management
Correspondence: ge.mavridoglou@go.uop.gr
https://doi.org/10.63356/redete.2025.015

Abstract
The sustainability of healthcare financing in Greece remains a pressing policy issue due to persistent macroeconomic fragilities, demographic ageing, high medical inflation, and one of the highest out-of-pocket (OOP) burdens in the European Union. This study evaluates medium- and long-term sustainability using updated macroeconomic and demographic projections for 2024–2035 and an actuarial modelling framework. Health expenditures are projected on the basis of age-specific spending profiles, population dynamics, and medical inflation, while contribution revenues depend on employment, wages, and stable contribution rates. The analysis employs actuarial balance and solvency ratio indicators to examine baseline and alternative scenarios. Results show that expenditure growth outpaces revenue capacity throughout 2024–2035, widening funding gaps despite moderate labour-market improvements. Long-run indicators confirm that, under realistic assumptions, the solvency ratio remains below the level consistent with full financial balance, signalling structural pressure on the pay-as-you-go health insurance model. Policy implications include adopting an actuarial reserve mechanism, restructuring state funding into direct health-insurance subsidies, introducing complementary insurance to reduce OOP burden, and implementing automatic adjustment rules linked to actuarial indicators.
Keywords: Actuarial Balance; Sustainability; Health Insurance; Solvency Ratio

1. INTRODUCTION

The Greek healthcare system is financed through a mix of state budget transfers and social health insurance contributions. The economic crisis of the 2010s brought severe expenditure cuts, statutory ceilings and strict consolidation rules. While these measures ensured short-term fiscal discipline, they also increased household exposure to healthcare costs, with Greece consistently exhibiting one of the highest OOP shares in the EU.

Macroeconomic conditions remain fragile. GDP recovery is moderate, productivity growth is low, and labour-force participation—especially among older workers and women—lags behind EU benchmarks. These weaknesses directly constrain contribution revenues, the backbone of the social insurance system. At the same time, demographic ageing and medical inflation exert upward pressure on health expenditures, raising concerns about the long-run sustainability of healthcare financing.

This paper combines updated macroeconomic and demographic projections for 2024–2035 with an actuarial sustainability framework to evaluate the financial outlook of the Greek health insurance system and to discuss policy options that could enhance its resilience.

2. BACKGROUND AND THEORETICAL FRAMEWORK

Healthcare systems financed on a pay-as-you-go (PAYG) basis require continuous alignment between revenues and expenditure obligations. In such systems, sustainability depends on demographic structure, labour-force participation, wage dynamics and the rate of medical inflation. Actuarial analysis provides tools to assess whether current financing arrangements are consistent with long-term balance.

Two indicators are central to this assessment. First, the actuarial balance compares the present value of projected revenues (contributions and state transfers) with the present value of projected expenditures over a long evaluation period. A negative actuarial balance indicates structural unsustainability. Second, the solvency ratio relates projected revenues to projected liabilities. Values above one indicate financial adequacy, whereas values below one signify persistent deficits and the need for parametric or structural reform.

Greece also faces challenges related to its public–private mix. The country records one of the highest OOP shares in Europe, reflecting limited financial protection. International experience, for instance from France and Germany, shows that well-designed complementary insurance schemes can absorb a substantial share of private costs while preserving universal access.

3. METHODOLOGY

The methodological framework builds on previous actuarial studies of the Greek health insurance system (Mavridoglou, Polyzos 2022, Mavridoglou Gourzouidis 2025), and extends them by integrating updated macroeconomic and demographic projections. Total health expenditure is projected by combining age-specific expenditure profiles with population forecasts and medical inflation assumptions. Contribution revenues are modelled as a function of employment, wages and stable contribution rates.

To evaluate the financial health of the Greek healthcare system, the study employs two key actuarial indicators. The first is the actuarial balance ($\boldsymbol{AB_{(t)}}$), which

measures the system's ability to cover its expenditures with its revenues on an annual basis. It is defined as:

$$AB_t = \frac{Revenues_t}{Expenditures_t}$$

A value of $AB_t < 1$ indicates an annual deficit that must be covered by other sources, such as increased employees and employers' contributions or extraordinary state subsidies.

The second indicator is the Solvency Ratio (SR), is the basic indicator used to assess the long-term sustainability of the health insurance system over the entire evaluation period. It is defined as the ratio of the present value of projected revenues to the present value of projected expenditure obligations:

$$R = \frac{PV(TotalRevenues)}{PV(TotalExpenditures)} = \frac{\sum_{t=t_0}^{\omega} \frac{Revenues_t}{(1+r)^{t-t_0}}}{\sum_{t=t_0}^{\omega} \frac{Expenditures_t}{(1+r)^{t-t_0}}}$$

where:
t_0 is the base year of the projection (2024),
ω is the final year of the projection horizon (2035),
r is the discount rate used to calculate present values,
Revenews_t includes all contribution inflows and state transfers at time t,
Expenditures_t represents the total projected health spending at time t.

This ratio signifies the overall financial adequacy of the current pay-as-you-go (PAYG) model; a SR significantly below unity indicates structural insolvency and the need for immediate policy intervention.

Furthermore, the Funding Gap (%) represents the residual share of total health expenditure that is not covered by public funding or the current level of private insurance penetration. This indicator highlights the structural deficiency in financial protection and is calculated as:

$$\text{Funding Gap}_t = \frac{\text{Total Exp}_t - (\text{Public Funding}_t + Contributions_t)}{\text{Total Exp}_t}$$

Interpretation of this gap is crucial, as it quantifies the pressure exerted on households to cover healthcare costs through out-of-pocket (OOP) payments, thereby signalling the potential market space for structured complementary insurance pillars.

4. DATA AND ASSUMPTIONS

The projection model is populated with data from national accounts, population forecasts, and official health expenditure statistics. The primary data sources and the rationale behind the key parameters are as follows:

- Demographic Data: Population projections ($Pop_\{a,t\}$) are based on Eurostat's EUROPOP 2024 database, which accounts for fertility, mortality, and migration trends. As shown in Table 1, the total population is expected to decline significantly through 2035.
- Macroeconomic Indicators: GDP per capita and growth projections are derived from Eurostat forecasts and the structural requirements set out in the Memoranda of Economic Cooperation signed by Greece. GDP per capita is projected to rise from €24,752 in 2024 to €29,589 in 2035.
- Health Expenditure Profiles ($C_\{a,t\}$): Due to the absence of detailed national data regarding age-specific healthcare costs in Greece, the spending profiles were calibrated using the EU-average profiles from the 2024 Ageing Report. This proxy approach captures the non-linear increase in costs associated with older age groups.
- Medical Inflation (i_m): The model distinguishes between general and medical inflation. While the general inflation rate is assumed to be 2.0%, medical inflation is set at 2.2%. This differential reflects the impact of technological progress and the increasing intensity of specialised care (Cutler & Sheiner 2020, Dormont et al., 2018).
- Revenue Variables: Contribution revenues are modeled based on employment and wage projections. The statutory contribution rates are kept constant at current levels to test the sustainability of the existing pay-as-you-go (PAYG) framework.

The data in Table 1 illustrates a critical tension: while GDP per capita is projected to grow by approximately 19.5%, the total population is shrinking. This demographic contraction, combined with the rising share of public health expenditure in GDP (from 5.10% to 5.60%), underscores the increasing fiscal pressure on the working-age population to sustain the healthcare system.

Table 1: Population and macroeconomic projections, 2024–2035

Year	Population	GDP per capita (€)	Public health exp. (% of GDP)
2024	10.396.324	24.752,10	5,10%
2025	10.345.636	25.271,89	5,20%
2026	10.292.097	25.827,87	5,25%
2027	10.235.326	26.266,94	5,30%
2028	10.175.942	26.660,94	5,30%
2029	10.117.518	27.060,85	5,40%
2030	10.060.012	27.466,76	5,40%
2031	10.003.413	27.878,76	5,45%
2032	9.947.967	28.296,94	5,45%
2033	9.893.936	28.721,39	5,50%
2034	9.840.676	29.152,21	5,55%
2035	9.788.482	29.589,49	5,60%

5. RESULTS

5.1. Projections of health expenditure and revenues (2024–2035)

Table 2 presents the projections for total, public, and private health expenditure for the period 2024–2035. Total health expenditure is projected to rise steadily, driven by the interaction of demographic ageing and a medical inflation rate of 2.2%. Specifically:

- Total Expenditure: Increases from €19.9 billion in 2024 to €24.1 billion in 2035.
- Public Funding: Follows a flatter trajectory, rising from €13.1 billion to €16.2 billion.
- Private Expenditure: Shows a continuous upward trend, exceeding €7.9 billion by the end of the projection horizon.

Composition: The share of public funding remains constrained, effectively shifting a significant portion of the financial burden to private sources.

Table 2: Projected health expenditure by source, 2024–2035 (euros)

Year	Total expenditure	Public funding	Private expenditure
2024	19.901.128.513	13.123.873.542	6.777.254.972
2025	20.351.924.569	13.595.596.154	6.756.328.415
2026	20.832.951.497	13.955.704.349	6.877.247.148
2027	21.219.325.457	14.249.086.694	6.970.238.763
2028	21.569.200.890	14.378.909.408	7.190.291.482
2029	21.924.178.673	14.784.586.177	7.139.592.496
2030	22.285.211.007	14.921.060.145	7.364.150.862
2031	22.651.758.116	15.199.109.522	7.452.648.595
2032	23.024.102.175	15.341.587.787	7.682.514.387
2033	23.401.971.875	15.629.218.313	7.772.753.562
2034	23.782.958.993	15.921.698.998	7.861.259.995
2035	24.167.680.079	16.219.627.466	7.948.052.613

5.2. Private Expenditure and the Funding Gap

The decomposition of private spending (Table 3) reveals a heavy reliance on out-of-pocket (OOP) payments:

- OOP Payments: Projected to rise from €6.4 billion (2024) to over €7.5 billion (2035).
- Private Insurance: Continues to cover only a minimal share of private spending (approx. 5%), significantly lower than in countries like France.
- Funding Gap: The residual share of expenditures not covered by public resources or existing insurance remains at approximately 8-9%.

- Actuarial Balance: Remains consistently below unity (0.91–0.92), signaling persistent structural pressure on the financing mix.

Table 3: Projected OOP (% and euros) and Actuarial Balance (%) , 2024–2035

Year	Private exp.	Share of total (%)	Private insurance	Out-of-pocket	Funding gap (%)	Actuarial balance (AB)
2024	6.777.254.972	34,10%	338.862.749	6.438.392.223	9,10%	0,91
2025	6.756.328.415	33,20%	337.816.421	6.418.511.994	8,20%	0,92
2026	6.877.247.148	33,00%	343.862.357	6.533.384.790	8,00%	0,92
2027	6.970.238.763	32,80%	348.511.938	6.621.726.825	7,80%	0,92
2028	7.190.291.482	33,30%	359.514.574	6.830.776.908	8,30%	0,92
2029	7.139.592.496	32,60%	356.979.625	6.782.612.871	7,60%	0,92
2030	7.364.150.862	33,00%	368.207.543	6.995.943.319	8,00%	0,92
2031	7.452.648.595	32,90%	372.632.430	7.080.016.165	7,90%	0,92
2032	7.682.514.387	33,40%	384.125.719	7.298.388.668	8,40%	0,92
2033	7.772.753.562	33,20%	388.637.678	7.384.115.884	8,20%	0,92
2034	7.861.259.995	33,10%	393.063.000	7.468.196.995	8,10%	0,92
2035	7.948.052.613	32,90%	397.402.631	7.550.649.982	7,90%	0,92

5.3. Long-Term Sustainability And Scenario Analysis (2020–2050)

To account for macroeconomic and demographic uncertainty beyond the initial projection horizon, the study evaluates the system's sustainability under three distinct scenarios up to 2050. The results demonstrate that the long-term solvency of the Greek healthcare system is highly sensitive to labor market dynamics and GDP growth:

- Baseline Scenario: Under neutral growth assumptions, healthcare expenditures are projected to reach 9.1% of GDP by 2050. The system faces a persistent structural deficit of approximately 1% of GDP, with an average Solvency Ratio of 0.94 over the 2020–2050 period.
- Pessimistic Scenario: Assuming a weaker economic recovery and lower labour participation, expenditures escalate to 9.6% of GDP. The deficit widens to 1.8% of GDP, while the average Solvency Ratio drops to 0.86, indicating severe financial instability.
- Optimistic Scenario: By assuming higher employment rates, especially among women and youth, expenditure is contained at 8.6% of GDP. In this case, the system approaches sustainability with an average Solvency Ratio of 0.997.

The following Table 4 summarizes these long-term findings:

Table 4: Long-term Projections and Scenario Comparison (2050)

Indicator	Pessimistic Scenario	Baseline Scenario	Optimistic Scenario
Total Health Expenditure (% of GDP)	9.6%	9.1%	8.6%
Public Funding (% of Total)	67%	67%	-
Private/OOP Payments (% of Total)	33%	33%	-
System Deficit (% of GDP)	1.8%	1.0%	0.2%
Average Solvency Ratio (2020-2050)	0.86	0.94	0.99

5.4 Evaluation of Funding Reserve Policies

The study compared two alternative strategies for addressing the projected structural deficits and maintaining the solvency of the system:

- Policy 1 (Ad-hoc Funding): This involves the immediate coverage of annual deficits through extra public/private funding or the reduction of health services. This reactive approach lacks predictability and fails to address the underlying structural pressures.
- Policy 2 (Actuarial Reserve): This strategy utilizes a mathematical reserve accumulated by the social health insurance organization (EOPYY) to smooth out financial shocks.

- Key Efficiency Finding: Actuarial modeling reveals that Policy 2 is significantly more efficient; in the neutral scenario, it requires only 11.67% of the liquidity that Policy 1 would demand to cover the same deficits. Even under the pessimistic scenario, the reserve-based policy requires only 72.75% of the funds compared to ad-hoc coverage.

By implementing an actuarial reserve mechanism (Policy 2), the Solvency Ratio in the neutral scenario can be stabilized, moving from 1.26 in 2020 to a sustainable 1.02 in 2050.

6. DISCUSSION

The results confirm persistent structural vulnerabilities in Greece's healthcare financing. Expenditure pressures driven by ageing and medical inflation outpace the system's revenue-generating capacity. Public funding remains constrained, while private expenditure—and especially OOP payments—plays an increasingly important role in maintaining overall spending levels. The actuarial balance indicator suggests that, without significant policy adjustment, the system will continue to rely heavily on private payments, raising concerns about equity and access.

The persistent funding gaps and the high reliance on OOP payments in Greece highlight a structural divergence from other European healthcare models. In countries such as France, the introduction of a structured complementary insurance pillar has successfully absorbed a significant portion of private costs, thereby preserving universal access (Chevreul et al., 2015). Similarly, the Belgian model demonstrates how multilayer financing can stabilize healthcare resources despite demographic pressures (Gerkens & Merkur, 2020). According to OECD (2023) data, these countries maintain some of the lowest OOP burdens globally, contrasting sharply with the Greek trajectory, where the actuarial balance (AB$\backslash approx 0{,}92$) signals a failure of the current single-pillar PAYG model to contain private spending.

6.1. Limitations

Despite the use of robust actuarial tools, this study is subject to certain limitations:

- Proxy Data Utilization: Due to the lack of detailed national age-specific cost data, the study utilizes EU-average profiles from the 2024 Ageing Report. While this is a standard academic practice, it may not fully capture unique local clinical patterns or specific inefficiencies of the Greek system.
- Macroeconomic Uncertainty: The projections rely on growth assumptions from Eurostat and the Memoranda of Economic Cooperation. Unforeseen economic shocks or shifts in fiscal policy could alter the revenue trajectory.
- Medical Inflation Volatility: The assumed differential between general (2.0%) and medical inflation (2.2%) is a conservative estimate; rapid technological breakthroughs could exert higher-than-expected pressure on expenditures.

7. POLICY IMPLICATIONS

The actuarial projections for 2024–2050 indicate that the Greek healthcare system faces a structural financing gap that cannot be addressed solely through ad hoc fiscal measures. The persistent Solvency Ratio below unity (approx. 0.92) and the escalating household burden necessitate a shift towards a more resilient and predictable financing model. Based on the findings, the following policy interventions are proposed:

- Establishment of an Actuarial Reserve Mechanism (Policy 2): The most critical finding of this study is that utilizing a mathematical reserve (accumulated by EOPYY) is significantly more efficient than immediate deficit coverage. In the baseline scenario, Policy 2 requires only 11.67% of the liquidity that would otherwise be needed. This mechanism would act as a financial buffer, smoothing out shocks from demographic ageing and medical inflation.
- Restructuring State Funding: It is proposed to convert a portion of direct state funding into a targeted health insurance subsidy for employees. This would stabilize the revenue base and ensure that public resources are directly linked to the insurance status of the population, enhancing the system's transparency.
- Introduction of a Structured Complementary Insurance Pillar: To bridge the observed 8-9% funding gap and reduce the high out-of-pocket (OOP) payments (projected at over €7.5 billion), Greece should look towards European paradigms such as France and Belgium. A second pillar of complementary insurance could absorb a significant portion of private costs, providing better financial protection for households without undermining the public character of the system.
- Rule-Based Automatic Adjustments: The implementation of automatic adjustment rules, triggered when the Solvency Ratio or Actuarial Balance falls below defined thresholds, would ensure long-term stability. This approach avoids the need for reactive political decisions and provides a predictable environment for both the state and contributors.

In conclusion, the transition from a reactive "pay-as-you-go" approach to a proactive model incorporating an actuarial reserve and complementary insurance is essential to ensure that the Greek healthcare system remains sustainable and equitable in the face of irreversible demographic trends.

8. CONCLUSION

Greece's healthcare financing system faces long-term sustainability challenges. Projections for 2024–2035 show continuing pressure from expenditure growth, while the current public-private mix implies a heavy reliance on OOP payments. Actuarial indicators point to the need for a comprehensive reform that combines the creation of an actuarial reserve, restructuring of state contributions and the introduction of complementary insurance. Such a package would strengthen the resilience of the system and support equitable access to care.

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