

ORIGINAL ARTICLES

TRENDS AND REGIONAL INEQUALITIES IN PRIMARY MEDICAL CARE EXPENDITURE IN BULGARIA, 2010–2024

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ABSTRACT

INTRODUCTION: Regional inequalities in primary care expenditure have important implications for equity and overall system performance. Evidence on how primary care expenditure varies by region over time remains limited in Bulgaria.

Aim: The aim of this article is to examine trends and regional disparities in National Health Insurance Fund (NHIF) expenditure on primary medical care in Bulgaria and to measure the level and evolution of inter-regional inequalities.

MATERIALS AND METHODS: A longitudinal ecological study of NHIF data on primary medical care expenditure per 100 insured persons across Bulgaria's 28 regions (2010–2024) was conducted. Nominal values were deflated to 2010 prices using the healthcare-specific Consumer Price Index, and national trends were analysed with linear regression. Regional inequality was analysed using the coefficient of variation (CV), rate ratio, and rate difference, while sigma- and beta-convergence were assessed with linear regression models.

RESULTS: National average NHIF expenditure increased significantly, rising by 299.5% in nominal terms and 232.8% in real terms between 2010 and 2024. Over the same period, the CV increased from 5.3% to 7.1%, the rate ratio peaked at 1.44, indicating widening regional dispersion. Sigma-convergence analyses showed significant divergence in both nominal and real terms, driven mainly by the pre-pandemic years, while beta-convergence was absent, implying no catchup of initially lowspending regions.

CONCLUSION: Although NHIF expenditures rose markedly, this increase did not close the gaps between lowspending and higherspending regions. These patterns suggest that existing payment arrangements and workforce distribution have not ensured equitable regional resource allocation and highlights the need for targeted measures addressing underserved regions.

Keywords: *primary care, expenditure, regional inequalities, social health insurance, ecological study, Bulgaria*

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INTRODUCTION

Primary health care provides the foundation of universal healthcare access, with resource availability and allocation at this level serving as key determinants of overall system performance and sustainability. Regional inequalities in primary care expenditure have attracted increasing research attention because they shape health equity, system efficiency, and population health outcomes (1).

Regional inequalities in primary care expenditure are a widely recognised feature of health systems across Europe, although the underlying factors and magnitude of those inequalities vary by system design. Where payment arrangements inadequately adjust for population needs, expenditure tends to concentrate in better-resourced areas. In Sweden, substantial differences in capitation levels and risk-adjustment approaches across counties drive the unequal geographic distribution of primary care providers (2). England demonstrates systematic underfunding in northern regions, with measured factors, such as demographic characteristics, urbanity, deprivation and morbidity, explaining only 39% of inter-regional funding variation, leaving a large residual attributable to other system-level or unmeasured determinants (1). Where spatial and demographic heterogeneity are pronounced, expenditure disparities extend across administrative boundaries. In Denmark, temporal heterogeneity and spatial spillover effects in general practice expenditure suggest that geographically concentrated factors shape expenditure patterns (3). In Austria, region-level differences in primary care spending are compounded by even larger disparities in health outcomes (4). Demographic differences between patient populations also contribute to inequality. A Hungarian study demonstrated that, even with universal coverage, capitation payments can disadvantage the most vulnerable groups (5). Across these contexts, a recurring finding is persistent disparities in resource allocation within and between regions, influenced by capitation design, workforce distribution, and spatial feedback.

In social health insurance systems, the allocation of expenditure across regions reflects not only population health needs but also the contracting arrangements, capitation design, and workforce distribution, which can accelerate or reduce geograph-

ic inequities (2,6). The evidence shows that even established social health insurance frameworks do not necessarily achieve equitable geographic allocations.

The health system in Bulgaria is designed around a single-payer compulsory social health insurance scheme administered by the National Health Insurance Fund (NHIF). The NHIF is the sole public purchaser of primary medical care services. General practitioners (GPs), as independent contractors, are reimbursed primarily through capitation and activity-based payments defined within the National Framework Contract (NFC). The unified contracting structure differentiates capitation payments by age, while preventive check-ups, vaccinations, and chronic disease monitoring are reimbursed fee-for-service. However, Bulgaria's 28 administrative regions differ substantially in population age structure, socioeconomic development, physician density, and morbidity burden, which may act as drivers of unequal expenditure distribution.

Per capita health expenditure in Bulgaria remains among the lowest in the European Union (EU). Public sources cover about 65% of total health spending, which remains heavily concentrated on inpatient care and pharmaceuticals. The share allocated to outpatient care is comparatively low relative to the EU average (7). A persistent shortage of health workers, especially in primary care, limits access to primary care in rural and remote areas. The supply of GPs is uneven, with more than a two-fold difference between regions with the lowest and highest provider density (8). These regional imbalances translate into marked differences in access to and utilisation of primary medical care.

Existing Bulgarian studies have examined overall trends in NHIF expenditure (9), individual-level determinants of primary care utilisation (10), and the financial protection implications of out-of-pocket payments (11), but evidence on NHIF primary care expenditure by region and its evolution over time remains limited. Consequently, it remains unknown whether per-capita NHIF spending on primary medical care has converged or diverged across Bulgaria's 28 regions.

AIM

The aim of this study is to examine trends and regional disparities in NHIF expenditure on primary

medical care in Bulgaria over the period 2010–2024 and to measure the level and evolution of inter-regional inequalities. Understanding how these expenditure patterns evolve over time and whether they are closing or expanding is essential for guiding regional allocation policies.

MATERIALS AND METHODS

This is a retrospective longitudinal ecological study based on routinely collected administrative data. Annual data on average monthly expenditure on primary medical care per 100 insured persons, disaggregated by the 28 Bulgarian administrative regions, were obtained from the NHIF for the 2010–2024 period (12). The unit of analysis corresponds to the NHIF's official reporting denominator and was retained to ensure strict adherence to the source data. Administrative regions represent the lowest geographical level at which NHIF expenditure data are consistently reported over time. Data for 2017 were unavailable, and this year was excluded from analyses, resulting in 14 study years. In time-trend models, calendar year was entered as a continuous predictor, so excluding a single intermediate year is unlikely to meaningfully influence the estimated linear trends. The NHIF-reported national average, weighted by insured population, was used as the reference national-level indicator.

Nominal expenditure values were deflated to constant 2010 prices using the annual average Consumer Price Index for the healthcare sub-group (CPI Healthcare), published by the National Statistical Institute (NSI) (13). This index is expressed in chain-linked form (previous year=100) and was converted to a fixed-base series (base year 2010=100) by cumulative multiplication of annual rates prior to deflation. The use of a sector-specific deflator was preferred over the general CPI to better capture health service price changes.

The national temporal trend was assessed by linear regression, using the NHIF weighted national average of primary care expenditure as the dependent variable and calendar year as the independent variable. Separate regressions were performed for nominal and inflation-adjusted expenditure. For each study year, three cross-sectional measures of regional inequality in average monthly primary medical care expenditure per 100 insured were calculated

across the 28 regions: the coefficient of variation (CV), expressed as a percentage; the rate ratio (maximum/minimum regional value); and the rate difference (maximum minus minimum regional value). Because the rate ratio is sensitive to single-region outliers, its trend is interpreted alongside the CV, which is more robust to extreme values.

Trends in regional inequality over time were assessed through sigma- and beta-convergence analyses, both adapted from the Barro–Sala-i-Martin regional growth convergence framework (14). Sigma-convergence was defined as a statistically significant negative linear trend in the annual CV over time, assessed using simple linear regression of CV on calendar year. The analysis was performed on both nominal and inflation-adjusted CV values to verify robustness to price changes. Beta-convergence was tested by regressing the average annual growth rate of log expenditure per region on the log of the baseline expenditure in 2010. A significant negative coefficient indicates that lower-spending regions caught up with higher-spending ones. These convergence measures are intended to summarise system-level patterns in regional expenditure, not to explain their determinants.

As several fee-for-service primary care activities were suspended in 2020 due to COVID-19, potentially distorting expenditure, a sensitivity analysis that excluded 2020 and stratified trends into pre-pandemic (2010–2019) and post-2020 (2021–2024) periods was conducted. In addition, sigma-convergence was examined in three restricted samples: the full series without 2020, and the pre-2020 (2010–2019) and post-2020 (2021–2024) periods separately.

All analyses were performed in Jamovi (version 2.6.44.0). Model fit was assessed using the coefficient of determination (R^2). Coefficients are reported with 95% confidence intervals (CI), and statistical significance was evaluated at $\alpha = 0.05$.

RESULTS

Average monthly NHIF expenditure on primary medical care, measured as the NHIF-reported national weighted average, rose from BGN 203 in 2010 to BGN 811 in 2024 (Fig. 1), a 299.5% nominal increase over the study period. Linear regression revealed a statistically significant upward trend: slope = +34.8 BGN/year (95% CI: 22.6–47.0; $R^2 = 0.763$;

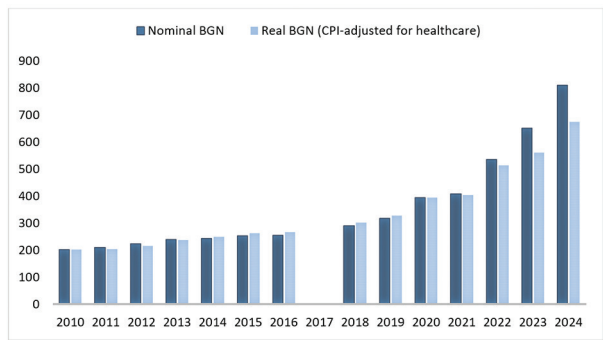


Fig. 1. Average monthly expenditure for primary medical care per 100 insured persons, 2010–2024.

Source: Nominal BGN: NHIF (12). CPI in Healthcare: NSI (13). CPI-adjusted for healthcare: authors' own calculations; 2010 = 100.

$p < 0.001$). This trend likely reflects both price and volume effects, including progressive increases in the capitation rate and in service fees.

After adjustment for healthcare-specific inflation, the real expenditure increased from BGN 203 (2010) to BGN 676 (2024) in constant 2010 prices (Fig. 1), representing a real increase of 232.8%. The inflation-adjusted trend was also statistically significant and exhibited a stronger linear fit: slope = +29.3 BGN/year (95% CI: 22.2–36.3; $R^2 = 0.850$; $p < 0.001$).

Disparity metrics across the 28 regions are presented in Table 1. The CV ranged from a minimum of 5.16% in 2011 to a maximum of 9.19% in 2020, and stood at 7.05% in 2024. The rate ratio followed a similar pattern, rising from 1.21 in 2011 to a peak of 1.44 in 2020, before declining to 1.31 in 2024. The absolute rate difference increased markedly in nominal terms, from BGN 39.5 in 2011 to BGN 222.0 in 2024. In 2020, all three disparity measures simultaneously reached their maximum values, coinciding with the COVID-19 pandemic and likely reflecting differential disruption of fee-for-service activity across regions. Targovishte and Vidin were the highest-expenditure regions in the majority of study years, while Sofia region consistently recorded the lowest expenditure.

Linear regression of the annual CV on calendar year revealed a modest but statistically significant positive trend: slope = +0.185 percentage points (pp)/year ($R^2 = 0.628$; $p = 0.001$). The CV demonstrated a relative increase of about one-third over the study period, indicating a gradual widening of regional inequality in NHIF primary care expenditure. Sigma-convergence analysis repeated on inflation-adjusted CV values yielded an identical result (slope = +0.185

Table 1. Annual cross-regional disparity metrics for NHIF primary medical care expenditure across 28 Bulgarian regions (nominal values).

Year	National Average (BGN)	CV (%)	Rate Ratio	Rate Difference (BGN)	Highest Value	Lowest Value
2010	203	5.31	1.23	42.00	Targovishte	Pernik
2011	210	5.16	1.21	39.50	Veliko Tarnovo	Sofia region
2012	224	5.66	1.24	49.50	Veliko Tarnovo	Sofia region
2013	240	6.13	1.27	57.40	Targovishte	Sofia region
2014	244	6.34	1.28	61.00	Targovishte	Sofia region
2015	253	6.69	1.28	64.80	Targovishte	Sofia region
2016	256	6.78	1.33	74.80	Targovishte	Sofia region
2017	N/A	N/A	N/A	N/A	N/A	N/A
2018	290	6.98	1.32	80.80	Targovishte	Sofia region
2019	319	7.13	1.31	87.30	Veliko Tarnovo	Sofia region
2020	395	9.19	1.44	147.40	Targovishte	Sofia region
2021	408	6.97	1.30	108.40	Veliko Tarnovo	Gabrovo
2022	535	8.22	1.37	169.60	Vidin	Sofia region
2023	651	7.48	1.35	195.60	Targovishte	Sofia region
2024	811	7.05	1.31	222.00	Vidin	Sofia region

pp/year; $R^2 = 0.621$; $p = 0.001$), confirming that the observed divergence trend reflects genuine inter-regional dispersion rather than differential nominal price effects across regions (Table 2).

evidence of catch-up among initially lower-spending regions.

The real increase in NHIF expenditure likely reflects a combination of drivers, including revisions

Table 2. Sigma- and beta-convergence analysis results.

Analysis	Slope	R^2	p
Sigma-convergence of CV (nominal values)	+0.1853 pp/year	0.628	0.001
Sigma-convergence of CV (CPI-adjusted values)	+0.1845 pp/year	0.621	0.001
Beta-convergence (β coefficient)	+0.001	<0.001	0.926

A sensitivity analysis excluding 2020 showed a stronger sigma-divergence estimate (slope = +0.163 pp/year; $R^2 = 0.791$; $p < 0.001$), indicating that the widening trend is not a result of the pandemic-period outlier. Period-stratified analysis further revealed that the divergence trend was concentrated in the pre-pandemic period (2010–2019): slope = +0.227 pp/year ($R^2 = 0.923$; $p < 0.001$). In the post-2020 period (2021–2024), the CV trend was flat and non-significant (slope = –0.050 pp/year; $p = 0.887$), indicating that regional inequality partially stabilised after the acute shock of 2020. Because the post-2020 period includes only four annual observations, the sigma-convergence analysis is best regarded as exploratory, and its p-values should be interpreted with caution.

Beta-convergence analysis found no statistically significant relationship between a region's initial expenditure level (2010) and its average annual growth rate over the study period: $\beta = +0.001$; $R^2 < 0.001$; $p = 0.926$ (Table 2). This indicates the absence of a catch-up mechanism. Regions with lower baseline expenditure did not grow faster than higher-spending regions.

DISCUSSION

Over the study period, NHIF expenditure on primary medical care rose markedly in real terms. Regional inequalities in per-capita expenditure widened gradually, with the CV increasing from 5.3% to 7.1% and the rate ratio peaking around 1.44, indicating a modest but persistent rise in primary healthcare expenditure dispersion across regions. Sigma-convergence tests point to divergence rather than convergence, and beta-convergence analysis shows no

to capitation rates and indexation of fees for services, rising needs due to population ageing and chronic disease burden, and some policy efforts to strengthen primary medical care. The NFC changes and broader health system reforms such as expansion of preventive packages are likely to have contributed to stepwise increases in expenditure. However, the ecological design of this study does not allow attribution of changes in spending to particular policy measures. At the same time, this growth must be interpreted against Bulgaria's low baseline health spending on outpatient care, relative to EU averages, and the predominantly hospital-oriented health system (7).

NHIF primary care expenditure can plausibly differ across regions because each of its main components is shaped by a mix of demand- and supply-side factors (15). Capitation payments vary by age group, so regions with older populations receive higher capitation spending per insured person, reflecting underlying differences in demographic structure. Fee-for-service payments depend on the utilisation of preventive services and chronic disease monitoring, which in turn are influenced both by demand-side factors (awareness, perceived need) and supply-side conditions (GP availability, practice organisation). Additional payments, including incentives for work in remote and hard-to-reach areas, reflect also the geographic distribution of providers and the policy measures used to compensate for service delivery gaps.

The aggregate trends are underpinned by relatively stable regional patterns, with some regions consistently at the upper end of the expenditure distribution and Sofia region repeatedly at the bottom,

suggesting that structural rather than random factors drive the observed inequalities. Within national context, plausible factors include persistent GP shortages and uneven provider distribution (16), particularly in rural and remote areas, as well as rural–urban differences in access and utilisation (17). Similar combinations of need-adjusted capitation, workforce imbalances, and spatial spillovers have been found to shape regional primary care spending in other European health systems (2,3,6). This repeating evidence suggests that widening inter-regional gaps in Bulgaria are rather rooted in structural features of social health insurance and primary care design rather than influenced by short-term fluctuations.

Over the study period, regional inequalities in NHIF primary care expenditure widened gradually, indicating that the gap in spending between the regions expanded substantially. The convergence results indicate that the system has not generated a systematic catch-up of low-spending regions over the study period. This pattern was driven mainly by the pre-pandemic period, during which dispersion increased steadily, with a pronounced peak in 2020. The post-2020 period showed partial stabilisation with dispersion remaining elevated but not continuing to rise at the same pace.

Our findings align with a broader international perspective showing that regional inequalities in primary care spending often persist when payment formulas only partially adjust for population need and when workforce distribution remains uneven. Evidence from countries such as England and Sweden similarly points to substantial regional variation in primary care resources and to only modest convergence over time (1,2). These inequalities are observed in developed health systems and have important consequences for access, utilisation, and health outcomes (18,19). The magnitude of inequality observed in Bulgaria appears comparable to, and in some aspects more marked than, patterns reported in other European countries.

The widening gaps in primary care expenditures point to a need to revise the payment mechanisms to reflect regional differences in morbidity and deprivation. The absence of catch-up in low-spending regions suggests targeted measures for under-served areas, such as stronger incentives for GP recruitment

and retention. Future research should extend this analysis to conditional convergence models that incorporate demand and supply factors, and link expenditure patterns to utilisation measures. Complementary studies in high- and low-spending regions at more granular level, would help analyse mechanisms behind the observed regional gaps.

This study has several limitations that should be considered when interpreting the findings. First, due to ecological design, associations observed at the regional level may not hold at the level of individual practices or patients. The analysis quantifies inter-regional inequality in NHIF expenditure but cannot identify the determinants of individual-level utilisation or spending. Second, data for 2017 were unavailable and this year was excluded, leaving 14 study years. Although 2016 and 2018 follow a smooth national trend, the missing observation slightly reduces the precision of estimated time trends. Third, the convergence analyses assess only unconditional beta-convergence and therefore do not adjust for structural regional characteristics. Conditional convergence analyses incorporating regional covariates were beyond the scope of this study. Finally, the rate ratio is sensitive to single-region outliers. However, its patterns are corroborated by the CV, which is more robust to extreme values, and the consistency of these indicators supports confidence in the overall direction of the inequality trends.

CONCLUSION

This study shows that NHIF expenditure on primary medical care in Bulgaria increased substantially in real terms between 2010 and 2024, but this growth was accompanied by a gradual widening of regional inequalities across the 28 administrative regions. Relative dispersion in per-capita spending rose, absolute gaps between the highest- and lowest-expenditure regions expanded sharply. Sigma-convergence tests pointed to divergence, while beta-convergence analysis found no evidence that initially low-spending regions were catching up with better-resourced areas.

These findings suggest that, within Bulgaria's underfunded primary care system, existing NHIF payment arrangements and workforce distribution have not been sufficient to equalise primary care financing across regions. They underscore the need to

better align payment components with population need and service delivery challenges, and to strengthen monitoring of regional primary care spending and utilisation. At the same time, the ecological nature of the data and the focus on unconditional convergence highlight that further work with regional covariates and more granular utilisation and outcome measures is required to understand the mechanisms behind the observed regional gaps.

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Conflict of interest

Nothing to declare

Use of AI-assisted technologies

During the preparation of this manuscript the authors used Perplexity (powered by GPT-5.1) for language editing and clarification of wording. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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