

Original Research Article

Determinants of life expectancy in India: an empirical analysis

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ABSTRACT

Background: The study examined the socioeconomic determinants of life expectancy in India through trend analysis and econometric investigation using time series data derived from the world development indicators (WDI) database of the World Bank. It focused on key variables such as life expectancy at birth, GDP per capita, current health expenditure, infant mortality rates and population growth during the period (1990-2025).

Methods: The study employed trend analysis to examine the changes in the selected variables over time and utilizes the autoregressive distributed lag-error correction model (ARDL-ECM) framework to investigate the long run and short run relationship between life expectancy and its socio-economic determinants.

Results: The findings uncover substantial improvement in life expectancy alongside significant decline in infant mortality rates and steady growth in GDP per capita, thereby reflecting gradual progress in public health and socioeconomic development. The econometric analysis using the ARDL-ECM framework confirmed the existence of long run relationship between life expectancy, GDP per capita, and current health expenditure. The results further indicated that economic growth significantly contributes towards enhancing life expectancy, suggesting that public spending without efficient governance, equitable healthcare accessibility, and institutional effectiveness may not sufficiently improve the health outcomes.

Conclusions: The study concluded that sustainable developments in life expectancy in India require integrated developmental policies, necessitating the need for economic growth, strengthened healthcare systems, reduced infant mortality, and equitable public health infrastructure.

Keywords: GDP per capita, Healthcare expenditure, Infant mortality rate, Life expectancy, Socioeconomic determinants

INTRODUCTION

Life expectancy at birth serves as one of the most critical indicators of human development, reflecting overall health conditions, quality of life, and socioeconomic progress of a nation. Over the past few decades, India has witnessed substantial demographic transitions denoted by declining mortality rates, improvements in healthcare accessibility, rising literacy levels, and gradual economic growth. As reported by the World Bank, life expectancy at birth in India has witnessed a gradual and systematic upheaval from nearly 58 years in 1990 to around 72 years

in 2022, thereby uncovering considerable progress in public health and developmental outcomes. However, despite such improvements, significant disparities continue to persist primarily across the economic, institutional, and healthcare dimensions.

The determinants of life expectancy are multidimensional yet interconnected in nature, encompassing economic, demographic, institutional, and healthcare related factors.¹⁻³ Factors such as gross domestic product (GDP) per capita, current health expenditure as percentage of GDP, population growth, infant mortality, education, and

institutional development collectively influence the longevity outcomes. Besides, economic growth also improves nutrition, sanitation, healthcare accessibility, and living standards, thereby positively influencing life expectancy.^{1,4} Moreover, improvements in maternal and child healthcare, reduction in infant mortality, and expansion of healthcare infrastructure also facilitates in enhancing the health outcomes.^{5,6} However, factors such as uneven health accessibility, rising out-of-pocket expenditure, and structural inequalities often hinders the equitable distribution of developmental benefits, especially in developing economies like India.^{4,7,8}

Against this backdrop, the present study mainly aims to examine the socioeconomic determinants influencing life expectancy in India through empirical analysis. The study utilizes secondary time series data obtained from the world development indicators (WDI) database of the World Bank.⁹ The study employed trend analysis along with econometric techniques to analyse the long run relationship between life expectancy, GDP per capita, and current health expenditure. The findings of the study are expected to contribute towards a holistic understanding of the broader developmental and policy dimensions etched with public health and longevity in India.

The existing literature on life expectancy uncovers the role of multidimensional factors such as economic development, healthcare systems, demographic dynamics, socioeconomic institutions as well as environment conditions towards influencing life expectancy. It reveals the interconnected nature of development and human well-being.

Economic development, growth in real income, systematic demographic transition, and expansion in productivity serve as key determinants influencing life expectancy and overall population outcomes. Distinct studies undertaken by prominent researchers consistently state that higher GDP per capita, improved income levels, rise in urbanization, and significant human capital formation significantly contribute to improved life expectancy by improving healthcare accessibility, nutrition, sanitation, housing conditions, and living standards.^{1,4,7,8,10-13} Additionally demographic transition and employment intensive growth also play a crucial role in determining long-term health outcomes. Further, demographic advantages solely cannot ensure economic and health enhancements unless they are accompanied with rightful labour absorption, productivity growth, and human capital development.¹⁴ Besides, it should also be noted that population growth may stimulate GDP expansion through growth in labour force and market enlargement, but excessive population pressure tends to put strain on healthcare systems, employment opportunities, housing, and natural resources. As a result of which, it adversely affects human development and living standards.

Life expectancy and economic growth also share a mutually reinforcing relationship. It is because increase in life expectancy contributes positively to economic productivity and enable GDP growth through labour efficiency and human capital formation, while on the other hand reduction in infant mortality rates enhance overall economic performance.^{1,10} Additionally, economic growth in its infant stages exerts strong positive effects on life expectancy through improvements in sanitation, nutrition, healthcare access, and public health expenditure, although such effects may tend to exert less influence with subsequent advancements.^{4,13} Empirical evidence from India demonstrates that regional differences in income, urbanization, infrastructure, and socioeconomic developments tend to influence longevity outcomes, with the economically developed states witnessing higher life expectancy rates compared to the less developed ones.^{7,8}

Additionally, healthcare expenditure, public health financing, healthcare infrastructure, and financial protection serves as key determinants of life expectancy and public health outcomes.^{2,15} Distinct studies undertaken by prominent researchers on public health suggest that rise in government health expenditure, improved healthcare accessibility, and efficient healthcare systems positively contribute to longevity by enabling reduction in mortality rates, improving disease prevention, alongside enhancing healthcare service delivery.^{1,2,15-19} In addition, public healthcare investment also improves human capital formation, labour productivity, maternal and child health outcomes, and overall economic performance, while on the other hand inadequate public spending and reliance on private healthcare systems enhance inequalities in healthcare access and financial vulnerability.^{1,2,17} Besides, stronger governance, efficient allocation of healthcare resources, and availability of medical professionals also enhance the effectiveness of healthcare expenditure in improving the population health outcomes.^{17,20}

Over time, there has been a substantial increase in out-of-pocket expenditure on health and catastrophic health expenditure, primarily in developing economies like India. High healthcare costs, prolonged hospitalization, chronic illness, and insufficient insurance coverage exposes households to severe financial hardships, often inducing the households to rely on borrowing, distress financing, as well as asset liquidation.^{15,16} Moreover, inadequate public financing and limited healthcare coverage also raises private expenditure burdens, especially in essential healthcare services.²¹ Besides, healthcare expenditure also facilitates reduction in infant mortality rates and improvements in life expectancy when it is augmented with stronger primary healthcare systems, maternal health care services, and equitable healthcare accessibility.^{1,18,20}

Furthermore, demographic factors along with mortality indicators and dynamics in population also serve as major

determinants influencing life expectancy and overall population health outcomes. It is because factors such as infant mortality, maternal mortality, birth rates, death rates, fertility behaviour, and population growth significantly affect longevity patterns across regions and societies.^{5,6,8,12,22,23} In addition, higher infant and child mortality significantly reduces life expectancy, while on the other side, improvements in maternal and child healthcare positively contributes to survival outcomes and overall well-being of the population.^{5,6,22} Moreover, demographic pressures such as rapid population growth, high birth rates, and adverse population structures put significant strain on multiple elements (employment opportunities, housing and public resources) substantially influencing health outcomes and living standards.^{8,12}

Apart from that socio-cultural and disparities in socio-cultural and regional demography also influence the mortality outcomes. Early motherhood, low maternal education, poor economic condition, short birth intervals, and limited healthcare accessibility raises risks pertaining to infant and neonatal mortality, particularly in socially and geographically disadvantaged regions.²² In addition, maternal education, antenatal care, institutional delivery, and postnatal healthcare services are critical for curbing maternal and infant mortality.⁵ Besides, gender-based discrimination and preference for son continue to influence mortality rates in India. It is because across multiple regions with strong unmet son preference, there exists higher female infant mortality rates on account of postnatal discrimination, neglect, and unequal treatment of the girl child.²³ Besides, child mortality serves as one of the strongest negative determinants of life expectancy, particularly in countries with weak healthcare systems and inadequate healthcare investments.⁶

Moreover, socioeconomic conditions, educational attainment, institutional quality, and governance structures are regarded as the significant determinants influencing life expectancy and overall population health outcomes. It is because they positively contribute to longevity by enhancing health awareness, healthcare accessibility, living standards, and public service delivery.^{2,3,7,24-26} In addition, education emerges as one of the major and the strongest determinant of survival and life expectancy as it improves health awareness, occupational opportunities, healthcare utilization, and healthier behavioral practices.²⁴ Furthermore, education also improves health literacy, promote healthier lifestyle as well as enhances better access to economic and healthcare opportunities.²⁶

Institutional quality, governance efficiency, urban infrastructure, and digitalization also play a critical role in improving health outcomes. Government effectiveness and internet penetration significantly improve life expectancy by strengthening sanitation facilities, healthcare accessibility, institutional efficiency.^{3,25} Moreover, equitable healthcare access, decentralized governance, integrated primary healthcare systems, and

efficient public spending are crucial for improving health outcomes and reducing regional inequalities in India.² Besides, adaptive institutional capacity, healthcare infrastructure, literacy, and governance mechanism also curb health vulnerabilities and make the population resilience against the socioeconomic and environmental risks.²⁷

Besides, environmental conditions, climate variability, pollution as well as ecological sustainability also influence life expectancy. To begin with, air pollution, rise in carbon emissions, environmental degradation, and poor environmental quality negatively affects longevity by increasing the susceptibility to respiratory illnesses, cardiovascular diseases, healthcare burdens and mortality risks.^{3,11,26,28-31}

On the other hand, adhering to the principles of sustainable development, environmental protection norms, and green growth positively contributes to human development.^{26,29,31} It is because green growth and environment friendly practices improve life expectancy by curbing pollution and strengthening public health conditions, whereas environmental degradation influences healthcare expenditure through rise in disease burdens and medical needs.^{26,31} Besides, stronger environmental quality, institutional support, and adaptive healthcare mechanism curbs vulnerabilities associated with health and lays the foundation for improving the long-term population resilience.^{27,28}

Thus, it can be stated that, life expectancy is mainly shaped through the complex interaction between economic growth, healthcare accessibility, demographic transitions, socioeconomic institutions as well as environmental conditions. This indicates that periodic improvements in population health require a holistic, integrated, and equitable developmental frameworks rather than economic advancements alone.

By following a systematic process, the study mainly seeks to examine the trends and patterns of population, current health expenditure (as percentage of GDP), life expectancy at birth, infant mortality rate, and GDP per capita over the study period as well as analyse the impact of demographic, economic and healthcare related factors on life expectancy through regression analysis.

METHODS

Study design

The present study was an analytical ecological time-series study based on secondary data.

Study setting (place)

The study was conducted for India using national-level data obtained from the world development indicators (WDI) database of the World Bank.⁹

Study period

The study utilized annual data covering the period January 1990 to December 2025. However, slight variations in the study period for certain variables were observed because of data availability in the WDI database.

Selection criteria

Data for variables with consistent annual observations available in the WDI database were included in the analysis. The study considered life expectancy at birth, GDP per capita, current health expenditure (as a percentage of GDP), infant mortality rate, and population. Variables with incomplete or inconsistent observations during the study period were excluded to maintain comparability and robustness of the analysis.

Study procedure

Initially, linear trend analysis was performed to examine the temporal patterns of the selected variables. Descriptive statistics were computed to summarize the characteristics of the study variables. Subsequently, the Augmented Dickey-Fuller (ADF) unit root test was used to examine stationarity. The autoregressive distributed lag (ARDL) bounds testing approach was employed to assess the long-run relationship among the variables, followed by the error correction model (ECM) to estimate short-run dynamics.

Statistical analysis

Descriptive statistics, trend analysis, Augmented Dickey-Fuller unit root tests, ARDL bounds testing, ECM estimation, and diagnostic tests including the Breusch-Godfrey LM test, Breusch-Pagan/Cook-Weisberg test, and residual normality test were performed. Statistical analyses were conducted using Stata 14.2.

Ethical approval

Ethical approval was not required because the study utilized publicly available, anonymized secondary data from the world development indicators database and did not involve human participants.⁹

RESULTS

The following section presents the major findings of the study through trend analysis, graphical interpretation, and econometric estimation to examine the long run relationship between the socio-economic factors and life expectancy in India.

Figure 1 represents the trajectory of population growth in the context of India. India has witnessed a population explosion over the passage of time. As revealed from the diagrammatic representation and scale of the growth,

initially it can be inferred that the population curvature has always been on an upward scale, although marked with some minor fluctuations which has slowed the momentum of growth. As referred from the data, it can be stated that the population of the nation during the commencement of the decade preceding the millennium stood somewhere at around 865 million. Over time, accumulating quantum of population explosion, it surpassed China to become the nation with the highest population with the population figure standing at 1.45 billion in 2024. The trend line equation viz. $y = 17.637x + 861.6$ proves the logic that, on an average the population of India during the time frame (1990-2024) kept increasing at around 17.64 million annually, which reveals the linear and upward projectile movement of the population curve in India.

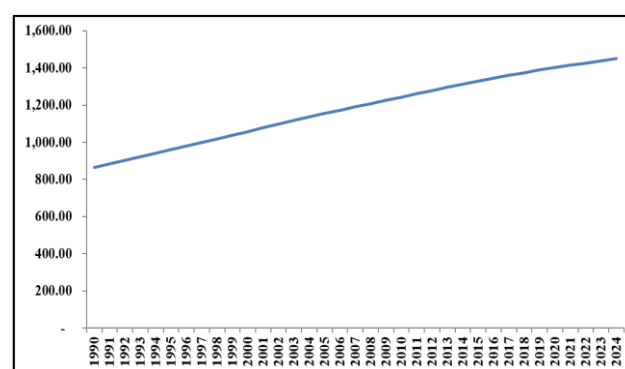


Figure 1: Population (in million).

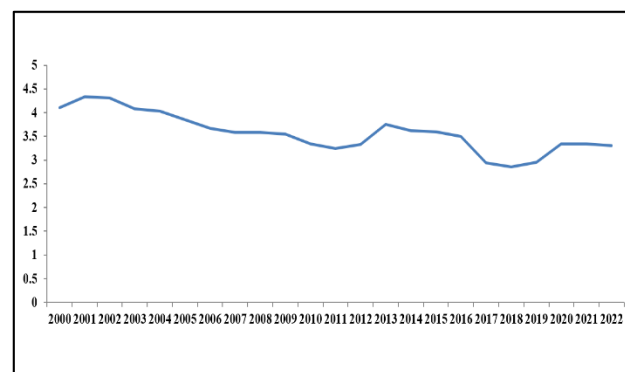


Figure 2: Current health expenditure (as % of GDP).

On account of absence of data, in case of the current health expenditure as percentage of GDP, the data set from 2000 was considered and the data for 23 years was analysed. From the Figure 2, it can be inferred that, the current health expenditure as percentage of GDP stood at around 4.1 percent during the millennial year. After that, witnessing the series of ups and downs, it has moved on a downward trajectory and as per the recent reports, it stood at 3.3 percent in 2022. Furthermore, from the trend line equation viz. $y = -0.0498x + 4.1731$, it can be further stated that on an average the current health expenditure as a percentage of GDP during the concerned time period kept declining by around 0.05 percent annually.

As inferred from the recent budgetary allocations, though there has been a slight increase in the allocations made towards health expenditure, but overall, as compared with the previous timeframes, it has moved on a downward trajectory.

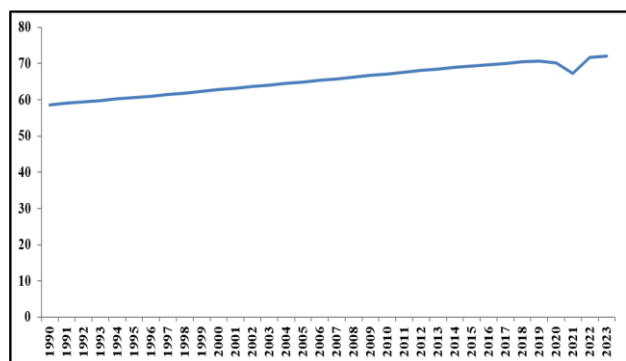


Figure 3: Life expectancy at birth (in years).

Life expectancy at birth, as a parameter has shown notable progress in performance over the passage of time. In 1990, when the economy was undergoing series of changes across the multiple domains, the life expectancy stood at 58 years. Over time, it has undergone noteworthy progress, which reveals the improvement in quality of health care services rendered, improvement in quality of life as well as standard of living. As per the recent figures, the life expectancy at birth stood at around 72 years, denoting an improvement of around 22 percent compared to 1990. From the trend line equation, it can be interpreted that, on an average, keeping everything constant, the life expectancy at birth in India, kept increasing by a margin of 0.39 years annually.

Moreover, it can also be stated that, although there has a fishy type of trend as revealed in the current health expenditure as percentage of GDP, but the life expectancy at birth, has improved over time, which uncovers the notable progress made across major associated sectors influencing life expectancy at birth, the prominent ones being, improvement in quality of life, standard of living, institutional deliveries, success of social insurance schemes, widening the reach of health institution, enhancing the quality of welfare schemes and many more.

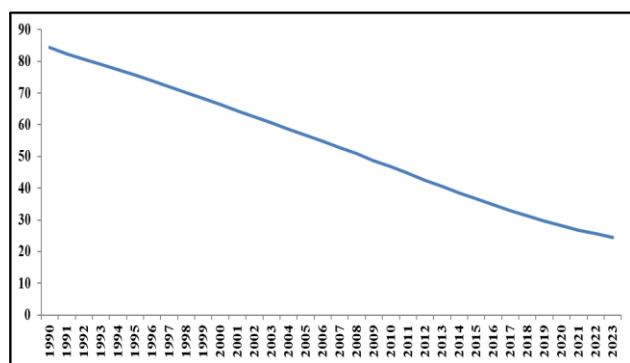


Figure 4: Infant mortality rate (per 1,000 live births).

Apart from life expectancy rates in India, infant mortality rates have also demonstrated significant progress over time. The graph of infant mortality rates records the highest fall over the period of time. During the commencement of the decade, preceding the millennium, the infant mortality rate was placed at 84 per 1000 live births. Over time, it has witnessed notable progress and as per the recent figures, it has reached to a new low of 24 per 1000 live birth in the year 2023, thereby recording a sharp decline of approximately 71 percent compared to the figures of 1990. As revealed by the trend line equation viz. $y = -1.8878x + 86.636$, it can be inferred that, on an average, keeping everything constant, during the concerned time frame (1990-2023), the infant mortality rates in India, kept declining by 1.88 per 1,000 live births annually. The trend reflects the nature of progress made in terms of ensuring proper child care, nutrition alongside the success of key schemes emphasizing improvement of mother and child care, the prominent ones being integrated child development scheme (ICDS), the increase in the intensity of proper institutional deliveries alongside progress in immunization, vaccination, and curbing the spread of communicable and infectious diseases.

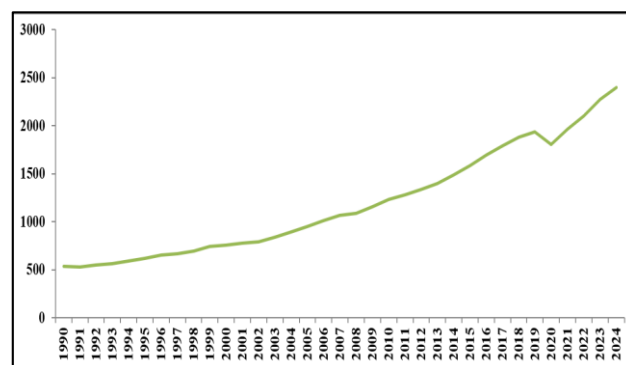


Figure 5: GDP per capita (constant 2015 \$).

As revealed from the trends, it can be stated that despite burgeoning population levels, and inherited limitations, GDP per capita (constant 2015 \$) has moved on an upward trajectory with the passage of time. From being an underdeveloped nation, rooted in the shackles of colonialism and the rooted maladies in the aftermath of independence, the nation managed to register a staggering growth in terms of per capita GDP over the period of time. The nation has been a pioneer in key movements ranging from green revolution, white revolution, flourishing telecommunication, service sector boom, shift in the engagement of the population towards employment from primary to secondary and tertiary sector. The nation successfully absorbed the shocks witnessed around the globe during key crises such as the global housing bubble burst, Asian financial crisis. Despite major shockwaves in the recent past, the most notable one being the COVID-19 pandemic, the nation has managed to grow positively. From the diagram, it can be inferred that the GDP per capita of the nation during 1990 was placed at around

\$537.88. Over time, there has been a mixed progress in GDP Per capita. Witnessing the cycles of ups and downs, as per the recent figures, the GDP per capita of India is placed at approximately \$2400. As revealed from the

trend line equation viz. $y = 52.985x + 235.95$, it can be stated that, keeping everything constant, on an average, the GDP per capita of India has increased by around \$53 annually.

Table 1: Correlation matrix.

	Population in million	Current health expenditure (% of GDP)	Out-of-pocket expenditure (% of current health expenditure)	Life expectancy at birth, total (years)	Mortality rate, infant (per 1,000 live births)	GDP per capita (constant 2015 US\$)
Population in Million	1					
Current health expenditure (% of GDP)	-0.84	1				
Out-of-pocket expenditure (% of current health expenditure)	-0.90	0.78	1			
Life expectancy at birth, total (years)	0.95	-0.84	-0.79	1		
Mortality rate, infant (per 1,000 live births)	-1.00	0.83	0.90	-0.95	1	
GDP per capita (constant 2015 US\$)	0.98	-0.82	-0.93	0.93	-0.99	1

Table 2: Descriptive statistics.

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
Life expectancy at birth (years)	23	67.26	2.64	62.75	71.70
Log of current health expenditure	23	1.27	0.12	1.05	1.47
Log of GDP per capita	23	7.15	0.33	6.63	7.65

Table 3: Augmented Dickey Fueller test.

Variables	Level ADF statistic	P value	First difference ADF statistic	P value	Order of integration
Life expectancy at birth	-1.074	0.7252	-6.236	0.0000	I(1)
Log of GDP per capita	-0.452	0.9011	Stationary after first differencing	—	I(1)
Log of current health expenditure	-1.498	0.5344	Stationary after first differencing	—	I(1)

Note: The augmented Dickey-Fuller (ADF) test was employed to examine the stationarity properties of the variables. Variables that became stationary after first differencing were considered integrated of order one, i.e., I(1).

After undertaking a systematic correlation analysis, it can be inferred that there is an existence of nexus and interconnectedness between levels of development and the health parameters. Essential elements such as the population size, GDP per capita as well as life expectancy form of tightly interconnected positive cluster while on the other hand, elements such as the infant mortality as well as out of pocket health expenditure form a contrasting negative cluster. The results clearly suggest that economic developments as well as systematic health financing mechanisms are clearly attached with improved health outcomes, while on the other hand, dependence on private health expenditure is closely linked to higher infant mortality as well as lower life expectancy.

However, the presence of extremely high levels of correlations among the key development indicators categorically indicate potential multicollinearity, thereby highlighting the critical need for initiating caution especially in multivariate regression modeling.

To further examine the interrelationship and long run impact of the selected socioeconomic variable on life expectancy in India, the study heads from trend and correlation analysis to econometric regression estimation using the ARDL-ECM framework.

Table 2 presents the descriptive statistics of the study variables for the period 2000-2022. It can be inferred that

the average life expectancy of India during the study period was 67.26 years. While on the other hand, the logged values of GDP per capita and current health

expenditure demonstrated moderate variations over the sample period, thereby indicating gradual economic and healthcare expenditure growth.

Table 4: ARDL-ECM estimation and bounds test results.

Variable / test	Coefficient/value	Standard error	t-statistic	P value / decision
ARDL-ECM estimation				
Adjustment term [ECT(-1)]	-1.066	0.222	-4.79	0.000***
Long-run coefficients				
Log of GDP per capita	6.850	0.952	7.20	0.000***
Log of current health expenditure	-2.222	2.675	-0.83	0.417
Constant	22.488	11.581	1.94	0.068*
Model statistics				
Model specification	Ardl (1,0,0)	—	—	—
Number of observations	22	—	—	—
R ²	0.5609	—	—	—
Adjusted R ²	0.4877	—	—	—
Root MSE	0.8245	—	—	—
Bounds test for cointegration				
F-statistic	7.665	—	—	—
t-statistic	-4.792	—	—	—
Critical bounds values				
10% significance level	I(0)=3.582; I(1)=4.703	—	—	Reject H ₀
5% significance level	I(0)=4.517; I(1)=5.830	—	—	Reject H ₀
1% significance level	I(0)=6.886; I(1)=8.673	—	—	Inconclusive

Null hypothesis (H₀): No long-run relationship exists among the variables. Note: ***p<0.01, **p<0.05, *p<0.10.

Table 5: Diagnostic test results.

Diagnostic test	Null hypothesis	Test statistic	P value	Decision
Breusch-Godfrey LM test	No serial correlation	$\chi^2=2.509$	0.1132	Fail to reject H ₀
Breusch-Pagan/Cook-Weisberg test	Constant variance (homoskedasticity)	$\chi^2=0.290$	0.5910	Fail to reject H ₀
Skewness/Kurtosis normality test	Residuals are normally distributed	$\chi^2=27.470$	0.0000	Reject H ₀

The ADF unit root tests results revealed that life expectancy, logged GDP per capita, and logged current health expenditure were non stationary at level. However, all the variables became stationary after first differencing, indicating that the variables are integrated of the order one, I(1). As the variables demonstrated mixed integration properties which were suitable for ARDL estimation and none of the variables were integrated of the order two, the ARDL bounds testing approach was considered appropriate for empirical analysis.

The ARDL ECM model [ARDL (1,0,0)] (Table 4) uncovered the existence of significant long run relationship between life expectancy, GDP per capita, and current health expenditure in India. The model explained nearly 56.09 percent of the variation in life expectancy (R²=0.5609), while the adjusted R² value of 0.4877 reflects moderate explanatory power. The error correction term [ECT (-1)] was negative and continued to be

statistically significant. This confirms the long run equilibrium and the rapid adjustments towards equilibrium. The logged GDP per capita positively influences life expectancy, while the logged current health expenditure demonstrates a negative and statistically insignificant relationship. Besides the root MSE value (0.8245) suggests a reasonable model fit.

The ARDL bounds test (Table 4) confirmed the existence of a long run relationship between life expectancy, GDP per capita, and current health expenditure in India. The computed F statistic (7.665) exceeds the upper bound critical values at both 10 percent and 5 percent significance levels. This leads to the rejection of the null hypothesis of no cointegration. Although the results tend to remain inconclusive at 1 percent level of significance, the statistically significant t statistic value (-4.792) further supports the presence of a long run equilibrium among the variables. Thus, the findings validate the suitability of

the ARDL framework for examining the long-term determinants of life expectancy.

The diagnostic test (Table 5) results confirmed the sufficiency of the estimated ARDL model, The Breusch-Godfrey LM test indicated the absence of serial correlation in the residuals, while on the other hand, the Breush-Pagan/Cook-Weisberg test confirmed homoskedasticity. Although the residual normality test suggested deviation from normality, the model was considered to be econometrically acceptable, given the small sample size and the satisfactory performance of the remaining diagnostic tests.

The findings of the study revealed that economic growth significantly improves life expectancy in India, while on the other hand, healthcare expenditure solely doesn't necessarily translate into better health outcomes without broader structural and institutional improvements.

DISCUSSION

The study examined the socioeconomic determinants of life expectancy in India using secondary data obtained from the WDI database.⁹ The findings uncover a steady improvement in life expectancy in India over the study period, accompanied by declining infant mortality and a sustained rise in GDP per capita. The trends reflect gradual improvements in socioeconomic and public health conditions in India and are consistent with earlier studies reporting a positive linkage between economic development and life expectancy.^{1,4,7,13}

Additionally, the econometric analysis revealed that GDP per capita positively influences life expectancy, while on the other hand, current health expenditure was not statistically significant. Our findings align with the previous studies which state that economic growth improves health outcomes by enhancing nutrition, sanitation, healthcare accessibility, and living standards.^{1,4,10} However, unlike previous set of important studies which revealed a positive association between healthcare expenditure and life expectancy, the current study didn't observe a statistically significant relationship.^{1,2,17,20} This may indicate that healthcare expenditure doesn't necessarily improve life expectancy unless it is accompanied with effective governance, equitable access to healthcare, and efficient utilization of vital resources.

Besides, the substantial decline in infant mortality rates during the study period alongside improvements in life expectancy rates uncover the necessity of strengthening maternal and child healthcare services and primary healthcare systems. The findings also align with previous studies which state posit decline in infant mortality serves as an important enabler for enhancing life expectancy.^{5,6,22} Overall, the findings suggest that improvements in life expectancy rates need coordinated efforts from the diverse players of the health care

ecosystem in order to promote economic growth, strengthen healthcare delivery, and improve equitable access to healthcare services.

CONCLUSION

The present study examined the socioeconomic determinants influencing life expectancy in India through a linear trend analysis and econometric analysis utilizing time series data derived from the world development indicators (WDI) database of the world bank.⁹ The findings uncover substantial improvements in life expectancy alongside significant reductions in infant mortality and notable progress in GDP per capita over the study period. The uncovered trends highlight gradual progress in public health conditions, healthcare accessibility, and broader socioeconomic developments.

The findings derived from the ARDL-ECM framework confirm the existence of long run relationship between life expectancy, GDP per capita, and current health expenditure. In addition, it can be stated that economic growth plays a crucial role in improving life expectancy by enhancing nutrition, sanitation, healthcare accessibility, living standards, and overall quality of life. However, current health expenditure alone was found to demonstrate an insignificant relationship with life expectancy. This suggests that increased spending on healthcare without efficient public health governance, equitable healthcare accessibility, and effective institutional delivery mechanisms doesn't necessarily translate into improved population health outcomes.

Therefore, the study concluded that sustainable improvement in life expectancy and public health outcomes in India require economic advancement alongside strengthening primary healthcare systems, reduction in infant mortality, equitable healthcare infrastructure, improved public health financing, and inclusive policy support mechanisms aimed at reducing socioeconomic and regional inequalities.

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REFERENCES

1. Dekaraja D, Hanse M. Investigating the nexus between government health expenditure and growth across SAARC nations. Research Square; 2026.

2. Patel V, Kalita A, Furtado KM, Mor N, Bhadada S, Albert S, et al. The Lancet Commission on a citizen-centred health system for India. *Lancet*. 2026.
3. Zhang H, Qiao H, Gu X, Uddin I, Li X, He Z, et al. Impact of air pollution on life expectancy: The role of digitalization, urbanization and institutional quality in BRICS economies. *Front Public Health*. 2026;14:1681381.
4. Felice E, Pujol Andreu J, D'Ippoliti C. GDP and life expectancy in Italy and Spain over the long run: a time-series approach. *Demogr Res*. 2016;35:813-66.
5. Parmar M, Chandrapal S. Maternal and infant mortality: A review of determinants, trends and health care services utilization. *Indian J Soc Work Educ Pract*. 2026;3(2):42-8.
6. Karunarathne M, Buddhika P, Priyamantha A, Mayogya P, Jayathilaka R, Dayapathirana N. Restoring life expectancy in low-income countries: The combined impact of COVID-19, health expenditure, GDP, and child mortality. *BMC Public Health*. 2025;25:894.
7. Anantharaman SK. Prime determinants that influence life expectancy: an analysis across Indian states using multiple regressions. *Indian J Econ Dev*. 2017;5(7):1-7.
8. Singariya MR. Principal component analysis of socioeconomic factors and their association with life expectancy in India. *J Econ*. 2013;113:163-72.
9. World Bank. *World Development Indicators*. Washington (DC): World Bank; 2026.
10. Okpako OL, Awoyemi BO, Babalola OO. Examining the effect of health outcomes on economic growth in selected developed and developing countries. *ARPHA Preprints*. 2026.
11. Verma PK, Giri AK. Empirical evidence on the impacts of climate change on sustainable economic growth in India. *Discov Sustain*. 2026;7:512.
12. Kulkarni S, Anjali R. The impact of population growth on development economics: a case study of India. *Sankalpa Int J Manag Decis*. 2025;11(2):20-6.
13. Gazilas ET. Factors influencing life expectancy in low-income countries: a panel data analysis. *J Appl Econ Res*. 2024;23(3):580-601.
14. Jayadev A, Tripathi A. Growth, employment, productivity and demographics in Indian states: Lessons from an accounting decomposition. CSIE Working Paper No. 4. Bengaluru: Centre for the Study of the Indian Economy, Azim Premji University. 2026.
15. Arora H, Patil S, Bhatia P, Khajanchi M, Sarang B, Nathani P, et al. Out-of-pocket expenditure in patients with isolated traumatic brain injury: A two-center cohort study, a preliminary report. *Cost Eff Resour Alloc*. 2026;24(16):1-8.
16. Immanuel T, Thomas BM, Salins N, Sundararaj JJ, Gursahani R. Healthcare burden and impoverishment among older adults with palliative care needs in India: findings from a nationally representative study. *BMC Palliat Care*. 2026;25:82.
17. Rahman MM, Dyuti TI, Tareque M, Alnour M. Health expenditure, governance and SDG3 nexus: A longitudinal analysis in BRICS economies. *Glob Health*. 2025;21:18.
18. Chhotaray A, Sahu KK. Health care expenditure and its impact on demographic indicators in India: an econometric analysis of IMR, LER, and birth-death dynamics. *Soc Sci Rev*. 2025;3(4):332-8.
19. Mariappan R. Impact of social sector expenditure on the economic growth of North-Eastern states of India. *Indian J Appl Bus Econ Res*. 2026;7(1):171-96.
20. Kittipittayakorn C. Association between healthcare resources, healthcare systems, and population health in European countries. *BMC Health Serv Res*. 2025;25:720.
21. Acharya S, Mathur MR, Tadakamadla SK, Brand A. Linking health financing to oral health coverage and disease burden in SEARO countries: A cross-sectional analysis of country level data. *Int J Health Plann Manage*. 2025;41(1):47-58.
22. Das U, Behera S. Burden of neonatal and infant mortality in relation to mother's age at birth: a regional analysis based in Odisha. *Discov Public Health*. 2026;23:141.
23. Kalsi P. Measures of son preference and the treatment of girls in India. *J Popul Econ*. 2026;39(2).
24. Dhakad M, Striessnig E, Saikia N, KC S, Lutz W. For reducing premature adult mortality in India, education matters more than income. *Proc Nat Acad Sci USA*. 2026;123(6):e2503809123.
25. Yeung C, Chung L. Technology, institutions, and longevity: an empirical analysis of AI investment and life expectancy in the OECD. *J Policy Options*. 2025;8(3):17-29.
26. Zhang H, Zhan Y, Chen K. Do education, urbanization, and green growth promote life expectancy? *Front Public Health*. 2025;12:1517716.
27. Sahu N, Mishra MM, Rathore YS, Kumar A, Kesharwani R, Varun A, et al. Multidimensional health vulnerability assessment of North East India. *Discov Public Health*. 2026;23:161.
28. Nugraha FS, Relaksana R, Fadhlurrahman A, Jaelani FR. Evaluating environmental variables in determining health spending: a case study on temperature, rainfall and environmental quality index in the context of CHE (Catastrophic Health Expenditure) 10%. *AKADEMIK J Mhs Ekon Bis*. 2026;6(1):41-51.
29. Ridwan M, Antor ZA, Akther A, Ko J, Fakher HA, Leung CK, et al. Heterogeneous associations of health expenditure, environmental pollution, and economic growth on life expectancy in BRICS economies. *Front Public Health*. 2026;14:1767163.
30. Shin TW, Ling GHT, Rusli N, Heng TH, Poh TK, Faisal S, et al. Factors influencing life expectancy: Global evidence from 125 countries. *Int J Built Environ Sustain*. 2025;12(2):17-28.

31. Bayar Y, Gavriletea MD, Pintea MO, Sechel IC. Impact of environment, life expectancy and real GDP per capita on health expenditures: Evidence from the EU member states. *Int J Environ Res Public Health*. 2021;18(24):13176.

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