



Determinants and Fiscal Implications of Public Health Expenditure in Thailand, 1994–2023

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Abstract

This study is the first in Thailand to quantitatively assess three decades of government health spending using an integrated model. It aims to identify the long-term key factors driving public health expenditure, with a focus on fiscal sustainability amid rapid population aging. Using national-level time series data from 1994 to 2023, multiple linear regression was applied to examine the relationship between public health expenditure (as a percentage of GDP) and key drivers: population aging, GDP, public revenue, inflation, unemployment, medical technology imports, political cycles, and the COVID-19 pandemic. Diagnostic tests for multicollinearity, heteroscedasticity, and autocorrelation were conducted, with the Cochrane–Orcutt method confirming model robustness.

The results show that population aging ($p < 0.001$) and COVID-19 years ($p < 0.01$) are significantly associated with increased government health spending. In contrast, GDP is negatively associated with spending in normal years ($p < 0.01$) but reverses during crises, reflecting structural shifts in fiscal response. Public revenue and unemployment ($p < 0.01$) show significant negative effects. Inflation, medical technology imports, and election years were not statistically significant.

The findings highlight that aging is the most consistent long-term driver of fiscal pressure in Thailand's health system. Policymakers should prioritize invest in geriatric and chronic care, shift from hospital-based to preventive and long-term community care, and build resilient financing mechanism to safeguard access to essential care. Future studies may consider using data on telehealth and medical technology to better understand their role in shaping health expenditure and strengthening system resilience.

Keywords: Public health expenditure, Population aging, Covid-19, GDP growth, Fiscal sustainability

What was Known

- Older populations increase government health costs in many developing nations.
- Economic growth and fiscal revenue traditionally drive higher public health budgets.
- New medical technology is often linked to higher national healthcare spending.

What's New and Next

- Aging now exerts the strongest long-term driver of public health fiscal pressure in Thailand.
- Contrary to theory, greater national economic output was linked to lower health spending.
- Future studies should track digital health and telehealth adoption in public care.

Introduction

Population aging has emerged as one of the most transformative demographic shifts of the 21st century. The global population aged 65 and older is expected to more than double from 761 million in 2021 to 1.6 billion by 2050⁽¹⁾. This irreversible demographic shift places mounting pressure on healthcare and pension systems, particularly in emerging economies⁽²⁾. Thailand is undergoing one of the fastest aging transitions in the world, reaching super-aged status in just 35 years, compared to 85 years in Sweden. As of 2022, 19.5% of the population were aged 60 or older and this is projected to reach 31.4% by 2040⁽³⁾. This transition presents significant fiscal challenges, especially in healthcare financing, as older populations are associated with more complex healthcare needs. While population aging is widely cited as a potential driver of increased public spending in emerging Asian economies, projected to rise by up to 7 percentage points of GDP by 2050^(4,5,6), its specific role in shaping Thailand's public health expenditure (PHE) trajectory remains underexplored.

Since the 2001 introduction of the Universal Coverage Scheme (UCS), access has improved⁽⁷⁾, and PHE increased from 56,885 million Baht in 1994 to 711,777 million Baht in 2020⁽⁸⁾, further accelerated by emergency COVID-19 spending⁽⁹⁾. Despite this upward trajectory in public investment, the macro-level determinants of Thailand's healthcare expenditure remain insufficiently examined. Most existing national-level studies have concentrated on either the

relationship between health and economic growth⁽¹⁰⁾ or the broader macro-fiscal and pension implications of population aging⁽⁵⁾. As a result, a critical gap persists in the literature: the lack of an integrated, multidimensional model that accounts for structural fiscal factors (e.g., government revenue and public debt)⁽¹¹⁾, political cycles and institutional behavior⁽¹²⁾, the fiscal implications of medical technology adoption in the context of population aging^(13,14), and the impact of external shocks such as the COVID-19 pandemic. These interconnected drivers are rarely considered together in a unified framework specific to the Thai context, particularly over a long-term time horizon

This study aims to fill this empirical gap by applying the Determinants of Healthcare Expenditure Theory⁽¹⁵⁾, which posits that healthcare spending results from the complex interaction of demographic (e.g. population aging), economic (e.g. GDP growth), fiscal (e.g. revenue and debt), political (e.g. election cycles), technological (e.g. medical innovation), and external (e.g. pandemics) factors. In Thailand's case, these elements interact within a fragmented and decentralized health financing system, raising concerns about both efficiency and equity. For example, while medical technology is often considered a driver of rising costs⁽¹⁶⁾, its direct fiscal effect in Thailand's public sector remains unclear. Political budget cycles may also influence health spending, as governments increase budgets in election years to gain public favor⁽¹²⁾. A further complication comes from exogenous shocks, the COVID-19 pandemic. The health crisis not only triggered a spike in short-term health expenditure but may have also altered the structural relationship between public spending and other macro-fiscal drivers⁽⁹⁾. Few studies in Thailand have systematically examined the long-term fiscal impact of COVID-19.

To address this need, the present study investigates the long-term determinants of public health expenditure in Thailand by formulating the following central research question: *What macroeconomic, demographic, fiscal, political, technological, and external factors have influenced public health expenditure in Thailand between 1994 and 2023?* To address this question, the study employs a multivariate time-series regression framework using a single dependent variable: public health expenditure (PHE) as a percentage of GDP, including a comprehensive set of theoretically grounded independent variables.

Materials and Methods

1. Research Design

This study employs a quantitative longitudinal research design, utilizing annual time-series data to investigate the determinants of government health spending in Thailand. The unit of analysis is the country-year at the national level, observed over a 30-year period from 1994 to 2023. To improve the validity of regression estimates and account for potential serial autocorrelation common in time-series data, the study employs a multiple linear regression model with correction for autocorrelated residuals using the Cochrane-Orcutt procedure⁽¹⁷⁾. This robust method is employed to examine the relationship between the dependent variables (public health expenditure) and a comprehensive set of independent variables, which are operationally defined, and data sources are summarized in (Table 1).

2. Variables and Data collection

This study relies on secondary data collected from reliable institutional databases covering 1994 to 2023 ($t = 30$).

1) Dependent variable

Public Health Expenditure (% of GDP): Similar to Akca et al.⁽¹¹⁾, this study uses public health expenditure (PHE) as a percentage of GDP as the dependent variable, sourced from Thailand's National Health Accounts (NHA)⁽¹⁸⁾. Based on the OECD's System of Health Accounts (SHA), PHE includes seven categories, such as curative care, long-term care, preventive care, medical goods, and health system governance and administration. This indicator reflects the relative fiscal burden of government health spending⁽¹²⁾.

2) Independent variable

Population ages 60 and above (% of total population): This variable captures the aging burden, based on the established notion that older adults require more frequent and costly care⁽¹⁹⁾. Therefore, a higher elderly share is hypothesized to increase PHE.

GDP per capita growth (annual %): The total income earned through the production of goods and services in an economic territory during an accounting period. Rising GDP per capita is generally associated with increased public health expenditure, aligning with Wagner's Law⁽²⁰⁾.

Unemployment rate (% of Total labor force): The share of the labor force that is without work but available for and seeking employment. Serves as a proxy for labor market instability, which may simultaneously reduce tax revenues and increase health service needs⁽²¹⁾.

Revenue, excluding grants (% of GDP): Revenue is an increase in net worth resulting from a transaction. Grants are excluded from this figure. A stronger revenue base is expected to be associated with higher PHE⁽²²⁾.

Central government debt, total (% of GDP): The total outstanding financial obligations of the national government. Captures fiscal limitations and trade-offs in budgeting. High debt may crowd out health expenditure^(11,12).

Inflation, consumer prices (annual %): represents the annual percentage change in the average cost of a fixed basket of goods and services consumed by households. Some researcher emphasize that healthcare systems are especially vulnerable to inflationary shocks due to the rising costs of wages, pharmaceuticals, and medical supplies⁽²³⁾.

Import of medical equipment (% growth): Annual percentage growth in the import value of medical devices, used as a proxy for technological change. Although this indicator does not fully capture the full spectrum of medical innovation, it was selected due to the availability of consistent long-term data for Thailand. Prior literature also suggests that the fiscal impact of medical technology adoption may vary depending on system absorption capacity and the public-private financing structure⁽¹³⁾.

Election Year: Dummy variable (1 = general election year, 0 = otherwise) to capture political influences on fiscal decision-making⁽¹²⁾.

Covid-19 Year: Dummy variable (1 = year 2020-2022, 0 = otherwise) to reflect the exceptional public health financing demands during the pandemic⁽⁹⁾.

Table 1 Summarizes the data sources utilized in constructing the empirical model

Variable	Source
Public Health Expenditure (% of GDP)	Ministry of Public Health, International Health Policy Program (IHPP). National Health Accounts, Thailand ⁽¹⁸⁾
Ages 60 and above (% of total population)	Ministry of Interior, Department of Provincial Administration (DOPA), Thailand ⁽²⁴⁾
GDP per capita growth (annual %)	World Bank World Development Indicators ⁽²⁵⁾
Unemployment rate (% of Total labor force)	World Bank World Development Indicators ⁽²⁵⁾
Inflation, consumer price (annual%)	World Bank World Development Indicators ⁽²⁵⁾
Revenue, excluding grants (% of GDP)	World Bank World Development Indicators ⁽²⁵⁾
Central government debt, total (% of GDP)	World Bank World Development Indicators ⁽²⁵⁾
Import of medical equipment (% growth)	Office of the Permanent Secretary Ministry of Commerce, Thailand ⁽²⁶⁾
Election Year	THAIPUBLICA, Thailand election ⁽²⁷⁾
Covid-19 Year	World Health Organization, COVID-19 ⁽²⁸⁾

3. Model Specification

A multiple linear regression model is estimated using Ordinary Least Squares (OLS)⁽²⁹⁾ to quantify the relationships between public healthcare expenditure and its related determinants over time. The model is applied to 30 years of national-level time-series data (1994 – 2023). All analyses were conducted using the R statistical programming language⁽³⁰⁾, which also facilitated diagnostic testing and model validation, including tests for multicollinearity, autocorrelation, and heteroskedasticity. The baseline model is as follows:

$$\begin{aligned}
 PHE_t = & \beta_0 + \beta_1 AGE60_t + \beta_2 GDP_t + \beta_3 UNEMPLOY_t + \beta_4 INFLATION_t \\
 & + \beta_5 REVENUE_t + \beta_6 DEBT_t + \beta_7 MEDTECHIMPORT_t \\
 & + \beta_8 ELECTIONYEAR_t + \beta_9 COVIDYEAR_t + \varepsilon_t
 \end{aligned}$$

Where β_0 is the intercept, ε_t is the error term

Result

1. Descriptive Statistics and Diagnostic Testing

The study used 30 years of annual time-series data (1994 – 2023) (to investigate the multidimensional drivers of PHE as a percentage of GDP in Thailand. As shown in Figure 1, public health expenditure as a share of GDP has steadily increased over the past three decades, with a pronounced rise during the COVID-19 period.

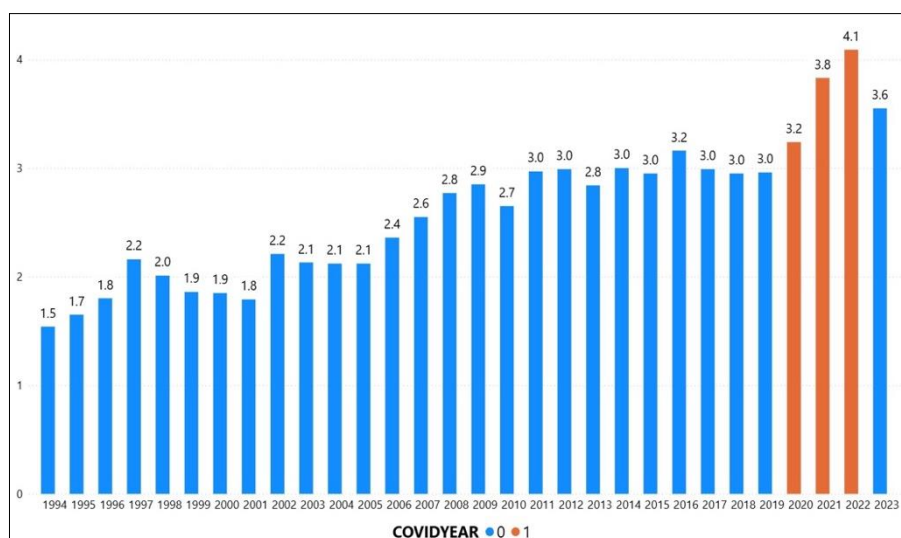


Figure 1 Trend of Public Health Expenditure as a Share of GDP in Thailand, 1994–2023

Source: Author's calculation based on National Health Accounts and World Bank data.

Over the study period, PHE accounted for 2.6% of GDP (SD = 0.64), ranging from 1.5% to 4.1%, indicating a steady upward trajectory in government health spending over time. The proportion of the population aged 60 and above (mean = 12.46) reflects Thailand's ongoing demographic transition and was included as a key variable due to its theoretical linkage to increased healthcare demand. Among fiscal and macroeconomic indicators, government revenue averaged 18.8% of GDP (SD = 1.57), while GDP per capita growth averaged 2.4% annually (SD = 3.65), reflecting economic fluctuations over the study period. Medical equipment import growth, used as a proxy for technological change, showed the greatest variability (mean = 10.15, SD = 21.86), suggesting volatile procurement patterns likely influenced by external shocks, policy shifts, or global market conditions (Table 2).

Table 2 Descriptive Statistics of Variables (1994 – 2023) (n=30)

Variable	Mean (SD)	Min – Max
PHE	2.59 (0.64)	1.54 – 4.09
AGE60	12.46 (3.66)	7.81 – 19.97
GDP	2.42 (3.65)	-8.83 – 6.79
UNEMPLOY	1.24(0.74)	0.25 – 3.40
INFLATION	2.62 (2.37)	-0.90 – 7.99
REVENUE	18.76 (1.57)	15.43 – 21.33
DEBT	29.17 (15.37)	3.67 – 61.24
MEDTECHIMPORT	10.15 (21.86)	-29.18 – 98.85

SD, Standard Deviation

Before proceeding with the regression estimation, diagnostic tests were conducted to ensure the validity of the model. Multicollinearity was assessed using the Variance Inflation Factor (VIF). Variables with VIF values exceeding 10 were considered problematic⁽³⁰⁾ and were excluded from the final model, specifically, public debt (% of GDP), which showed severe multicollinearity. Moreover, to account for the structural shift in public spending behavior during the COVID-19 pandemic, an interaction term between GDP per capita growth and the COVID-19 year dummy variable was introduced. This allows the model to capture a differentiated effect of economic growth on health expenditure specifically during the pandemic year, where fiscal responses may have diverged from standard economic patterns due to emergency healthcare demands.

Therefore, the final multiple linear regression model, after VIF-based refinement, is specified as follows:

$$\begin{aligned}
 PHE_t = & \beta_0 + \beta_1 AGE60_t + \beta_2 GDP_t + \beta_3 UNEMPLOY_t + \beta_4 REVENUE_t \\
 & + \beta_5 INFLATION_t + \beta_6 TECHIMPORT_t + \beta_7 ELECTIONYEAR_t \\
 & + \beta_8 COVIDYEAR_t + \beta_9 (GDP_t \times COVIDYEAR_t) + \varepsilon_t
 \end{aligned}$$

Normality of residuals was tested using the Shapiro-Wilk test, which resulted in a W statistic of 0.972 and a *p*-value of 0.607. This indicates that the residuals do not deviate significantly from normality, supporting the assumption of normally distributed errors. In addition, homoscedasticity was tested using the Breusch-Pagan test, which yielded a *p*-value of 0.243, indicating no significant heteroskedasticity and confirming that the residuals are

homoscedastic. To examine serial correlation in the residuals, the Durbin-Watson (DW) test was applied. The initial test produced a DW statistic of 0.887 ($p < 0.001$), indicating strong evidence of positive autocorrelation. To correct for this, the Cochrane-Orcutt¹⁷ transformation was applied. After transformation, the Durbin-Watson statistic improved substantially to 1.842 with a (p -value = 0.451), suggesting no remaining first-order autocorrelation and supporting the robustness.

2. Regression Results

Table 3 Multiple Regression Analysis: Cochrane-Orcutt regression model

Variable	β	Std.	t.	P-value
(Intercept)	3.611	0.772	4.680	0.00016***
AGE60	0.117	0.030	3.957	0.00085***
MEDIMPORT	-0.001	0.001	-0.653	0.52184
GDP	-0.029	0.008	-3.810	0.00118**
UNEMPLOY	-0.257	0.069	-3.733	0.00141**
INFLATION	0.003	0.011	0.286	0.77815
REVENUE	-0.107	0.035	-3.095	0.00596**
COVIDYEAR	0.423	0.113	3.733	0.00141**
ELECTIONYEAR	-0.033	0.044	-0.743	0.46682
GDP $\times$ COVIDYEAR	0.077	0.018	4.317	0.00037***

p-value < 0.01; *p-value < 0.001

R = 0.898, R² = 0.807, Adjusted R² = 0.730, SE = 0.122, Durbin-Watson = 1.842

The final model demonstrated strong explanatory power. The adjusted R-squared was 0.73, indicating that the independent variables collectively explain 73.0% of the variance in public health expenditure as a percentage of GDP over the 30-year period (Table 3). Several variables exhibited a statistically significant *positive* association with public health expenditure. The proportion of the population aged 60 and above (AGE60) emerged as the most significant positive predictor ($\beta = 0.117$, $p < 0.001$). This implies that a 1 percentage point increase in the elderly population is associated with a 0.12 percentage point increase in PHE, underscoring the fiscal implications of demographic aging. The COVIDYEAR dummy variable also had a strong positive effect ($\beta = 0.423$, $p < 0.01$), indicating elevated spending levels during the pandemic. Additionally,

the interaction term between GDP per capita growth and COVIDYEAR ($\beta = 0.077$, $p < 0.001$) was highly significant, suggesting that the influence of economic performance on health spending was modified under pandemic conditions.

In contrast, three variables were found to have a statistically significant negative association with public health expenditure: GDP per capita growth ($\beta = -0.029$, $p < 0.01$), the unemployment rate ($\beta = -0.257$, $p < 0.01$), and government revenue ($\beta = -0.107$, $p < 0.01$). These results may reflect fiscal pressures or reallocation of resources during periods of economic uncertainty. Finally, the coefficients for medical equipment import growth ($p = 0.522$), inflation ($p = 0.778$), and election year ($p = 0.467$) were not statistically significant, indicating no noticeable impact on public health expenditure in this model.

Discussion

The most robust and consistent predictor of increased public health spending is the proportion of the population aged 60 and above (AGE60), which showed a significant positive effect ($\beta = 0.117$, $p < 0.001$). This finding aligns with observations by Kaikeaw⁽³¹⁾ et al., who reported that non-communicable diseases (NCDs) such as hypertension and diabetes have become increasingly prevalent among Thailand's elderly, accounting for the majority of outpatient visits in several regional hospitals. As Tejativaddhana⁽³²⁾ et al. further noted, this rising burden of chronic illness has placed sustained pressure on the Universal Coverage Scheme (UCS), which faces mounting fiscal strain due to higher utilization by older adults. Internationally, Hallaert⁽³³⁾ identified similar demographic and fiscal tensions in Belgium, where long-term care demands have complicated healthcare financing and intergovernmental coordination. These findings collectively underscore the need for forward-looking policy in Thailand, not only in terms of demographic forecasting and service delivery, but also in the strategic allocation of health resources. Prioritizing investments in geriatric care, NCD management, and long-term support infrastructure will be critical to maintaining fiscal sustainability and ensuring that public health systems remain resilient amid rapid population aging. Policy instruments such as expanding community-based long-term care programs, strengthening primary care networks, and integrating health and social care financing could help manage rising demand while controlling long-term costs.

The COVID-19 pandemic had a significant positive effect on PHE, highlighting the fiscal vulnerability of health systems to large-scale shocks. In Thailand, the increase in health spending was largely reactive. Although a central emergency fund existed, it proved insufficient to meet the

scale and urgency of the crisis. The government had to issue emergency loan decrees, while some public hospitals were forced to use their retained revenue to pre-finance critical need, such as ward upgrades, due to budget disbursement delays⁽³⁴⁾. These challenges point to a lack of institutional preparedness despite fiscal capacity.

A key theoretical contribution of this study is the identification of a structural shift in the relationship between economic growth and PHE during the pandemic. While GDP per capita growth was negatively associated with PHE in non-pandemic years, contrary to Wagner's Law⁽²⁰⁾ and prior findings by Furuoka et al.⁽¹⁹⁾ However, the relationship reversed during COVID-19. The significant interaction term GDP and COVIDYEAR reveals that during crises, countries with stronger economies were more able to scale up health responses, consistent with OECD⁽⁹⁾ recommendations.

However, Thailand's case illustrates that macroeconomic strength alone is not sufficient. The absence of well-functioning emergency health financing mechanisms delayed critical response efforts. This underscores the importance of not only maintaining fiscal space but also institutionalizing contingency funds and rapid-disbursement systems to ensure timely and adequate financing of essential health services during future crises. Such funds could be designed with predefined financing mechanisms, for example, allocating a fixed percentage of national tax revenue or earmarked health taxes, and governed through inter-agency coordination between the Ministry of Public Health, the Ministry of Finance, and relevant oversight bodies to enable rapid and transparent budget deployment during emergencies.

In addition, the negative association between economic growth and health expenditure during normal periods may reflect fiscal prioritization and sectoral competition within the government budget. During periods of economic expansion, public investment may be directed toward infrastructure development, debt servicing, or other growth-oriented sectors rather than health. This pattern highlights the political economy dimension of budget allocation, where economic growth does not automatically translate into increased health sector investment.

This study found that when unemployment increases, government spending on public health tends to decrease. In contrast, research from Yale University⁽²¹⁾ shows that rising healthcare costs can also lead to job losses and lower tax income. This creates what can be described as a "double burden", just as more citizens require support from the public healthcare system, the government may reduce spending due to broader economic and fiscal pressures. The

mechanisms behind this effect appear to be twofold. First, rising unemployment reduces government tax revenues, particularly from payroll and consumption taxes, thereby constraining fiscal space for health spending. Second, during economic downturns, governments often prioritize short-term social protection measures, such as unemployment benefits and welfare transfers, over longer-term healthcare investment. To avoid this double strain, policymakers should consider setting up emergency funds or flexible budget plans to maintain essential health services during difficult times.

Unexpectedly, government revenue (% of GDP) was also negatively associated with PHE. Behera and Dash⁽²²⁾, in contrast, found a positive long-run relationship between tax revenue and health spending in Indian states. Although this contradicts the expectation, it may reflect budget competition or reallocation to other sectors such as debt service or infrastructure. In Thailand, health expenditure represents only a mid-tier share of total government spending, with substantial allocations directed toward transport infrastructure and general public services⁽³⁵⁾. This pattern is consistent with a political economy dynamic in which growth-oriented or visibility-enhancing investments are prioritized over recurrent health budgets when fiscal space expands. This finding underscores the need for more responsive and targeted fiscal policy to strengthen Thailand's public health system. To ensure that additional government revenue translates into improved health outcomes, public health administrators should advocate for earmarked health budgets and fiscal safeguards that protect essential services. For example, dedicating a portion of sin taxes or health-related excise revenues to preventive and long-term care programs could help stabilize health financing while addressing risk factors associated with non-communicable diseases.

Interestingly, medical equipment import growth, a proxy for technological adoption, was not a statistically significant determinant of PHE in this model. This aligns with Chernew and Newhouse⁽¹⁴⁾, who observed that the impact of medical technology on spending varies by country and often depends on how innovations are adopted and financed. In Thailand, such expenditures may be more prevalent in the private sector or delayed in their fiscal effects. Furthermore, Inflation was also not significantly associated with PHE, contrast from prior literature such as Siarni-Namini⁽²⁰⁾ and Jeurissen et al.⁽²³⁾, which found that inflation could increase real health budgets. Employing a medical consumer price index in future work may yield clearer results.

Similarly, the election year dummy showed no significant effect, contradicting theories of political budget cycles⁽¹¹⁾, which posit that health spending may rise during election years due to

populist incentives. However, political budget dynamics may be more complex, as spending adjustments may occur in the period preceding elections or vary across different political or coalition contexts. Future research may therefore explore lagged election effects or alternative political economy indicators to better capture these dynamics.

This study's strengths lie in its use of three decades of national data and its integration of economic, demographic, and crisis-related factors, offering a rare long-term view tailored to Thailand's evolving healthcare landscape. For public health administrators, the findings support evidence-based planning by identifying key drivers, such as aging and fiscal flexibility, that shape health budgets. The inclusion of interaction terms reveals how system responses shift during crises, providing strategic insights for building resilient health financing. Nonetheless, limitations should be noted. Proxy indicators, medical imports for technology, may not fully capture the breadth of innovation or service complexity. Lastly, the findings are context-specific to Thailand and may not generalize to countries with different institutional or political structure.

Conclusion

This study provides robust empirical evidence on the macro-level determinants of public health expenditure in Thailand over the 30-year period from 1994 to 2023. Population aging emerged as the most consistent and significant long-term driver, highlighting the urgent need for structural reform. A shift is required from a hospital-centric, curative model toward more cost-effective, preventive, and community-based long-term care. The COVID-19 pandemic further exposed institutional vulnerabilities in emergency health financing. The findings underscore the importance of establishing contingency health funds and improving the responsiveness of fiscal mechanisms to health shocks. Notably, GDP growth and government revenue were not always positively associated with health spending, suggesting that fiscal space alone is insufficient without supportive institutional frameworks and cross-sector coordination. For example, strengthening inter-ministerial coordination on long-term care financing or exploring earmarked health taxes could help ensure more sustainable funding for aging-related health services.

Although medical technology imports did not show a significant effect, this does not necessarily discount the influence of innovation on healthcare systems. Instead, it likely reflects measurement limitations, as the proxy used captures only part of technological change and does not fully account for domestic innovation, pharmaceutical development, or digital health technologies. Future research may therefore explore more nuanced indicators of technological

change, such as the adoption of high-cost medical technologies, medical device innovation, or composite measures that incorporate pharmaceutical and digital health spending.

In addition, the public debt variable was excluded from the final regression model due to multicollinearity. While this is a standard econometric practice, rising public debt may still influence fiscal space and public health budget allocation through potential crowding-out effects on social spending. Future studies may therefore explore alternative modeling strategies to better capture the relationship between debt dynamics and health financing.

Although the findings are grounded in Thailand's context, they offer broader implications for other aging middle-income countries facing similar demographic and fiscal transitions. Strengthening evidence-based planning and developing resilient, forward-looking health financing systems will be critical for long-term sustainability.

Ethical Approval Statement

This research was approved by the Ethics Committee in Human Research, National Institute of Development Administration, on August 21, 2025, under project code ECNIDA 2025/0145.

Author Contributions

The author conceived and designed the study, collected and curated the data from international and national databases, performed the statistical analyses using R programming, interpreted the results, and drafted and revised the manuscript. The author takes full responsibility for the accuracy and integrity of the entire work.

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Conflicts of Interest

The authors declare no conflicts of interest.

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