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The role of health for achieving sustainable development of India

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Abstract
Healthcare is essential for human development. This study examines the impact of health indicators, such as Life Expectancy and Infant Mortality Rate, on the Human Development Index [HDI] for the years 2011-2020, and 2023-24. The study revealed that Life Expectancy has a positive impact, and the Infant Mortality Rate has a negative effect on the HDI.

This paper also examines the relationship between the Human Development Index and the Sustainable Development Goal Index. A strong positive relationship was observed between the HDI and the SDGI, which indicates that improvement in human development contributes to overall Sustainable Development Goals progress. The findings suggest that Government initiatives and policy implementation can help to reduce maternal mortality and infant mortality rates and accelerate India's progress towards Sustainable Development Goal 3 (Health and Well-being) and Sustainable Development.

Keywords: Health, health indicators, human development index, sustainable development

Introduction
Health is a critical factor that directly impacts human development, economic growth, and social well-being. In the context of India, an increasing population requires more productivity, which will contribute to overall national and Sustainable Development.

Recognising these imperatives, in 2015, the United Nations launched the Sustainable Development Goals (SDGs) to address the environmental, political, and economic challenges faced by the world. India is one of the member countries, so it is necessary to achieve Sustainable Development Goal 3: Good Health and Well-being. The government has given this opportunity to NITI Aayog to coordinate, monitor, and implement the Sustainable Development Goals (SDGs) objectives in India.

Despite commendable efforts, India continues to face challenges in achieving the SDG 3 target and still needs to make progress on regional disparities, infrastructure, quality health services, and affordability.

Nevertheless, the Government of India has introduced many schemes, such as Aayushman Bharat and the National Health Mission, to reduce infant mortality and maternal mortality rates, reduce poverty and disparities between rural and urban areas, and improve life expectancy, human development, and health facilities, which will help strengthen Sustainable Development Goal 3 and will be directly linked to the Sustainable Development of India.

Therefore, this study explores the relationship between health indicators and the human development index, analysing how improvements in public health can accelerate progress toward sustainable development outcomes and, ultimately, the broader achievement of the SDGs in India.

Review of Literature
The literature reviewed in this study highlights various dimensions, such as the impact of COVID-19 on healthcare, national health policy, communicable and non-communicable diseases, and yoga. Most of the study focused on the relationship between health indicators, the ranking human development index, and the importance of the sustainable development index.

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Sr. No.	Research paper	What they researched	Major Findings	Conclusion
1	Khetrapal and Bhatia (2020) [1]	Impact of COVID-19 pandemic on the health system & Sustainable Development Goal 3	COVID-19 exposed weaknesses in child health services, disease control, and emergency response systems.	Strengthening healthcare systems is vital to sustaining progress on SDG 3
2	Shabnam et.al (2022) [2]	India's performance in achieving the targets of Sustainable Development Goal 3 and the National Health Policy 2017 based on NFHS data	Progress seen in maternal health and antenatal care; infant mortality target not yet met.	Policy implementation needs to focus more on reducing infant mortality
3	Anju et.al (2023) [3]	Role of Decentralisation, health, and Sustainable Development Goal 3 in Kerala	Positive impact of local governance on healthcare policy on implementation	Decentralisation enhances the effectiveness of SDG initiatives
4	Tamanna and Aarti (2023)	India's Health Dynamics around SDG 3: Challenges, Expanding Health Dimensions, Preventative Healthcare Opportunities, and Feminine Health Promotion	Identified challenges in modern healthcare and emphasized the importance of e-health literacy and holistic health	Integrating modern and traditional health systems can support SDG 3 progress
5	Kumar and Singh (2024) [5]	SDG3, Good Health, and Well–Being: Status, Achievement, and Yoga Strategies.	Yoga can help prevent CDs and NCDs, mental health affected post-COVID for region Asia-Pacific	Yogic and wellness-based strategies can support regional SDG 3 goals

Research Gap

This research will examine an analytical study of Sustainable Development Goal 3: Good Health and Well-being for Sustainable Development of India.

It will mainly focus on the relationship between the performance of India's Health indicators and the Sustainable Development Goal Index.

Objectives

The paper evaluates and analyses the health Indicator of Sustainable Development Goal 3: Good Health and Well-being of India.

Research Methodology

This research used secondary data, which is based on time series trends. For analytical purposes, the period of 2011 to 2023 is considered.

- The variables used for the study are life expectancy, maternal mortality rate, infant mortality rate, and Sustainable Development.
- The data sources comprise: a) NITI Aayog (SDG index of India) and b) other research papers and journals.
- Techniques to be used for the study like: trend analysis by using time series data, correlation analysis, and regression analysis.

Data Analysis and Interpretation

To evaluate and analyse the Health Indicator of Sustainable Development Goal 3: Good Health and Well-being of India

Table 1: Trends of SDG 3 and SDG Index

Year	SDG3	SDG index
2018	52	57
2019-20	61	60
2020-21	74	66
2023-24	77	71

Source: Niti Aayog, SDG India Index Report

Table 1 and Graph 1(a) represent the trend analysis of the Sustainable Development Goal 3 Index and Sustainable Development Index for the period 2018 to 2023-24.

It shows that the SDG 3 index has improved and reflects the progress of Health and Well-being over the years.

During the period 2018 to 2020, the index shows significant improvement, rising to 61 in 2019-20, from 51 in the year 2018. This explains that positive policy and government intervention helped to improve health outcomes.
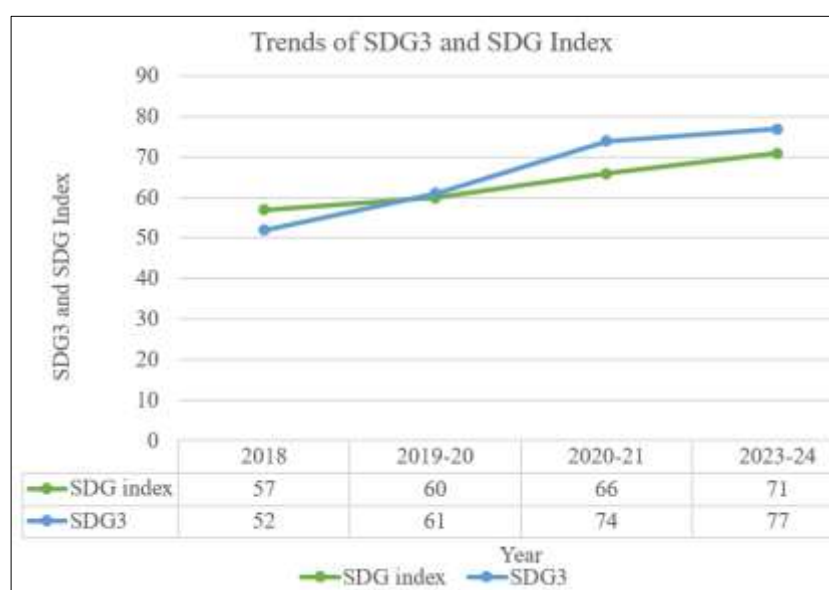

Fig 1(a): Trend Analysis of SDG 3 and SDG Index (2018 to 2021 and 2023-24)

- Similarly, graph 1(a) shows that during the period 2019-20 to 2023-24, the index increased to 77, from 52 (2018), reflecting strong progress in health indicators and government initiatives. This indicates that the government's consistent efforts to achieve the targets of SDG 3 in India are quite achievable.
- The overall SDG Index, which was 57 in 2018, rose continuously to 60 during the period 2019-20 to 2023-24.
- Therefore, overall suggests that health-related policy and government interventions have improved health and well-being over time. However, it still requires continuous investment and policy enhancements to overcome the challenges and maintain sustainable development and growth in India.

B-Regression Analysis Human Development Index with the Health indicators like Infant Mortality rate, and Life Expectancy

Table 2: Trends of HDI, LE, and IMR for Years 2011-2020

Year	HDI (Y)	LE (X1)	IMR (X2)
2011	0.586	67.36	43.23
2012	0.594	67.89	41.16
2013	0.6	68.46	39.08
2014	0.611	69.07	37.67
2015	0.619	69.64	36.25
2016	0.63	70.12	34.83
2017	0.636	70.47	33.42
2018	0.636	70.71	32
2019	0.638	70.91	30.92
2020	0.638	70.15	29.85

Source: Open World Bank Data

Table 2 evinces that HDI has improved marginally, and it was around 0.63 on average during the period under study. Life Expectancy, which was 67.36 in 2011, increased to 70.15 in 2020. This indicates a sharp increase of approx. 2 percent. Similarly Infant mortality rate has shown a continuous decline from 43.23 to 29.85, which indicates a positive trend to achieve sustainable development goals.

To find out the trend pattern, the study used the above data [Table 2]. It is evident from R-value that there is a significant improvement in health and well-being

Multiple R	**0.9939**
R square	0.988
Adjusted R-squared	0.982
Standard error	0.002664
.Observation	10

Table 3: Anova table

Source	Df	
Regression	2	F-stat = 242.46
Residual	7	F- significance = 3.43
Total	9	

Table 4: Coefficients table

Variable	Coefficient	T stat	p-value
Intercept	0.0189	0.102	0.921
Life Expectancy (X1)	0.00930	4.0991	0.004
Infant Mortality Rate (X2)	-0.00184	-2.8430	0.025

It represents,
$y = \beta 0 + \beta 1 X1 + \beta 2 X2 + e$

Were, γ = Human Development Index,
$\beta 1$ and $\beta 2$ = regression coefficients, $X1$ = Life Expectancy, $X2$ = Infant Mortality Rate, e = Error

Therefore, it also represents
$y = \beta 0 + \beta 1 X1 + \beta 2 X2 + e$
$y = 0.0189 + 0.00930(LE) + (-0.00184)(IMR) + e$

Interpretation
- The R value is 0.988, which explains 98.8% of the variation in HDI, indicating a very strong fit. The ANOVA Table 3 results also confirm that a high F-value means that the regression model is highly significant. Therefore, the independent variables collectively have a significant impact on the HDI.
- From the Coefficient table, p-values < 0.05 indicate that both Life Expectancy and infant mortality rate are individually significant predictors and also show that life expectancy has a strong positive impact on HDI, and Infant Mortality Rate has a significant negative impact on HDI, which reduces IMR and improves HDI.
- Overall, the predictors (LE and IMR) together explained most of the variation in the HDI.

C-Correlation analysis of HDI and SDG Index for 2018 to 2021, 2023-24

Table 5: Trend of HDI and SDG Index for the year 2018 to 2021, 2023-24

Year	HDI (X)	SDG index (Y)
2018	0.636	57
2019-20	0.638	60
2020-21	0.638	66
2023-24	0.644	71

Source: UNDP report, SDG India Index Report

Table 5 and Table 6 represent Trend and Correlation analysis of HDI and SDG Index for year 2018 to 2021, 2023-24

Table 6: Correlation analysis of HDI and SDG Index

	HDI (X)	SDG index (Y)
HDI (X)	1	
SDG index (Y)	0.893683649	1

- The correlation between HDI (X) and SDG Index (Y) is 0.89, which indicates a highly positive relationship between the independent variable and the dependent variable. Therefore, an increase in HDI improves the SDG Index.
- It concludes that achieving a higher HDI can act as a driver for overall Sustainable Development in India.

Major Findings
- To focus on the importance of Health Indicators.
- To relate the SDG Index and the Human Development Index of India.

Conclusion
- There is a strong relationship between Human Development and the SDG Index
- India has made significant progress in healthcare through various policies and initiatives that can accelerate human development, contribute to an

equitable society, and achieve sustainable development in India.

Limitations
- This study only considers health as an important factor in human development, and neglects education and income.
- Health remains important, but more investment is needed in health facilities, infrastructure, and other social policies.
- Therefore, the Government of India needs to overcome challenges such as inequality, infrastructure gaps, and socioeconomic disparities etc.

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