Are India's Primary Health Centres Delivering Quality Care? An Efficiency Evaluation

Abstract

One of the main concerns of any country is its health sector because of its strong linkages with the development of the country and its people. The development of healthcare system of any country depends upon how efficiently the various resources that is financial and human resources are utilized. The evaluation of effectiveness of healthcare facilities can assist decision-makers in ensuring the best possible use of the resources at their disposal. In this context, it is vital to evaluate the efficiency of Primary Health Centres (PHCs) as they work at the primary level of the healthcare system and provide precautionary, curative, and promotive services to the people of both rural and urban areas. The present study has tried to evaluate the technical efficiency of PHCs in India using data from Health Management and Information System (HMIS) and Rural Health Statistics (RHS) for the year 2019-20 by applying the Data Envelopment Analysis (DEA) technique. The study shows that out of the total PHCs included in the study, 13 (37%) were technically efficient constituting the 'best practice frontier'. The other 63 per cent were technically inefficient with an average TE score of 0.65. This implies that these 22 inefficient PHCs could potentially reduce their current input endowment by 37 per cent while leaving their output unchanged. Henceforth, it is seen that more than half of the PHCs were operating inefficiently. Decision-makers and administrators in the state should determine the underline cause of the observed inefficiencies and can take the necessary steps to improve the effectiveness of these PHCs.

Keywords: Technical Efficiency, Primary Health Centres, Public health, Interstate analysis

1. Introduction

In the pursuit of achieving universal health coverage and ensuring equitable access to quality healthcare, the role of Primary Health Centers (PHCs) in India has become increasingly pivotal. As the cornerstone of India's healthcare system, PHCs serve as the first point of contact for millions of individuals seeking medical attention, especially in rural and underserved areas. (Sankar & Kathuria, 2004). Evaluating the efficiency and effectiveness of these primary healthcare facilities is of paramount importance to gauge their impact on public health outcomes and identify areas for improvement. (Jat & Sebastian, 2013).

The question at the heart of the present study is a critical one: "Are India's Primary Health Centers Delivering Quality Care? An Efficiency Evaluation." As the world's most populous country with a vast and diverse population, India faces unique challenges in its healthcare delivery system (Sankar & Kathuria, 2004). Providing comprehensive and accessible healthcare to its citizens is not only an ethical imperative but also essential for driving socio-economic development and achieving health-related sustainable development goals. The lack of healthcare resources and manpower are significant factors contributing to the low performance of its public healthcare system. To enhance the healthcare system's performance, it is essential to optimize the utilization of health resources. This can be achieved by evaluating the efficiency of the healthcare system, which provides valuable insights for policymakers to develop appropriate policies and improve the sector's performance (Jat & Sebastian, 2013).

Koopmans and Debreu (1951) were trailblazers in introducing the concept of efficiency, which has been a matter of significant interest for economists since 1951. Efficiency plays a crucial role as a performance indicator for production units, allowing us to assess the impact of inputs on various external factors, such as political, social, economic, legal, and institutional elements, on productivity (Lovell, 1993). In the realm of healthcare systems, studies have shown that inefficiencies exist at both micro and macro levels. At the microlevel, technical inefficiency arises when health resources and inputs are utilized in a manner that yields suboptimal results, affecting individual healthcare facilities like hospitals and primary health centres (Ruiz-Rodriguez et al., 2016). At the macro level, however, various factors like life expectancy, infant mortality, and access to healthcare services (outputs) and various inputs like expenditures on healthcare, education, income, and infrastructure (Mirmirani & Lippmann, 2011) have an impact on the performance of the healthcare system. Varying levels of efficiency

are observed among different countries, with some efficiently utilizing health resources despite needing significant improvements in health outcomes (Retzlaff-Roberts et al., 2004).

The impact of quality and accessibility of hospital services on technical efficiency shows a positive correlation between high efficiency and low childhood mortality rates (Ferreira & Marques, 2019; Mustafa & Shekhar, 2021). Adjusting output for quality affects the efficiency analysis, leading to notable deviations from potential output, higher dispersion from the production possibility curve, and altered efficiency rankings (Murillo-Zamorano & Petraglia, 2011). Inefficiencies in healthcare resource utilization were found to be prevalent in Asian countries, with high-income countries demonstrating better technical efficiency compared to others (Ahmed et al., 2019; Nassar et al., 2020; Yitbarek et al., 2019).

The evaluation of PHCs' efficiency in delivering quality care encompasses a multidimensional approach that considers various facets of healthcare provision. This research delves into key aspects such as healthcare infrastructure, service availability, healthcare workforce capabilities, patient satisfaction, and health outcomes. By scrutinizing these factors, the study seeks to understand the strengths and weaknesses of India's primary healthcare system and contribute to evidence-based policymaking and strategic planning.

Ultimately, our research aims to contribute to the ongoing discourse on healthcare reform, enhance our understanding of the Indian healthcare landscape, and inform evidence-based interventions to strengthen PHCs. The significance of this research extends beyond the boundaries of India, as many countries worldwide confront similar challenges in delivering accessible and quality primary healthcare services. By examining India's experiences and lessons learned, the present study tries to offer valuable insights and potential solutions that can be adapted and implemented in other contexts to achieve universal health coverage and foster healthier societies. Thus, the current study aims to:

(i) Assess the efficiency and quality of care provided by India's PHCs.
(ii) Contribute to the existing literature by advancing knowledge about healthcare systems and promoting better health outcomes for all individuals, irrespective of their geographical location or socio-economic status.
(iii) The findings and conclusions drawn from this study inform evidence-based policy decisions and foster positive transformations in India's healthcare landscape and beyond.

The article unfolds as follows: The subsequent section presents the theoretical framework, followed by the research objective. In the fourth section, an outline of the research methodology is presented followed by results in the next section. The article concludes with a conclusion, implications, limitations, and future research avenues.

2. Theoretical Framework

According to Worthington (2004), for the measurement of healthcare organization efficiency, Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) are the two most frequently used methodologies.

To assess the efficiency of DMUs (Decision-making ~~Making~~ Units), the SFA (Stochastic Frontier Analysis) employs a parametric approach along with econometric techniques. This approach not only accommodates potential modeling and measurement errors but also constructs a seamless parametric boundary. SFA makes use of economic theory when examining the frontier's shape and the statistical criteria to distinguish between alternative functional relationships suitable for appropriate datasets (Skinner, 1994). DEA, developed by Charnes et al. (1978), is a non-parametric method paired with linear programming techniques that provides the required flexibility. Because of this flexibility, it has been extensively used for calculating the efficiency of DMUs, as noted by the Scrcssp - Steering Committee for the Review and Provision in 1997. Further, Banker et al. (1984) extended this concept by developing DEA models based on Farrell's earlier work (Farrell, 1957). These models assess the efficiency of DMUs within a group by comparing their performance to the best practices observed within that same group.

Before delving deeper into DEA, it's crucial to take into account the various definitions of efficiency. Technical efficiency, which is the most commonly employed concept of efficiency, pertains to the effectiveness with which physical inputs are transformed into outputs. Another type of efficiency, known as allocative efficiency, refers to whether inputs are chosen to minimize production costs for a specific level of output and set of input prices, considering the organisation being evaluated is technically efficient. Technical and allocative efficiency are prerequisites for an organisation to be cost-effective. An organisation can only get a 100 percent score in cost efficiency if it has attained 100 percent in both technical and allocative efficiency, since cost efficiency is computed as the product of the technical and allocative efficiency scores (Scrcssp: Steering Committee for the Review and Provision, 1997).

The present study has employed DEA as it has several advantages over parametric techniques, such as handling multiple inputs and outputs without requiring a specific functional form, handling small sample sizes, and improving discrimination with high sensitivity. On the basis of the most effective input-output combinations, it establishes an empirical frontier of production possibilities. By employing technical efficiency measures, one can evaluate how

efficiently resources are utilized to attain the desired outputs (Das, 2018). There are two distinct types of DEA analyses: Input-oriented technical efficiency measures concentrate on identifying the maximum input quantities that can be reduced proportionately without affecting output quantities. Conversely, output-oriented technical efficiency measures focus on determining the maximum output quantities that can be increased proportionally without altering input quantities. As input cost data are not accessible for the investigation, allocative efficiency measures are not used. Given that PHCs have a limited amount of control over their outputs, the study performed DEA with an output-oriented approach. Thus, the study focuses on determining the maximum output amounts that can be proportionately raised without changing the input amounts.

3. Objective~~s~~

To estimate and analyse technical efficiency of PHC's in India.

4. Methodology

The ~~current~~ study ~~has~~ used the following technique ~~to accomplish the aforementioned objectives.~~

4.1 Methods

As elucidated in a preceding section, the DEA framework encompasses two distinct methodologies, namely input-oriented and output-oriented approaches. To fulfil the aim of this research and assess the technical efficiency of PHCs in India, a methodology based on output-oriented DEA is employed. The concept of technical efficiency encompasses two distinct components, namely pure technical efficiency and scale technical efficiency, as explicated by Dash et al. (2010). The efficiency of the DMUs is intrinsically influenced by the concept of scale efficiency whereas the phenomenon of economies or diseconomies of scale arises as a consequence of the expansion in the scale of operations at a given DMUs.

The DEA model developed by Charnes et al. (1978) is predicated upon the assumption of Constant Returns to Scale (CRS) in production. Under CRS, any alteration in the input would yield a proportional adjustment in the output (Charnes et al., 1978). Banker et. (1984) introduced an alternative model known as the Banker, Charnes, and Cooper (BCC) model, which incorporates the concept of Variable Returns to Scale (VRS) in the production process. VRS implies that the increase in input quantities may lead to either an increase or a decrease in output levels (Banker et al., 1984). The determination of whether to employ the estimation

of a DEA model under the premise of VRS or CRS assumes paramount significance within this particular context.

The assumption of CRS places significant emphasis on the notion of productivity while maintaining a consistent scale of operations. The examination of the relationship between the scale of an operation and its impact on productivity is a subject of inquiry within the context of the VRS assumption. The current investigation is grounded upon the VRS assumption, as it acknowledges that not all of the DMUs under analysis are operating at their optimal scale. The employed methodology, nonetheless, exhibits certain limitations stemming from its reliance on an extreme point metric, which encompasses susceptibility to outliers, measurement errors, and random influences on the data. Another limitation associated with the utilization of DEA pertains to the issue of internal weight generation. Notwithstanding the aforementioned limitations, it is plausible to assert that the DEA method stands as the most optimal approach presently accessible for gauging relative efficiency within the realm of health care efficiency literature. This assertion is primarily rooted in the notable comparative advantages that DEA offers, as highlighted by Hollingsworth et al. (1999).

4.2 Study Variables

When employing DEA as a methodological tool, the utmost importance lies in the careful selection of input and output variables. In the context of healthcare production, it is pertinent to acknowledge that PHCs play a pivotal role in the conversion of input resources into output in the form of health services. Drawing upon existing healthcare literature, the current study employed a set of five inputs and four outputs as key indicators to assess the efficiency of PHCs in the provision of healthcare services. The study aims to investigate the relationship between various input variables, including health workers, pharmacists, lab technicians (Yitbarek et al., 2019), doctors, and nurses (Jat & Sebastian, 2013), and a set of output variables. The output variables of interest in this study are the number of pregnant women who received four or more ante-natal care (ANC) check-ups, the number of women who received post-natal care (PNC) within 48 hours under the Home Based New Born Care (HBNC) program, the immunization rate of Bacillus Calmette Guerin (BCG) vaccine given to newborns immediately after birth, and the number of newborns who received the full schedule of visits by Accredited Social Health Activists (ASHA) (Das, 2018).

4.3 Data Collection

The ~~present~~ study involve~~s~~ the utilization of secondary data derived from multiple sources, encompassing the Health Management Information System (HMIS), Rural Health Statistics, Ministry of Health and Family Welfare, as well as various government websites such as the National Health Mission, Directorate of Health Services, and National Family Health Survey. The data pertaining to population is procured from the report published by the National Sample Survey Office (NSSO) as well as the Census of India conducted in the year 2011. It is crucial to acknowledge that the evaluation of technical efficiency takes into account data from all 24,918 operational PHCs in India during the 2019-20 period, as reported by the Government of India in 2020.

5. Results

The findings of the study are presented in the following sections. Table 1 illustrates the percentage distribution of PHCs across various Indian states and Union Territories. Technical efficiency (TE), scale efficiency (SE), and returns to scale properties of PHCs in India are illustrated in table 2. Lastly, Table 3 presents information about the peers of inefficient PHCs.

5.1 Percentage share of PHCs in India

Table 1 showcases the percentage share of PHCs for each state and union territory in relation to the total number of PHCs in India (24,918). This percentage represents the proportion of PHCs in each region compared to the overall number in the country. The number of PHCs varies significantly across states and union territories. States like Uttar Pradesh (11.56%), Karnataka (8.73%), Rajasthan (8.40%), and Maharashtra (7.34%) have a higher number of PHCs, which could be attributed to their larger populations and healthcare needs. On the other hand, smaller states and union territories like Sikkim, Chandigarh, Lakshadweep, Dadra & Nagar Haveli, and Daman & Diu have a much lower number or no PHCs, reflecting their lower population density, healthcare requirements, challenging terrain, smaller geographical area, and the presence of other healthcare facilities that cater to their population. The data presented in the table can be instrumental in shaping healthcare policies and resource allocation. States with a lower percentage of PHCs might require additional investment to strengthen their primary healthcare infrastructure, while states with a higher percentage might focus on optimizing existing facilities.

Table 1: Percentage share of PHCs in India

S. No.	STATE/UT	PHCs	PERCENTAGE
1	Andhra Pradesh	1142	4.58%
2	Arunachal Pradesh	119	0.48%
3	Assam	946	3.80%
4	Bihar	1702	6.83%
5	Chhattisgarh	792	3.18%
6	Goa	55	0.22%
7	Gujarat	1477	5.93%
8	Haryana	385	1.55%
9	Himachal Pradesh	564	2.26%
10	Jharkhand	291	1.17%
11	Karnataka	2176	8.73%
12	Kerala	784	3.15%
13	Madhya Pradesh	1199	4.81%
14	Maharashtra	1829	7.34%
15	Manipur	85	0.34%
16	Meghalaya	119	0.48%
17	Mizoram	57	0.23%
18	Nagaland	130	0.52%
19	Odisha	1288	5.17%
20	Punjab	427	1.71%
21	Rajasthan	2094	8.40%
22	Sikkim	24	0.10%
23	Tamil Nadu	1420	5.70%
24	Telangana	636	2.55%
25	Tripura	107	0.43%
26	Uttarakhand	257	1.03%
27	Uttar Pradesh	2880	11.56%
28	West Bengal	913	3.66%
29	Andaman & Nicobar Islands	22	0.09%
30	Chandigarh	0	0.00%
31	Dadra& Nagar haveli and Daman &Diu	10	0.04%
32	Delhi	5	0.02%
33	Jammu & Kashmir	923	3.70%
34	Ladakh	32	0.13%
35	Lakshadweep	4	0.02%
36	Puducherry	24	0.10%
	All India/2 Total	**24918**	100%

Source: Rural Health Statistics,2019-20, Govt. of India

5.2 Technical efficiency (TE), scale efficiency (SE) scores and returns to scale characteristics of PHCs in India

The interpretation of Table 2 reveals that the mean scores of pure TE and SE of PHCs are 0.78 and 0.93, respectively. Of the total PHCs included in the study, 13 (37%) are technically

efficient, constituting the 'best practice frontier'. The other 63 percent are technically inefficient, with an average TE score of 0.65. This implies that these 22 inefficient PHCs could potentially reduce their current input endowment by 37 percent while leaving their output unchanged. In other words, these 22 technically inefficient PHCs could, on average, produce 37 percent more output by utilizing the existing levels of input.

On the other hand, 13 (37%) PHCs have an SE of 100%, implying thereby that they have the most productive scale size (MPSS) for that input-output mix. The remaining 22 (63%) PHCs are found to be scale inefficient, showing a mean SE score of 0.73. This indicates that, on average, scale-inefficient PHCs could reduce their input size by 10 percent without affecting their current output levels.

Out of 22 scale-inefficient PHCs, 1 (4.5%) shows increasing returns to scale (IRS), and the remaining 21 (95.5%) reveal decreasing returns to scale (DRS). These findings reveal the fact that 4.5% of scale-inefficient PHCs in India are too small for their operations, and to operate at their Most Productive Scale Size (MPSS), they need to expand their scale of operations. However, 95.5% of inefficient PHCs in the country need to scale down their operations to achieve CRS.

Table 2: Technical efficiency (TE), scale efficiency (SE) scores and returns to scale characteristics of PHCs in India

S.No.	STATES/UTs	CRSTE	VRSTE	SCALE	TYPE OF SE
1	A & N Islands	1.00	1.00	1.00	
2	Andhra Pradesh	0.95	1.00	0.94	DRS
3	Arunachal Pradesh	1.00	1.00	1.00	
4	Assam	0.70	0.94	0.73	DRS
5	Bihar	0.34	0.98	0.35	DRS
6	Chandigarh	1.00	1.00	1.00	
7	Chhattisgarh	0.49	0.57	0.85	DRS
8	Dadra & Nagar Haveli Daman &Diu	0.74	1.00	0.74	IRS
9	Delhi	0.63	0.81	0.78	DRS
10	Goa	1.00	1.00	1.00	
11	Gujarat	1.00	1.00	1.00	
12	Haryana	0.42	0.53	0.79	DRS
13	Himachal Pradesh	1.00	1.00	1.00	
14	Jammu & Kashmir	1.00	1.00	1.00	
15	Jharkhand	0.44	0.93	0.47	DRS
16	Karnataka	0.85	1.00	0.85	DRS
17	Kerala	0.86	1.00	0.86	DRS
18	Lakshadweep	1.00	1.00	1.00	

19	Madhya Pradesh	0.50	0.97	0.51	DRS
20	Maharashtra	0.92	1.00	0.92	DRS
21	Manipur	1.00	1.00	1.00	
22	Meghalaya	0.68	0.80	0.84	DRS
23	Mizoram	0.76	1.00	0.76	DRS
24	Nagaland	1.00	1.00	1.00	
25	Odisha	0.62	1.00	0.68	DRS
26	Puducherry	1.00	1.00	1.00	
27	Punjab	0.61	0.72	0.84	DRS
28	Rajasthan	0.64	0.70	0.73	DRS
29	Sikkim	1.00	1.00	1.00	
30	Tamil Nadu	1.00	1.00	1.00	
31	Telangana	0.89	1.00	0.89	DRS
32	Tripura	0.58	0.83	0.70	DRS
33	Uttar Pradesh	0.43	1.00	0.43	DRS
34	Uttarakhand	0.76	1.00	0.76	DRS
35	West Bengal	0.40	0.67	0.60	DRS

Source: calculated by authors

5.3 Peers of Inefficient PHCs

Now, in order to benchmark or find out the best performing PHCs among different inefficient PHCs, peers are set as potential role models in identifying the most efficient one. It is assumed that, on a frontier, each PHC tries to move either horizontally or vertically, that is, either to increase its outputs or reduce its inputs by following the closest PHCs to become efficient. For each set of inefficient PHCs, a single or set of inefficient PHCs acts as a peer, which the inefficient PHCs need to follow to become efficient.

Based on the findings presented in Table 3, it is evident that there exists a presence of peer PHCs across all regions. Notably, the states of Maharashtra and Jammu & Kashmir emerged as the most efficient PHCs, being referenced as peers a total of seven times. Subsequently, Karnataka ranked second with six references as peers, while the remaining PHCs were classified as inefficient. The states of Maharashtra and Jammu and Kashmir exhibit notable characteristics in terms of input combinations that yield optimal levels of output efficiency.

It is imperative to acknowledge that the inefficiency of PHCs is not a universal phenomenon, as substantiated by the observation that among all states and Union Territories (UTs), a total of 13 have successfully attained the best practice frontier while concurrently operating at their MPSS.

Table 3: Peers of Inefficient PHCs

S.No.	STATES/ UTs	PEERS
1	A & N Islands	A & N Islands
2	Andhra Pradesh	Andhra Pradesh
3	Arunachal Pradesh	Arunachal Pradesh
4	Assam	Karnataka, Maharashtra, Rajasthan, Jammu & Kashmir
5	Bihar	Himachal Pradesh, Maharashtra
6	Chandigarh	Chandigarh
7	Chhattisgarh	Karnataka, Gujarat, Odisha, Jammu & Kashmir, Maharashtra
8	Dadra & Nagar Haveli Daman &Diu	Dadra & Nagar Haveli Daman &Diu
9	Delhi	Chandigarh, Tamil Nadu, Jammu & Kashmir
10	Goa	Goa
11	Gujarat	Gujarat
12	Haryana	Himachal Pradesh, Chandigarh, Karnataka, Gujarat, Maharashtra
13	Himachal Pradesh	Himachal Pradesh
14	Jammu & Kashmir	Jammu & Kashmir
15	Jharkhand	Maharashtra, Uttarakhand
16	Karnataka	Karnataka
17	Kerala	Kerala
18	Lakshadweep	Lakshadweep
19	Madhya Pradesh	Uttarakhand, Maharashtra
20	Maharashtra	Maharashtra
21	Manipur	Manipur
22	Meghalaya	Jammu & Kashmir, Nagaland, Karnataka
23	Mizoram	Mizoram
24	Nagaland	Nagaland
25	Odisha	Odisha
26	Puducherry	Puducherry
27	Punjab	Jammu & Kashmir, Chandigarh, Tamil Nadu, Gujarat
28	Rajasthan	Tamil Nadu, Jammu & Kashmir, Gujarat, Karnataka, Maharashtra
29	Sikkim	Sikkim
30	Tamil Nadu	Tamil Nadu
31	Telangana	Telangana
32	Tripura	Sikkim, Jammu & Kashmir, Nagaland, Tamil Nadu, Arunachal Pradesh
33	Uttar Pradesh	Uttar Pradesh
34	Uttarakhand	Uttarakhand
35	West Bengal	Karnataka, Maharashtra, Odisha

Source: calculated by authors

6.Discussion

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7. Limitations

The study aims to undertake a comprehensive assessment of the technical efficiency of India's healthcare system at the national level. However, there is a promising avenue for future research to explore this efficiency by conducting analyses at both state and district levels. This approach would provide valuable insights into the efficiency of specific PHCs in those regions, thereby enhancing the granularity of our understanding.

It is imperative to acknowledge that the present study was predicated upon a specific set of input-output parameters for the purpose of conducting its analysis. Future investigations could benefit from the incorporation of supplementary or alternative output indicators, as well as the comprehensive exploration of diverse input-output combinations. The adoption of a more expansive viewpoint has the potential to yield intricate and refined findings thereby augmenting the overall comprehensiveness of the research endeavour.

One of the primary limitations inherent in the present study pertains to the exclusive reliance on input and output data sourced from a single year. The temporal constraint imposed a limitation on the ability to analyze efficiency trends among PHCs in previous years. Future research endeavours should contemplate the utilization of an extended temporal framework to meticulously scrutinize efficiency scores and their sequential fluctuations, thereby facilitating a more nuanced and dynamic evaluation.

Moreover, it is worth noting that future researchers can further investigate the determinants that impact the effectiveness of PHCs facilities and examine feasible approaches to rectify any inefficiencies that may be identified. The comprehension of these fundamental elements will provide policymakers with the capacity to execute focused interventions aimed at enhancing healthcare efficiency, consequently yielding advantages for the general public.

6. Conclusion ~~and Implications~~

The present study aimed to evaluate the technical efficiency of PHCs that are operational in diverse states and Union territories of India. The study's findings elucidate that the augmentation of technical efficiency yields advantageous outcomes in terms of optimizing the utilization of extant resources, thereby fostering enhanced health service coverage and ultimately culminating in improved health outcomes.

The study's implications hold substantial significance for the formulation and implementation of healthcare policies as well as the provision of healthcare services within the country. The findings of this study reveal that the mean Technical Efficiency (TE) score of 0.78, suggests that the PHCs examined in this research possess the capability to attain equivalent output levels while economizing approximately 22 percent of their inputs. This observation implies that the reallocation of saved resources could be channelled towards the provision of healthcare services for marginalized populations and individuals residing below the poverty threshold. This is especially pertinent within the context of PHCs where there is a notable demand for such services. The implementation of such measures has the potential to significantly enhance the achievement of equitable access to healthcare services on a nationwide scale.

The findings of the study indicates that 63 percent (22) of the PHCs are currently functioning at suboptimal efficiency levels. This observation highlights the potential for substantial efficiency gains in inefficient PHCs through the implementation of enhanced resource management strategies within the current operational framework. It is imperative for decision-makers and administrators within the nation to discern the fundamental factors contributing to these inefficiencies and subsequently execute suitable interventions aimed at augmenting the efficacy of these PHCs.

Considering the country's poor health indicators and the scarcity of resources, ensuring the efficient functioning of these PHCs becomes of paramount importance in the realm of public health. It is worth noting that the findings of this study are based on the specific input-output mix utilized, and therefore, policy implications should be viewed within this contextual framework.

~~7. Limitations and Future Research~~

~~This study aims to undertake a comprehensive assessment of the technical efficiency of India's healthcare system at the national level. However, there is a promising avenue for future research to explore this efficiency by conducting analyses at both state and district levels. This approach would provide valuable insights into the efficiency of specific PHCs in those regions, thereby enhancing the granularity of our understanding.~~

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