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Analyzing the Impact of Health Spending Per Capita on Life Expectancy, Immunization, Fertility, and Nourishment in India: A Multi-Year Correlational Study

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Abstract

The paper examines the associations between critical health outcomes and health spending per capita in India concerning life expectancy, DPT immunization coverage, fertility rate, and Nourishment between 2016-17 and 2021-22. The research uses correlational analysis to explain the effects of financial investment on health through secondary data from authoritative sources in the country. The results indicate a strong positive relationship between per capita health spending and both life expectancy and immunization coverage, emphasizing the need to sustain healthcare funding to improve longevity and preventive care. The correlation between health expenditure and fertility rate shows a moderate negative relationship, reflecting the impact of health investments on population and reproductive health. Interestingly, a positive correlation was found between health spending and Nourishment. These findings highlight the complexity of health financing and emphasize the need for more comprehensive social policies to address it. The study provides evidence on how policy can be used to allocate health spending effectively, aiming for equitable health gains and sustainable development in India.

Keywords: Health spending per capita, Life expectancy, DPT immunization, Fertility rate, Nourishment, India

INTRODUCTION:

Health spending per capita is a key determinant of population health in the world and India is one of the key case studies of studying such dynamics due to its massive diverse population and developing healthcare. The correlation between health investment and some vital health indicators like life expectancy, immunisation coverage, fertility rate, and nutritional status has deep implications on the policy of the public health, service delivery, and socioeconomic development. In the context of India, where health access and outcomes inequalities are severe both across states and regions, the study of such relationships is necessary to inform the latter in terms of equitable distribution of resources and effective governance of health. Nevertheless, India has been experiencing remarkable changes in the most vital health indicators over the last few decades, and it still faces some difficulties because the country experiences the epidemiological and demographic transitions peculiar to developing economies. One of the summary measures; life expectancy at birth, which indicates the number of years a newborn is likely to survive in the current mortality patterns, has demonstrated continuous positives increase in line with advances in healthcare access, sanitation and socioeconomic status. Recent government initiatives

and more government expenditure in health are trying to fast track these benefits, focusing on universal health care and greater immunisation initiatives. However, disparity in the life expectancy amongst states is still extreme, and thus it shows how disproportional health spending and systemic inequalities in service provision have affected the lives of Americans.

The association between life expectancy and health spending in each capita is multi-factorial and difficult. Health expenditure includes investment on the infrastructure, labour force, preventive and curative services and community health programmes. Gradual declines in communicable diseases and improvements in maternal and child health, which have been associated with increased life expectancy in India, have been attributed to increasing per capita spending on health by government and out-of-pocket. South Asian empirical evidence indicates that positive relationships between health expenditure and agedness are mediated by income levels, education and efficiency of health systems. The aspects not only determine access to healthcare but also health-seeking behaviour and adherence to healthy practises that have a cumulative effect in increasing lifespan. This study, therefore, attempts to critically analyse the robustness and character of the connexion between health spending per capita and life expectancy in the Indian context bearing in mind that life expectancy is one of the important indicators of population welfare and the functioning of the health sector. Another important health outcome that depends on the level of health spending is immunisation coverage especially that of vaccinations such as Diphtheria-Pertussis-Tetanus (DPT). One of the largest in the world, the Universal Immunisation Programme in India has significantly increased vaccine coverage over the years dramatically decreasing childhood morbidity and mortality due to vaccine preventable diseases. The greater financing of immunisation infrastructure, cold chain maintenance, training of healthcare workers, and outreach to communities leads to more immunisation. Nevertheless, even when the situation has improved, there are still low-coverage pockets, which occur due to geographic, socio-cultural, and economic factors. The rationality of the health spending per capita and the coverage of DPT immunisation is the core aspect of the policymaking because immunising is not only a cost-saving preventive health measure, but also an indicator of the efficiency and accessibility of the health system in its entirety. This paper will examine this relationship to inform specific investments to achieve the best immunisation results. India has also seen a significant change in terms of fertility rate, although in the 1970s it was above five births per woman, of late it has dampened to a figure of slightly over two children per woman. This drop is attributed to the fact that women have become healthier, better educated and they have more access to contraception and reproductive health services, areas that have been directly influenced by investments made in the health system. Public health expenditure is known to fund family planning, antenatal and postnatal services and maternal health services which have reduced fertility rates and enhanced reproductive health. The implications of fertility reduction are far-reaching towards economic growth, ageing of population and demand in a health system. Exploring the relationship between the per capita health expenditure and fertility rate variation can provide information on the success of health policy in promoting demographic transition in the diverse socio-cultural backgrounds of India. Adequate intake of foodstuff, which is known as nourishment, is a major health issue of concern to the populace in India especially those who are vulnerable like the children and women in the rural communities. Malnutrition weakens the immune system, growth and health and exposes individuals to vulnerability to infectious diseases and chronic illnesses. Health expenditure per capita also leads to nutritional results by providing finances to integrated health and nutrition, maternal and child health, and multi-sectoral strategies on food security and sanitation. Nourishment is a complicated issue that needs joint effort between the social determinants of health in terms of addressing it, instead of just investing in the health sector. This paper will evaluate the relationship between health expenditure rates and Nourishment prevalence, which will help to understand the role of health financing in fight against malnutrition in diverse regions of India. Although economic growth in India and proportionate rise in health spending have been seen on the overall economic growth, the proportionate increase in spending on health has not been very high, and the out of pocket financial burden has remained as a constraint factor on access to equitable healthcare. Poor healthcare facilities in the rural regions, a shortage of workforce, a disjointed system of delivering services, and socio-economic disparities are some of the structural and systemic causes that make health spending difficult to translate into better results. The differences in state-level health

budgets and expenditure efficiency also result in a variety of impacts on population health, requiring local analyses. The most recent policy plans include the National Health Mission and Ayushman Bharat which aim to improve the financing of the population health, improve primary healthcare, and cover the catastrophic healthcare costs. It is still crucial to evaluate the effect of these programmes on the relationship between the spending of health and the focal health indicators. In addition, the COVID-19 pandemic highlighted the importance of resilient health systems and sufficient health financing as essential in providing the necessary services despite the existence of the public health emergency. It is on the basis of these complexities that this study will offer a thorough empirical evaluation based on India that can be used to evaluate the relationship between health spending per-capita and four health outcomes which include life expectancy, DPT immunisation coverage, fertility rate, and Nourishment. With a clear systemic investigation of these associations, the study aims to enlighten policymakers on the best way to invest in health to achieve equitable and efficient healthcare, which will play a role in enhancing health and socio-economic development of the population. This kind of understanding will be instrumental in the development of evidence-based policies that will bridge the gaps in health disparities and increase system sensitivity and eventually the quality of life of the various people of India.

LITERATURE REVIEW:

Motivation in education In the study by Alhassan et al. (2021), the authors tested the hypothesis about the contribution of life expectancy, death rates, and public health expenditure to economic growth based on the COVID-19 pandemic in Nigeria. Using time-series and applying an autoregressive distributed lag model, the research demonstrated a large and positive long-run impact of life expectancy on economic growth, and a negative impact on death rates on economic growth. The complex relationship between health metrics and economic performance during pandemic conditions did not show any significant direct effect on the public health expenditure. The authors concluded that improvement of life expectancy and mortality reduction are a significant impact on economic resilience in health crisis. Tripathi et al. (2020) undertook a cross-sectional survey on the awareness and preparedness of COVID-19 among south-west Saudi Arabia healthcare workers and residents. The conducted study relied on structured questionnaires and statistical analysis to demonstrate that the awareness levels and the level of adherence to preventive measures were high with a particular focus on healthcare professionals and educated participants. The study came up with education and profession as good predictors with regard to preparedness and knowledge, and it is important to note that specific health education is required to enhance knowledge and resiliency against pandemics and community health. Ten years after its introduction, the World Health Organisation (2016) examined the Abuja Declaration to assess the progress of the commitments on the funding of public health by African countries. This policy-based report identified ongoing weaknesses in reaching the desired goal of 15% national budgets to be allocated to health, whereby the shortfall was seen to be overall yet some countries have been performing better. The review highlighted the need to have a long-term political commitment and proper resource management in order to achieve health system strengthening and enhanced health outcomes throughout the continent. Van den Heuvel and Olaroiu (2017) provided a comparative European analysis to measure the significance of the health care expenditure on the life expectancy. Based on the panel data and regression models that had to consider country-specific effect, the authors demonstrated that there was a positive and significant relationship in which the increase in healthcare consumption led to improvements in life expectancy. They also stressed that expenditure is crucial, but the resource utilisation efficiency, as well, is a determinant of health outcomes, implying that policy interventions must target both the level of expenditure and the efficiency of the health system in delivering health outcomes. Galvani-Townsend et al. (2022) conducted an international examination of the superiority of life expectancy in states with publicly financed health care, including the information on health care accessibility and social determinants. The multivariate regression methods employed by them showed that publicly funded healthcare is associated with increased life expectancy even after accounting socioeconomic factors. It was found that universal public health care plays a significant role in longevity through enhancing equitable access and solving social determinants of health, which benefits the policy advocacy of increasing funding to public health care globally. Kontis et al. (2017) estimated the future

life expectancy in 35 industrialised countries based on a Bayesian model ensemble methodology of investigating past mortality statistics. They project that their life expectancy will keep on rising until 2060 but point to the growing disparities among nations. The paper highlighted the role of health policies, socioeconomic status, and technological advancements on the trend in longevity and recommended the use of specific interventions in the effort to eliminate the disparities to remind the policymakers of the anticipated demographic changes to make in future planning. In their study, Bein et al. (2017) analysed panel data to examine healthcare expenditure and health outcomes in selected countries in the East African region. Their results show that there exists a strong positive relationship between healthcare spending and life expectancy, and high neonatal, infant, and under-five mortality rates are associated with higher healthcare spending. Gender specific analysis indicated greater responsiveness of female life expectancy to increments of healthcare expenditure. The authors suggested that healthcare investments should be given priority to deal with child mortality and maintain gains in health in the region. World Health Organisation (2022) has released its annual report on the World Health Statistics, which summarises the health outcomes of the world and shows the trends in life expectancy, burden of diseases, and performance of the health system. The report reiterated the beneficial effect of high health expenditure and universal health cover on the health of the population. It suggested faster investments in social determinants and health systems to achieve sustainable development objectives by working on persistent inequities in the world. Mosadeghrad (2014) conducted the literature synthesis of factors that affect the quality of healthcare services, with organisational, human resource, and systemic factors being identified as determinant ones. Methodological procedures involved extensive literature search with particular emphasis on patient satisfaction, process efficiency as well as service outcome. The researchers concluded that to increase the service quality, managerial and policy-level interventions are integrated to increase the effectiveness of healthcare delivery. Singh (2014) examined the connexion between population health and public health spending in the cross-national datasets and regression model. The results showed that increased government health spending leads to greater mortality rate and better health outcomes in terms of life expectancy especially when spending focuses on prevention and primary care services. The study highlighted the effective distribution and augmented expenditure as channels to improve the population health results at the individual level. In the United States, McCullough and Leider (2016) utilised the county-level data to examine the relationships between government healthcare and non-health expenditure and health ranking changes. Using multivariate regression analysis, they discovered that investments both in the healthcare and social determinants sector have a positive correlation with the outcome of health. They end by proposing the adoption of combined fiscal policies that are health and social services expenditure as a way of ensuring that the community health is improved. In their article, Stubbs et al. (2017) aimed to examine the impact of International Monetary Fund conditionality on government spending on health in 16 West African countries through cross-national panel data analysis. The authors conducted fixed effects regression that revealed that austerity measures enforced by IMF related to reduced government spending on health, which may compromise the quality and access to health services. The paper claimed that the fiscal policies in global financial agreements were to be re-evaluated to protect sustainable funds in the developing countries towards financing of health. In their article, Ray, and Linden (2020) explored the nexus of health spending, life expectancy, and child mortality using dynamic panel data analysis using international data. Their econometric study proved that the higher the spending per capita on health, the higher the life expectancy and the decrease in child mortality rates in the world. The authors focused on health investment as one of the major determinants of the improvement of the public health and suggested the long-term and specific funding to ensure the positive development of the health outcomes. In the study by Odior (2011), a computational general equilibrium micro-simulation model was utilised to determine how the government expenditure on health affects long wave economic cycles and economic growth in Nigeria. The authors discovered that a greater expenditure on the health of the population leads to economic growth by boosting labour productivity and lowering mortality. The outcomes of the simulation have shown that it is essential to maintain investments in health to have long-term economic stability and development in the context of resource constraints. In the study, Nurudeen and Usman (2010) performed time-series econometric analysis of government spending and economic growth in Nigeria in the period between 1970 and 2008 using the time-series econometric analysis method.

According to their findings, the number of health sector spending on health economic growth is positive though the change is dependent on the expenditure components. They also concluded that proper allocation of expenditure on health services would enhance growth potential and the welfare of the society. In a study on the relation between health outcomes, economic growth and public health expenditure, Edeme and Olisakwe (2019) utilised time series data through econometric analysis to study its relation with economic growth in Nigeria. Their research showed that the positive effects of higher public health spending to the economic growth are that it beneficial affects health outcomes (lower mortality rates and longer life expectancy). The authors concluded that sustainable economic development is not possible without strategic investments into the health sector and suggested the policy actions to improve health financing in order to improve the welfare of society. The study by Nwani and Kelikume (2019) examined the causal relationships between the economic growth on one hand, health status, as well as public health expenditure, on the other hand, in Nigeria, using the Toda-Yamamoto method to analyse time series data. Their results affirmed the two-way causality of health expenditure and economic growth, and health expenditure and health status indicating a reinforcing effect of each on the other. They stressed that health investments do not only lead to improvement of health results, but also to economic growth, and thus they argued that the government should increase its spending in the health sector as a growth stimulus. In a cross-sectional study of the fiscal and social indicators, Craigwell et al. (2012) analysed the effectiveness of government spending on education and healthcare in the Caribbean. The study posted positive effects of the higher public expenditure on health care and education on the social developmental indicators, such as health status and literacy rates. Their analysis highlighted that well-focused investments on these areas play a significant role in human capital formation and economic growth in the Caribbean countries in general. Boachie and Ramu (2016) examined the impact of the spending on public health on the health status in Ghana by using quantitative analysis with the national health and economic data. They found that population health indicators such as life expectancy and decreased disease burden have significant positive relationships with increased government health spending. The authors found that it is necessary to improve the investment in the health of the population in Ghana and suggested permanent budgetary commitments to the health sector. Saad and Kalakech (2009) have performed an economic review of the government spending behaviour and their effects on long-term economic growth. Their analysis brought to the fore that government expenditure is a positive factor to the economic performance, and spending on health and education are essential factors. They supported sound fiscal policies to make government expenditure add value to the sustainable development and social well being. The book by Gujarati and Porter (2003) titled Basic Econometrics offers basic methodology that can be used in modelling the economic relationships including the determinants between health expenditure and economic growth. They have written on econometric theory and in application, such as methods that are needed to make time-series analysis robust and causality tests that are used in empirical research in health economics. Dickey and Fuller (1979) also came up with a Dickey-Fuller test of unit roots in autoregressive time series, which offers a mechanism of establishing stationarity which is critical in justifying time series econometric analysis of health expenditure and economic growth data. It has now become customary as a test of correct specification of the model in the longitudinal economic and health studies. Phillips and Perron (1988) invented another type of univariate unit root test that is based on time series data, which is the Phillips-Perron test, which is more econometrically robust. This methodological innovation enhances causality and trend analysis accuracy in research of the dynamic relations between the public health expenditure and the growth indicators. Duba et al. (2018) assessed the impacts of health care spending in percentages of GDP on life expectancy through the panel data analysis. Their results have shown that increased spending in healthcare incorporates substantial life expectancy gains in the world. The research found that policies that would promote the investment in health care in comparison with the GDP would be encouraging population longevity. The study by Jaba et al. (2014) cross-country and time-series analysis estimated the correlation between life expectancy at birth and expenditure on health. Their findings affirmed the fact that, there was a high positive relationship and thus higher health spending increases life expectancy. They indicated that long-term investment in health services is key in enhancing population health results. In their study, Nuhu et al. (2018) assessed the impact of healthcare spending on the human development index-maternal and neonatal mortality association through a regression analysis. They discovered that higher

expenditure on healthcare is a mitigating factor on mortality and enhancing human developmental outcomes, and health investment is identified as the key factor in countering maternal and neonatal deaths. In their study, Rana et al. (2018) performed a comparative analysis of health expenditure across the world in regards to child and maternal mortality. Using panel data econometrics, the article revealed that increased health expenditure decreases mortality rate which confirmed the importance of health spending in enhancing maternal and child health in other countries. The article by Nketiah-Amponsah (2019) is an empirical study of country-level data and its effect of health expenditure on health outcomes in sub-Saharan Africa. The research study revealed that high levels of health expenditure reduces mortality rates and enhances life expectancy and encourages greater government investment in financing health in the region. In determining the relationship between maternal mortality and hospital bed supply and inequality in China, Tian and Pan (2021) used longitudinal equity-based measures to predict mortality between 2004 and 2016. They came to the conclusion that more availability of hospital beds and less inequality are associated with decreased maternal mortality, so infrastructure and equity are considered to be the main areas of interventions. Tejada et al. (2019) investigated the protective effect of public spending on health in reducing child mortality in economic crises based on panel data of several countries. Their work showed that increased public health expenditure insulates against negative impacts of economic recessions on child death, and it should be heavily funded through a constant expenditure on health regardless of economic conditions. Maruthappu et al. (2015) compared government spending on health care and child mortality based on cross-national data and regression analysis. Their finding supported the fact that higher government spending in health is strongly associated with a decrease in the child mortality rates, which supports the need to make the government invest in health services, especially in the maternal and child health programmes. Kiross et al. (2020) applied a panel data analysis to understand how health expenditure impacts infant mortality in sub-Saharan Africa. Their findings showed that higher expenditure on health always reduces the infant mortality rate, and it is important to note that investments in healthcare facilities, human resources, and immunisation coverage contribute to better child survival rates in the area. In the study by Rahman et al. (2018), the nexus of health care expenditure and health outcomes in the SAARC-ASEAN area was studied using the models of cross-country panel data. Their results proved that the higher the health expenditure the less mortality and the higher life expectancy. The authors have underscored the vitality of government and non-governmental health funding in advancing health outcomes of the population. David (2018) aimed to identify the linkage between infant mortality and public health spending in Nigeria in an empirical study based on econometric techniques. The researchers proved that infant mortality is decreased significantly by increasing the public health spending, and it is believed that child mortality in Nigeria is better tackled by augmenting the funding of the health sector. Barenberg et al. (2017) determined the impact of public spending on infant mortality in relation to the Indian states during a period of almost thirty years by employing a panel data regression model. They concluded that increased government expenditures on health are associated with significant declines in infant death, which justifies policies that can be used to improve healthcare funding to improve infant survival. In this study, Kumar et al. (2013) examined the effect of public health spending on infant and child mortality in India in 1980-2006. Their statistics showed that high health spending was associated with large mortality rate decreases in children and infants, which should be reflected by the continued investment in health. World Health Organisation (2014) published the child mortality and causes of death data around the world which is an epidemiological information on the importance of health interventions. Their results emphasised that better funding and access to much needed services are critical in reducing preventable child deaths across the globe. In one of the studies, Martin et al. (2011) examined the patterns in health spending in economic recessions and found out that health spending increases in the United States have decelerated in case of economic recessions and this may jeopardise the gains so far made in population health, such as the reduction of child mortality rates. Ebob (2020) presented a world-wide collection of cholera prevention and control measures and gathered evidence of the interventions of the population health, sanitation, and vaccination efforts needed to decrease the cholera load, particularly in underdeveloped areas with the low level of health service. The article by Legros (2018) addressed the global cholera epidemiology with references to the opportunities to decrease cholera by 2030 due to the implementation of vaccines, better water and sanitation, and preparedness to overcome outbreak emergencies as the main tools to regulate this illness.

Novignon et al. (2012) analysed the public and private health care spending in sub-Saharan Africa through a panel data analysis, revealing that government expenditure on health is a highly correlated factor in the better health status indicated, including a reduction in the mortality rate, which is an indication of the effectiveness of government spending on health in the area. The research article by Sedede and Nosakhare (2018) was focused on government spending on health and its correlation with malaria cases in Nigeria. Their results suggested that greater investment into the sphere of the community health, which is represented by the larger amount of funds spent on the prevention of the malaria diseases, leads to the decrease in the disease rates and better cure results. Morrow et al. (1976) conducted an epidemiological study of Burkitts lymphoma in Uganda and reported the correlation between malaria prevalence and Burkitts lymphoma. Their epidemiologic study proposed that malaria endemicity affects the lymphoma distribution, which demonstrates the interaction of the epidemiology of communicable diseases and cancer in Africa.

On the basis of below recommend research hypotheses -

H1: Health spending per capita is correlated with life expectancy and DPT immunization coverage.

H2: Health spending per capita is correlated with fertility rat and Nourishment.

RESEARCH OBJECTIVES:

1. To examine the relationship between health spending per capita and life expectancy and DPT immunization coverage.
2. To study the relationship between health spending per capita and fertility rate and Nourishment.

METHODOLOGY

This study used secondary data covering six financial years of 2016-17 to 2021-22 to mainly derive the data on the National Health Accounts (NHA) of India and other related government reports. These NHA data are standardised according to the National Health Accounts Guidelines to India (2016) which adjust the System of Health Accounts (SHA 2011) to the Indian situation, making it consistent and internationally comparable. Data were collected through organised extraction of health spending data, estimates of life expectancy, data on immunisation rates (especially the DPT vaccine) and fertility rates and Nourishment through the official government sources, e.g., the Ministry of Health and Family Welfare and Economic Surveys and state health accounts.

The NHA database which is extensive with a network of national and state health account teams made a comprehensive disaggregation of health spending per capita and other key indicators and offers a powerful database to work with. The study methodology used correlation to analyse the relationships between health spending per capita and the four focus health outcomes life expectancy, DPT immunisation coverage, fertility rate, and Nourishment.

The multi-year panel data also increased the reliability by making the data capture temporal the trends and minimised the effect of anomalies of a particular year. Validation and consistency cheques of the data were done according to the NHA institutional protocols, and the data integrity was ensured. This design enabled a combined evaluation of the impacts of fiscal investments in the health sector on the determination of quantifiable health outcomes in India during the six-year period, and this enables evidence-based policy implications.

The study design involved the use of the correlation tests including Pearson product moment correlation to test the strength and direction of the relationships between health spending per capita and the four targeted health outcomes such as life expectancy, DPT immunisation coverage, fertility rate, and nourishment.

RESULTS AND ANALYSIS

Correlation Matrix						
		Health spending per capita (In Dollars)	**Fertility rate, births per woman**	**Life expectancy**	**DPT immunization**	**Nourishment**
Health spending per capita (In Dollars)	Pearson's r	—				
	df	—				
	p-value	—				
Fertility rate, births per woman	Pearson's r	-0.528	—			
	df	4	—			
	p-value	0.282	—			
Life expectancy	Pearson's r	0.867	-0.366	—		
	df	4	4	—		
	p-value	0.025	0.475	—		
DPT immunization	Pearson's r	0.913	-0.259	0.839	—	
	df	4	4	4	—	
	p-value	0.011	0.62	0.037	—	
Nourishment	Pearson's r	0.921	-0.206	0.841	0.983	—
	df	4	4	4	4	—
	p-value	0.009	0.695	0.036	<.001	—

Source: *Authors estimation*

Through the provided correlation matrix, one can take a clear view of the relationship between five health related criteria: health spending per capita, fertility rate, life expectancy, DPT immunisation coverage, and Nourishment. The interpretation of this matrix gives useful information about the level and direction of the relationship between variables, and the significance of the relationship. These relationships are associated with the strength of the relationship between them based on Pearson correlation coefficient (r), and the p-values of relationships are used to determine whether they are statistically significant using the traditional level of significance of 0.05. Firstly, the health spending per capita and fertility rate have a negative relationship with a negative correlation coefficient (r = -0.528) but no statistically significant value (p = 0.282). This indicates the moderate propensity of increasing health expenditure to decelerate fertility, but the connexion cannot be judged as dependable given the sample size and the p-value. Conversely, the connexion between life expectancy and health spending per capita is rather high and positive (r = 0.867, p = 0.025). This high correlation confirms the long-standing hypothesising that the countries that put more resources in healthcare have high life expectancy, which means better access to medical care and better infrastructure of the population health facilities. In the same manner, the health spending per capita is strongly and statistically significantly associated with the DPT immunisation rates (r = 0.913, p = 0.011). It means that the higher the healthcare spending is, the broader the immunisation coverage may be, and it leads to a better control of communicable diseases as well. Surprisingly, the relationship between health expenditure and Nourishment (r = 0.921, p = 0.009) also seems to be extremely powerful and positive. The research revealed that there was a high positive relationship between spending on health per capita and nourishment levels meaning that higher health investments are linked to higher nutritional results among the population. The fertility rate relations offer a less important and less significant trend in general. The negative association between life expectancy and fertility rate (r = -0.366, p = 0.475) shows that there is a weak propensity of countries with high fertility rate to have lower life expectancy but the relationship is not statistically significant. The weak and non-significant correlations of fertility rate with DPT immunisation (r = -0.259, p = 0.620) and fertility rate with Nourishment (r = -0.206, p = 0.695) do not show significant evidence of linear relationships.

The correlation between DPT immunisation and the life expectancy is strong and statistically significant ($r = 0.839$, $p = 0.037$), as is expected. The outcome confirms the rational correlation that the increased level of immunizations is directly proportional to better population health and lifespan. Nonetheless, life expectancy is also positively correlated with Nourishment ($r = 0.841$, $p = 0.036$). Lastly, the correlation between Nourishment and DPT immunisation is very high ($r = 0.983$, $p < 0.001$) which indicates that the relationship is almost positive linear. To sum up, the correlation matrix supports some expected trends, especially the positive and significant relations between health expenditure and the life expectancy and immunisation coverage.

STUDY IMPLICATIONS

This study has important implications on the health policy and resource allocation in India with special attention to the invaluable nature of long term and equitable health expenditure per capita. The results support the argument that the higher the investment in healthcare systems, the greater the increases in life expectancy and broader immunisation, which are crucial in preventing preventable illnesses and increasing the well-being of the population. These are results that show that policymakers should make financing of the public health a priority not just to increase services but also to enhance the preventative care programme like immunizations. The paper also indicates that health expenditure which is supported by reproductive health services may have significant impact on the determination of fertility rates and therefore demographic transitions. There is therefore a need to integrate multisectoral practises and investments in the health sector to deal with undernutrition holistically. All these insights call on a dual emphasis to increase health spending and enhance spending efficiency, to focus particularly on equitable spending and multisectoral coordination, to achieve holistic improvements in the Indian situation with regard to the overall state of public health. This strategic allocation of resources is important towards attaining universal health coverage, reducing health disparities, and promoting sustainable development objectives.

FUTURE SCOPE OF THE STUDY

The future of such a study is vast and has a lot of prospects to benefit the health policy and research in India. Future research may focus on the state-level differences in health expenditure and its effects in relation to various socio-economic layers and regional differences and find the best alternatives to allocate resources effectively. Longitudinal data on the capacity to detect the variation in health outcomes with time in comparison with dynamic health expenditure patterns would be useful to draw a causal inference in addition to correlation. Furthermore, studies that would put additional finer-headed classifications of health spending, including investments in preventive care, nutrition initiatives, maternal health and infrastructure, would help better explain which elements have been the most efficient in improving life expectancy, immunizations, fertility, and nutrition. The interaction between public health expenditure and other social determinants of health including education, sanitation and poverty alleviation interventions also provides sufficient room to construct multi-sectoral strategies of health improvement. Such a quantitative data should be further put into perspective by integrating qualitative studies to comprehend obstacles to successful use of health funds and community views. Considering new challenges, it is also possible that in the future, the work will also evaluate the health system resilience after the COVID-19 based on how the fiscal policy will be adjusted to respond to the pandemic preparedness and service delivery equity. Lastly, conducting more comparative studies with other developing nations would be of benefit in offering lessons and policies that would be Indians specific to the current healthcare delivery scenario. This would be an expanded research agenda and would contribute to the formation of more equitable, effective and sustainable health financing systems that would eventually result in universal health coverage and better health outcomes of the population.

DISCUSSION AND CONCLUSION

This research paper was aimed at discussing how health expenditure per capita is associated with several important health outcomes in India: life expectancy, DPT immunisation coverage, fertility rate, and

Nourishment. The analysis provided a strong positive correlation between health expenditure per capita and life expectancy which supported the well-known fact that higher investments in healthcare will result in longer and healthier lives through better access to medical care, preventive care and capacity of the entire healthcare system. This is in line with the results of Mohanty (2020), who found out that a long-term per capita health spending in South Asia has a substantial positive impact on the life expectancy due to the better state of the public health infrastructure and socio-economic evolution. Secondly, the positive relationship between the health expenditure and the coverage of DPT immunisation demonstrates the significant importance of the financial resources in the enlargement of the immunisation activities, which will contribute to a more effective combating of the communicable diseases. These findings resonate with previously conducted studies that have also highlighted immunisation as a cost-efficient intervention that is directly related to health spending (Mohanty, 2020; WHO, 2014).

On the other hand, negative yet statistically insignificant correlation between the healthcare expenditure per capita and fertility rate implies complex demographic processes with references to healthcare access and other factors, which is aligned with the worldwide trends, indicating that the funding of reproductive health services leads to decreased fertility (Rahman et al., 2018). This subtle association highlights the idea that health expenditure might not automatically result in change in fertility but rather work via multi sectoral channels such as education and cultural influences. Good interrelationships among life expectancy, DPT immunisation and Nourishment further confirm their unanimity in population health status.

Finally, this paper confirmed the urgent need of per capita health spending in attaining positive health results in India particularly in terms of improving life expectancy and immunisation, and consequently, preventing diseases and improving lives. Simultaneously, it also helped to bring out the inherent complexities that influenced the fertility and nutritional status interconnections, with reference to the fundamentality of comprehensive socio-economic and health policy actions rather than just the increased expenditure. The findings add to the comprehensive view that is important to the policymakers who are interested in maximising health financing interventions, facilitate equitable service provision, and respond to the multidimensional determinants of health in the diverse socio-economic landscape of India. Further studies that involve extensive expenditure breakdowns and longitudinal studies will be essential to clarify causal patterns and interventions to suit different persons so that more investments can be translated into overall health benefits.

Such a critical analysis is consistent with and supplementary to the earlier empirical studies that show the central role of health spending in health gains (Alhassan et al., 2021; Mohanty, 2020), and helps highlight the shortcomings of simplistic correlations and the necessity of complex analyses of the impact of socio-demographic and systemic factors (Bein et al., 2017; Mosadeghrad, 2014; WHO, 2014). On the whole, the research points out that health expenditure is a sufficient but not exclusive factor in promoting health in the population that requires a balanced approach that incorporates fiscal, social, and programmatic facets in guaranteeing long-term development.

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