
Public Expenditure on the Healthcare Sector in an Ageing Society of the European Union

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Abstract:

Purpose: This research analyses regional differences in public health spending in European Union countries, focusing on the impact of an ageing population. By examining Northern, Southern, Eastern, and Western Europe, it assesses how demographic trends and investments in prevention influence health financing and system efficiency. The main objective is to identify regional inequalities and their implications for EU health policy.

Design/Methodology/Approach: A quantitative approach was applied using data from Eurostat, the World Health Organisation, and the Organisation for Economic Co-operation and Development. Key indicators, including the share of the population aged 65+, per capita health expenditure, and the proportion of preventive care in total spending, were analysed. Descriptive statistics, correlation analysis, and Student's t-test were used to evaluate regional differences and relationships between variables.

Findings: The analysis reveals significant disparities in health spending across EU regions. Northern Europe reports the highest per capita expenditure and the largest share of preventive care, indicating a proactive approach to ageing populations. In contrast, Southern and Eastern Europe face financial constraints and lower investment in prevention, both of which affect system efficiency. Correlation analysis confirms a strong positive relationship between preventive care spending and per capita health expenditure. The Student's t-test results show no statistically significant differences in spending levels between regions, suggesting that EU policies promote financial cohesion in healthcare.

Practical Implications: The study underscores the need to increase investment in preventive care, particularly in underfunded regions, to improve healthcare efficiency. Digital health solutions, including telemedicine, can enhance access to medical services and optimise resource allocation. Additionally, targeted EU financial support and policy adjustments can help mitigate regional disparities in healthcare access.

Originality/Value: This research provides a comparative analysis of health system financing across EU regions in the context of demographic ageing. It highlights the role of preventive healthcare spending in improving system efficiency and offers policy recommendations to reduce regional inequalities. The findings provide practical insights for policymakers seeking to develop more sustainable and equitable health strategies.

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1. Introduction

Ageing populations represent one of the key demographics, social, and economic challenges faced by the European Union (EU) in the 21st century. According to Eurostat data, the share of people aged 65 and older in EU countries is increasing, with significant implications for healthcare systems, social policies, and public finances.

Projections for 2050 indicate that in countries such as Italy, Germany, and Bulgaria, the old-age dependency ratio could exceed 50%. This means that more than half of the working-age population will be required to support older people.

The increase in the number of seniors drives growing demand for healthcare and long-term care, placing a burden on public budgets (Crocker *et al.*, 2024). However, European Union countries differ both demographically and in the level of health expenditures. In Western and Northern Europe, healthcare spending per person often exceeds \$5,000, while in Eastern and Southern Europe, these amounts are significantly lower. This disparity highlights existing inequalities in access to healthcare and the quality of services provided in these regions (Hudák, Varga and Várpalotai, 2015).

This article aims to analyse public healthcare expenditures across European Union countries, accounting for demographic diversity and indicators related to the elderly population. Particular attention is given to identifying differences between EU regions, such as Northern, Southern, Eastern, and Western Europe, as well as to defining the challenges associated with the ageing population processes in individual countries.

This article aims to fill a research gap by comparing public expenditures across countries with varying levels of demographic development. It highlights key relationships between population ageing and healthcare spending levels. The research provides a valuable contribution to the discussion of health policy in ageing societies and offers recommendations for the effective management of public healthcare expenditures in the European Union.

2. Literature Review

Ageing societies pose a key challenge for modern Europe, driving increased demand for medical services, long-term care, and social benefits. Healthcare systems across countries vary significantly. Western and Northern Europe are characterised by higher levels of development and better funding, whereas Eastern and Southern Europe experience significant underfunding of the healthcare sector, resulting in lower service quality and limited access to medical care.

In Northern Europe, including Sweden, Finland, and Denmark, per capita healthcare expenditures are among the highest in the EU, averaging over \$5,500. These substantial financial investments ensure broad access to modern medical technologies and efficient health prevention systems.

In these regions, particular emphasis is placed on early detection of chronic diseases and on preventive measures, which account for 4-5% of total healthcare expenditures. This strategy not only improves the overall health status of the population but also helps reduce long-term treatment costs (Rosenkranz, 2024).

Southern Europe, including Italy, Spain, and Greece, faces diverse challenges. In this region, the ageing population rate is among the highest in the EU, with people aged sixty-five and older comprising over 23% of the population. Although Southern European countries allocate a considerable portion of their GDP to healthcare—on average 8-9%—per capita expenditures are lower compared to Northern regions.

This is due to challenging economic conditions and a higher public debt burden. Moreover, investments in health prevention are typically minimal, often not exceeding 2% of total healthcare expenditures, leading to higher costs of treating chronic diseases and more extended hospital stays (OECD, 2024a).

Countries such as Germany, France, and the Netherlands, which represent Western Europe, serve as role models for their balanced financing of healthcare systems. This region stands out not only for the high quality of its healthcare infrastructure, which is systematically modernised, but also for broad access to medical services.

Average healthcare expenditures in Western Europe range from \$4,500 to \$6,000

per person, enabling the maintenance of high standards of medical care and the implementation of innovations. Additionally, countries in this part of Europe are characterised by greater efficiency in allocating funds among prevention, treatment, and long-term care. This approach contributes to improved health indicators and increased life expectancy (Di Marcantonio *et al.*, 2024).

Eastern Europe, including Poland, Romania, and Bulgaria, faces numerous challenges due to insufficient healthcare funding. Per capita healthcare expenditures in this part of Europe are among the lowest in the European Union, averaging below \$3,000 annually. This situation directly impacts the limited availability of medical services and the reduced quality of healthcare (Piroddi *et al.*, 2024).

Insufficient investments in healthcare infrastructure, especially in rural areas, hinder access to modern treatment and diagnostic methods. Moreover, the low level of spending on health prevention results in a high incidence of chronic diseases, which, in turn, creates additional burdens on healthcare systems in this region (Stylianidis, 2024).

The COVID-19 pandemic highlighted regional differences. Northern and Western European countries were able to respond to the crisis more effectively, thanks to greater availability of protective equipment, higher levels of healthcare funding, and better organisation of care systems (Dantas *et al.*, 2024). In contrast, in Southern and Eastern Europe, the pandemic exposed shortages of medical personnel, outdated infrastructure, and insufficient intensive care resources, contributing to higher mortality rates and longer hospitalisation periods.

Differences in public healthcare expenditures across the regions of the European Union reflect variations in economic development, demographic structure, and the priorities of both health and social policies. Higher levels of investment characterise northern and Western Europe, more efficient healthcare systems, and better health indicators.

In contrast, Southern and Eastern European countries, including Poland, face significant underfunding of healthcare and inequalities in access to medical services (Ptak-Chmielewska, 2015). Such inequality often deepens health disparities between regions within countries. These challenges require the adoption of an integrated EU-level policy to reduce regional disparities and improve the efficiency of healthcare systems.

3. Research Methodology

To analyse variation in public healthcare expenditures in the EU's ageing societies, a quantitative approach supported by statistical tools was employed. The study assesses the impact of demographic processes on the structure of healthcare

expenditures across four regions of Europe: Northern, Southern, Eastern, and Western. The division into regions was based on geographical and economic criteria, as well as demographic and structural differences in healthcare spending.

The data used in the study were sourced from reputable databases, including Eurostat, the World Health Organisation (WHO), and the Organisation for Economic Co-operation and Development (OECD). These sources provide reliable information on demographic and economic indicators in European Union countries. The analysis covered the following indicators:

- The percentage of the population aged sixty-five and older in 2023, along with projections for 2050.
- The demographic dependency ratio, which defines the proportion of individuals in the post-working age to those in the working age.
- Public healthcare expenditures per capita expressed in USD (PPP), allowing for a comparison of spending levels across regions.
- The share of expenditures on health prevention in total healthcare spending, enabling an assessment of commitment to preventive measures.

The summary of source data is presented in Table 1, which outlines the key demographic and economic indicators for the four EU regions.

Table 1. *Summary of Basic Demographic and Economic Indicators in EU Regions.*

Region	The percentage of the population aged 65 and older (% , 2023)	Projected percentage of the population aged 65 and older (% , 2050)	Healthcare expenditures per capita (USD, PPP)	Investments in health prevention (% of healthcare expenditures)
North	18.65	25.54	4216.67	11.00
South	17.12	23.43	3829.17	8.00
East	18.41	25.57	2600.00	6.45
West	18.52	25.56	5459.71	10.39

Source: Authors' calculation based on data from European Commission. Eurostat, (2023), OECD, (2024b) and Kirkby et al. (2023).

The collected data were subjected to detailed statistical analysis to identify differences between regions and assess the impact of an ageing population on public healthcare expenditures. Descriptive statistics were used to better understand the distribution of values across areas, and correlation analysis was used to explore relationships between demographic and economic indicators. These data serve as the basis for concluding healthcare policy priorities in various parts of the EU.

The analyses and data collected allow for an in-depth examination of variation in public healthcare expenditures and the identification of challenges associated with ageing societies. The results of this analysis will be discussed in detail in the

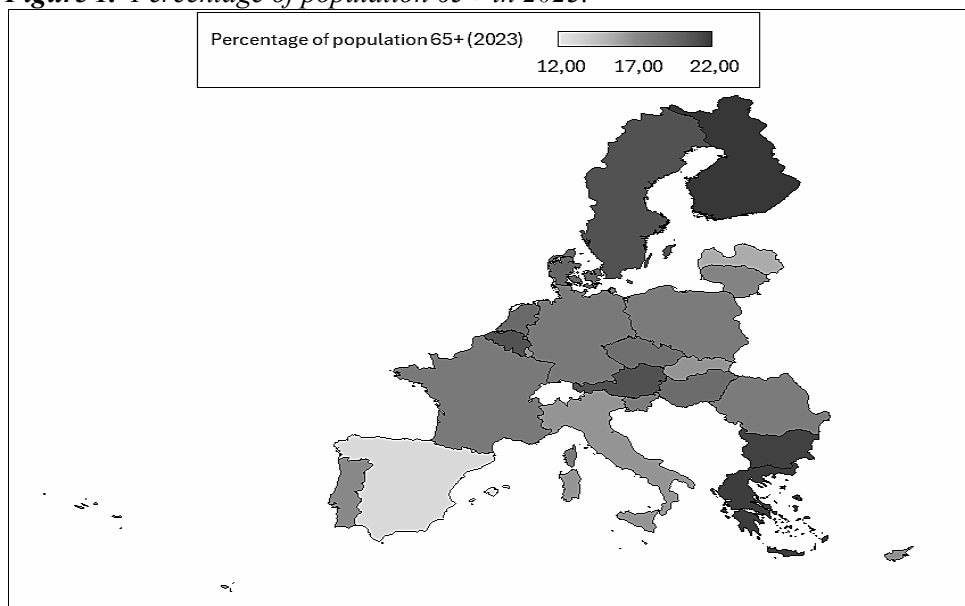
subsequent sections of the article.

4. Research Results and Discussion

The ageing population is one of the most significant challenges facing European healthcare systems. In 2023, the percentage of people aged sixty-five and older in EU countries averaged 18%, with particularly high values observed in Southern and Eastern Europe. Despite similar proportions of elderly populations, these regions struggle with insufficient funding for their healthcare systems, which significantly limits their ability to respond effectively to the needs of ageing societies.

Northern Europe is better equipped to adapt its healthcare systems to demographic challenges, thanks to higher per capita healthcare expenditures and effective health prevention programs. In contrast, the Western region combines high healthcare spending with emerging challenges arising from the anticipated demographic burden.

Figure 1. *Percentage of population 65+ in 2023.*



Source: Authors' elaboration based on data from European Commission. Eurostat, (2025), OECD, (2023) and WHO, (2024).

Figure 1 illustrates differences in the proportions of elderly populations across regions. Higher values are evident in the Southern and Eastern areas, highlighting greater healthcare challenges, especially in countries with limited financial resources.

Significant disparities in healthcare funding exist across EU regions. Northern

Europe clearly leads, with average public healthcare expenditures per capita amounting to \$6,300. This results in better service quality and greater accessibility to healthcare. In contrast, the Southern and Eastern regions, with the lowest funding levels (\$3,829 and \$2,600, respectively), face severe financial constraints and limited access to modern medical services.

Table 2. *Summary of Basic Demographic and Economic Indicators in EU Regions.*

Region	The percentage of the population aged 65 and older (% , 2023)	Projected percentage of the population aged 65 and older (% , 2050)	Old-age dependency ratio (2023)	Projected old-age dependency ratio (2050)	Healthcare expenditures per capita (USD, PPP)	Healthcare expenditures (% of GDP)	Investments in health prevention (% of healthcare expenditures)
North	18.65	25.54	30.79	49.08	4216.67	8.55	3.05
South	17.12	23.43	28.21	45.52	3829.17	8.00	2.95
East	18.41	25.57	30.67	51.14	2600.00	6.45	2.10
West	18.52	25.56	30.89	51.23	5459.71	10.39	3.63

Source: Authors' calculation based on data from European Commission. Eurostat, (2023), OECD, (2024b) and Kirkby et al. (2023).

Table 2 presents data on the elderly population, per capita healthcare expenditures, and investments in health prevention. Particularly noteworthy is the high spending in Northern and Western regions, which enables a practical approach to demographic challenges. On the other hand, low funding in Southern and Eastern areas highlights inequalities in access to public resources.

To better understand the relationship between demographic structure and public healthcare expenditures, an analysis of the correlations between key indicators was conducted. The results reveal significant regional differences in approaches to healthcare funding. Table 3 presents regional correlation coefficients.

Table 3. *Correlation between investments in prevention and healthcare expenditures per capita.*

Region	Old-age dependency ratio (2023) and healthcare expenditures per capita	Old-age dependency ratio (2023) and healthcare expenditures	Percentage of investments in health prevention vs. healthcare expenditures per capita
North	0.8025	0.8183	0.9985
South	-0.2220	-0.4431	0.4586
East	-0.4091	-0.3357	0.9466
West	-0.4930	-0.3452	0.8671

Source: Authors' calculation based on data from European Commission. Eurostat, (2023), OECD, (2024b) and Kirkby et al. (2023).

In the Northern region, a strong positive correlation ($r=0.998$) can be observed

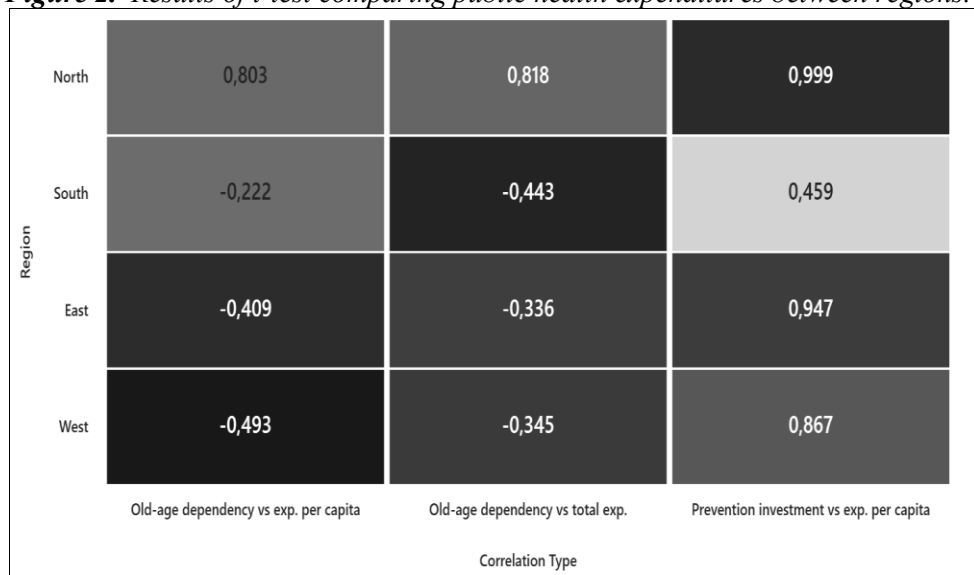
between investments in prevention and healthcare expenditures per capita. This indicates that countries such as Denmark and Sweden effectively reduce long-term healthcare costs. A similar trend is evident in the Eastern region ($r=0.947$), although expenditure levels there are significantly lower.

In Northern Europe, a strong relationship is highlighted between the old-age dependency ratio and healthcare expenditures per capita ($r=0.802$). On the other hand, in the Southern and Eastern regions, there is a negative correlation ($r = -0.222$ and -0.409), which may suggest budgetary constraints and inefficiencies in healthcare systems.

The heatmap of the correlation coefficients across regions and variables is illustrated in Figure 2. The heatmap shows associations between old-age dependency ratio, healthcare expenditures (per capita and total), and prevention investment. Values range from -1 to $+1$; darker shades indicate stronger positive correlations.

Numeric labels provide exact coefficients for North, South, East, and West. Notably, North shows strong positive associations for ageing and spending, and an almost perfect positive association between prevention investment and per-capita spending; South, East, and West show negative associations for ageing vs. spending, but positive associations for prevention vs. per-capita spending.

Figure 2. Results of *t*-test comparing public health expenditures between regions.

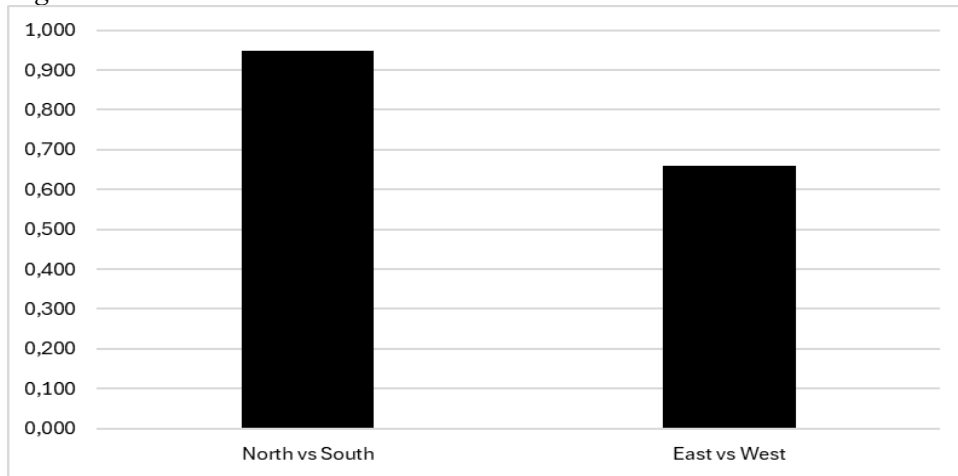


Source: Authors' own work.

The heatmap displays Pearson correlation coefficients (r) by region for three variable pairs:

- (i) old-age dependency ratio (2023) vs. healthcare expenditures per capita,
- (ii) old-age dependency ratio (2023) vs. total healthcare expenditures, and
- (iii) percentage of investments in health prevention vs. healthcare expenditures per capita.

Figure 3. Results of t-test Comparing Public Health Expenditures Between Regions.



Source: Authors' elaboration based on data from Eurostat and European Commission, (2023), OECD, (2024b) and WHO, (2024).

To evaluate differences in public health expenditures between EU regions, a t-test was conducted. Figure 3 illustrates the results of a comparison of public health expenditure between regions. The analysis indicates no statistically significant differences in mean spending between the North and South ($p = 0.95$) or between the East and West ($p = 0.66$).

This suggests a relative consistency in health financing levels across these areas, which may be attributed to overarching EU policies. However, it should be noted that internal variability within each region may have obscured more pronounced differences.

The analysis of public healthcare expenditures across EU regions reveals significant differences in resource allocation and adaptation to current demographic trends. The results indicate that Northern Europe achieves the highest efficiency in adapting healthcare systems to the challenges posed by an ageing population.

This is confirmed by higher per capita expenditures and a stronger emphasis on preventive measures. This region allocates 11% of its total healthcare expenditures to preventive activities, reflecting a proactive strategy to reduce long-term costs.

In contrast, the Eastern and Southern European regions face significant challenges. They are characterised by lower healthcare expenditures per capita, amounting to \$2,600 and \$3,829, respectively, and a weaker emphasis on prevention.

Low investments in the healthcare sector may result in limited access to specialist care and insufficient support for the ageing population. Despite facing similar demographic challenges, these regions appear to struggle to organise and finance their healthcare systems effectively.

The results of the Student's t-test further emphasise the overall consistency in healthcare funding levels across EU regions. Differences between regions are not statistically significant, suggesting that standard EU policies effectively maintain relative balance in expenditures within this sector. However, considerable variability within individual regions may have obscured larger differences between countries.

One of the most important findings is the strong positive correlation between investments in health prevention and per capita healthcare expenditures, particularly in the Northern and Eastern regions. These results highlight the fundamental importance of prevention in enhancing the efficiency of healthcare systems. Examples from countries such as Sweden and Denmark demonstrate that prioritising preventive measures improves health outcomes while simultaneously reducing pressure on healthcare systems.

The analysis shows that differences in healthcare sector funding are not solely due to demographic pressures. Although the proportion of elderly individuals in the population is comparable across regions, expenditure levels and health policy priorities vary significantly. This suggests that the organisation of healthcare systems and regional strategies play a crucial role in influencing the efficiency of expenditures and the accessibility of medical services.

5. Conclusions, Proposals, Recommendations:

The analysis confirmed significant differences in public healthcare expenditures across the regions of the European Union. The Northern region stands out for its high per capita costs and strong emphasis on preventive measures, facilitating better adaptation of healthcare systems to the challenges posed by an ageing population.

In contrast, the Southern and Eastern regions, despite facing similar demographic pressures, struggle with lower funding levels, limited access to healthcare services, and a less intensive approach to prevention.

The analysis indicates that healthcare expenditures and their efficiency are influenced not only by demographic factors but also by the organisation of

healthcare systems and regional political strategies.

The identified differences in funding levels and health policy priorities highlight the need for greater harmonisation of actions within the EU. Southern and Eastern Europe should invest in preventive measures, as seen in Northern and Western Europe, to reduce long-term treatment costs and improve health outcomes.

Financial and structural support from the EU could help reduce inequalities between these regions, ensuring equal access to medical services and enhancing the efficiency of healthcare systems in countries with lower funding levels.

These conclusions emphasise the critical importance of preventive measures, effective resource management, and innovative technological solutions in shaping future healthcare systems. The development of digital tools, such as telemedicine and e-health systems, could significantly improve the accessibility and quality of medical services in budget-constrained regions. Furthermore, inter-regional collaboration, based on sharing best practices and experiences, could contribute to greater cohesion in healthcare across Europe.

Despite certain limitations of the study, such as limited access to more detailed data on the efficiency of healthcare systems and the diversity of socio-economic factors influencing outcomes, this research provides valuable insights that can serve as guidelines for shaping public policy. Future studies should include long-term analyses of changes in public healthcare expenditures, the impact of socio-economic factors, and detailed case studies from various countries.

These conclusions are critical in the face of ageing populations and provide a solid foundation for action to improve the quality and efficiency of healthcare systems across the European Union.

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