A SLACK BASED DATA ENVELOPMENT ANALYSIS MODELLING FOR SCRUTINIZING THE EFFICIENCY OF PRIVATE AND PUBLIC HEALTHCARE SETTINGS IN KERALA

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in

Management

By

Jithin Gangadharan.K

Registration Number: 42000269

Supervised By

DR. Pritpal Singh (UID) 16741

Professor

Mittal School of Business

Transforming Education Transforming India

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DECLARATION

I, hereby declared that the presented work in the thesis entitled "A SLACK BASED DATA ENVELOPMENT ANALYSIS MODELLING FOR SCRUTINIZING THE EFFICIENCY OF PRIVATE AND PUBLIC HEALTHCARE SETTINGS IN KERALA" in fulfilment of degree of Doctor of Philosophy (Ph. D.) is outcome of research work carried out by me under the supervision of DR. PRITPAL SINGH, working as Professor, in the Mittal School Of Business of Lovely Professional University, Punjab, India. In keeping with general practice of reporting scientific observations, due acknowledgements have been made whenever work described here has been based on findings of other investigator. This work has not been submitted in part or full to any other University or Institute for the award of any degree.

(Signature of Scholar)

Name of the scholar: Jithin Gangadharan K

Reg No: 42000269

Department/school: Mittal School Of Business

Lovely Professional University, Phagwara, India

Date: 16/02/2025

CERTIFICATE

This is to certify that the work reported in the Ph. D. thesis entitled "A SLACK BASED DATA ENVELOPMENT ANALYSIS MODELLING FOR SCRUTINIZING THE EFFICIENCY OF PRIVATE AND PUBLIC HEALTHCARE SETTINGS IN KERALA" submitted in fulfillment of the requirement for the award of degree of Doctor of Philosophy (Ph.D.) in the MANAGEMENT, Mittal School Of Business, is a research work carried out by JITHIN GANGADHARAN. K, (Registration No.)42000269, is bonafide record of his/her original work carried out under my supervision and that no part of thesis has been submitted for any other degree, diploma or equivalent course.

(Signature of Supervisor)

Name of supervisor: DR. PRITPAL SINGH

Designation: Professor

Department/school: Mittal School of Business

University: Lovely Professional University, Phagwara

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ABSTRACT

The portray examination objectives to charge a thorough evaluation of the technical proficiency exhibited by both private and public healthcare settings within the state of Kerala. This investigation will employ a data envelopment analysis with a slack -based modelling method, which has proven to be a robust and widely accepted approach in evaluating the efficiency of various sectors. By employing this method, we seek to deliver a complete thoughtfulness of the efficiency levels in both private and public healthcare settings, thereby shedding light on potential areas for improvement and informing policy decisions in the healthcare sector. Data envelopment analysis (DEA) is a prominent methodology employed in the field of businesses investigate to ascertain efficacy levels by utilizing an input/output-based model. This model is rooted in linear mathematical formulations, which enable the quantification and valuation of the virtual efficacy of “decision-making units”. By engaging DEA, researchers aim to identify the ideal distribution of supplies and govern the highest efficient utilisation of inputs to create anticipated outputs. The escalating demand for healthcare services in India can be accredited to a multitude of influences, comprising heightened awareness regarding the significance of preventive health check-ups, the burgeoning population, the intricate nature of diseases, and the accessibility of healthcare facilities. The escalating demand for health services has emerged as a pressing concern, while the persistent challenge of ensuring their availability continues to persist. Kerala, renowned for its exceptional healthcare services, occupies a prominent position within the Indian healthcare landscape, assuming a pivotal role in the national health industry. The escalation of population accredited to the influx of immigrant workers in the Kerala state raises pertinent inquiries regarding the efficacy of the health ministry's operations. In light of the aforementioned circumstances, it is imperative for healthcare institutions, irrespective of their ownership status, to effectively harness their current resources in an optimal manner. Data

envelopment analysis (DEA) is a well-established technique that has ensued developed to assess the operational efficacy of organisations. Its central quantitative is to determine the logical and scale effectiveness of these entities, thereby enabling them to identify their performance benchmarks. By operating in accordance with these benchmarks, organisations can strive for improved efficiency and effectiveness. In illustrations wherever a benchmark fail to exist, DEA also provides a mechanism for organisations to establish their own benchmarks, thereby facilitating self-improvement and performance optimisation. The differentiation between health and healthcare services is a crucial aspect that warrants careful consideration. The intricate interplay between an individual's well-being and the obligation of healthcare essential amenities is a liege of paramount importance. It is imperative to acknowledge that healthcare services extend beyond the confines of hospital-based care, encompassing a comprehensive array of preventive measures and post-medical check-up services.

In this comprehensive investigation, the researcher has diligently curated a representative sample encompassing all healthcare settings within the geographical boundaries of the state of Kerala. In the context of the healthcare delivery system in India, it is noteworthy to mention that the provision of healthcare services has been systematically categorised into three distinct stages, namely the primary, secondary, and tertiary healthcare settings. The realm of primary healthcare encompasses various essential components, namely the primary health centre (PHC), the community health centre (CHC), and the sub centres. Secondary healthcare encompasses a comprehensive network of medical facilities, namely taluk hospitals, government general and district hospitals, as well as privately owned healthcare establishments. Tertiary health care encompasses the comprehensive network of medical college hospitals, both public and private, that collectively contribute to the delivery of advanced medical services. This study undertakes a comprehensive analysis of each stratum within the healthcare system. The present investigation entails the careful selection of samples from diverse segments within the healthcare delivery system. The study employs a method known as disproportionate stratified random sampling to select the samples for the entirety of the research. The first segment of this study encompasses a comprehensive analysis of the primary health care in Kerala State. Founded on the available data from the Central Rural Health Scheme for the period of 2020-2021, it has been observed that the state of Kerala is equipped with a total of 229 Community Health Centres (CHCs), 924 Primary Health Centres (PHCs), and 5414 sub-centres. These healthcare facilities play a decisive part in satisfying to the healthcare ought of the rural population in the territory. At a confidence level of 95% and a margin of error of 5%, the researcher has selected a sample consisting of 144 Community Health Centres (CHC), 272 Primary Health Centres (PHC), and 359 sub-centres for the purpose of this study. Upon rigorous analysis, it has been determined that a significant proportion of Primary Health Centres (PHCs) amounting to 63%, as well as Community Health Centres (CHCs) with a notable percentage of 64.2%, have demonstrated commendable stages of operational efficacy. However, it is disconcerting to note that a mere 30% of sub centres have been deemed efficient based on the same evaluation criteria. The subsequent division encompasses both privately-owned and government-operated healthcare facilities, encompassing taluk, district, and general hospitals. The present investigation has encompassed the selection of government hospitals as the focal point of examination. The present investigation has exclusively focused on the inclusion of private hospitals duly registered on the official websites of the district government. The comparative efficiency score between private hospitals, with a value of 72.26%, and government hospitals, with a value of 38.8%, highlights a significant disparity in performance. The subsequent segment encompasses the hospitals affiliated with medical colleges. The outcomes of this examination indicate that the government medical college sanitoriums exhibit a significantly higher level of efficiency, with a recorded rate of 28.8%. In contrast, the private medical college hospitals demonstrate a comparatively lower level of efficiency, with a recorded rate of only 15%. The initial phase of this examination involved the computation of the overall efficacy of all the hospitals under consideration. During the next point of the consideration, a comprehensive assessment was undertaken to identify the presence of inefficiencies within hospital settings. Specifically, attention was directed towards the identification of areas where operational processes exhibited suboptimal performance. The study identified several key factors that warrant attention, namely the sum of subordinate staff members, the quantity of beds available, the count of doctors, nurses, and paramedics, the operational hours of the outpatient department (OPD), and the inventory of equipment. These aspects were found to be areas of potential improvement or concern within the scope of this investigation. Upon the validation of the sufficiency of these inputs, it is plausible to posit that the hospitals' efficiency score may experience an increase. During the tertiary phase of the examination, a comprehensive scrutiny was accomplished to establish benchmarks for each category of healthcare settings. The selection of the 176 primary healthcare centres (PHCs) in this study was conducted utilizing the (DEA) Data Envelopment Analysis method. This approximate was employed to enable the benchmarking of these selected PHCs against other similar healthcare facilities. A total of 88 Community Health Centres (CHCs) were meticulously chosen and subjected to a comprehensive benchmarking process to evaluate their performance and effectiveness. Similarly, a sample of 112 sub-centres was carefully selected and subjected to the same benchmarking procedure. A total of 86 private hospitals were carefully chosen as benchmarking institutions for hospitals, in accordance with the classification criteria established by the National Accreditation Board for Hospitals (NABH). The National Accreditation Board for Hospitals (NABH) is an independent and self-governing organisation operating within the framework of the Quality Control of India. The hospitals have been categorised into distinct groups based on their bed capacity, namely: hospitals with less than 100 beds, hospitals with 101 to 300 beds, infirmaries with 301 to 500 beds, and infirmaries with bed capacities exceeding 501. Within the subset of hospitals with a capacity of less than 100 beds, a total of 19 healthcare facilities have undergone the process of benchmarking. Within the designated range of 101 to 300, a total of 36 hospitals were subjected to benchmarking. Within the range of 301 to 500, a total of 19 hospitals have successfully implemented benchmarking practises. Similarly, among hospitals with a bed capacity of 501 and above, 12 hospitals have also engaged in benchmarking activities. Among the cohort of 20 privately-owned medical college hospitals, a mere 15% demonstrate commendable operational efficacy, with only three establishments attaining the status of exemplars within this subset. These three hospitals have successfully established a benchmark for their counterparts within the realm of private medical college hospitals, thereby setting a standard to be aspired towards. Among the total of 14 government medical college hospitals, it has been observed that a subset of 4 hospitals exhibit commendable operational efficiency. Consequently, these four hospitals have been identified as benchmarks for the entire cohort of government medical college hospitals. The study has also undertaken a comparative analysis of the aforementioned categorised hospitals, as well as referenced and incorporated their findings. The final stage of the study entails the formulation and establishment of pivotal performance indicators. The present study posits that the key performance indicators encompass waiting time, patient safety, patient follow-up rate, claims denial rate, hospital readmission rate, net profit margin, bed occupancy rate, average hospital stays, treatment cost, medical equipment utilisation, staff to patient ratio, and treatment error rate.

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INTRODUCTION

As the average human life span continues to increase, maintaining a healthy lifestyle has emerged as one of the most important issues of discussion. It is widely believed that in order to survive a prolonged and vigorous lifespan, one must declare entry to health care services of the highest possible quality. Because hospitals are such a cardinal part of health care, determining and addressing inefficiencies inside hospitals has the capacity to enhance the quality of treatment patients get while also reducing the overall cost of health care. One of the industries in India that is developing at one of the quickest rates, both in rural and urban regions, is the healthcare industry. It is growing both in terms of income and job opportunities. According to Mogha et al. (2012), the Indian government has been working to build a healthcare infrastructure at the primary, secondary, and tertiary levels since the country gained its independence. As the topic of health occupies a more important position on the agenda of international organisations, there is a growing need to precisely examine the numerous dimensions of the topic as well as the effect that changes in policy have. Having a solid comprehension of the inner-workings of health care systems paves the way for effective policy formulation and the finest use of available supplies. This can only be accomplished if a reliable system of measurements and assessment protocols is already in place (Kujawska, 2021).

This research study has an emphasis on examining the efficacy of both public and private healthcare settings in Kerala. Using the approach of data envelopment analysis, an effort is constructed to locate areas of inefficiency within the inputs of healthcare settings. In addition to this, the research attempts to design a model of best practise for the operational functioning of PHCs, sub centres, and hospitals. In totalling to that, the findings of this findings would be beneficial in contrasting the shortcomings of Kerala's public and private healthcare systems.

The DEA is a technique which is extensively aimed for the purpose of determining the effectiveness of hospitals. It is common practise to use this method for determining how efficient a hospital is since it can accommodate the many output and input data that is required by the nature of a health care system. The non-parametric (DEA), has been utilized in the majority of the numerous comparative scrutiny of healthcare organizations that have been carried out across various groupings of nations all over the world.

A relatively new "data centric" approach known as (DEA) or the Data Envelopment Analysis is treated to gauge how well a firm of comparable objects known as Decision Making Units (DMUs) function. These DMUs are liable for switching a strain of inputs into a number of different outputs. The characterization of a DMU is extremely all-encompassing and vague. In contemporary years, a wide diversity of DEA efforts has been used to evaluate the running of a extensive variety of organisations involved in a eclectic variety of conducts in a varied variety of settings across a large variety of nations. These DEA claims have utilized DMUs of varying arrangements in order to examine the recital of a wide variety of establishments, like sickbays, US Air Force wings, colleges, conurbations, law court, commercial businesses, and others, as well as the recital of nations, provinces, and other administrative divisions and organisational units. DEA has also made it feasible to apply it in scenarios that have previously been resistant to other approaches (Cooper et al., 2011). This is for the reason that the intricate (and often anonymous) disposition of the linkages among the many inputs and numerous outputs that are implicated in DMUs.

The Data Envelopment Analysis, often known as DEA, is a technique that is frequently applied in the fields of operations exploration and executives discipline. Its purpose is to scale the proportional ability and implementation of decision-making units (DMUs) that are contained inside a set. Researchers have made a number of remarks regarding DEA over the years, noting its benefits, limitations, and prospective applications in each of their respective statements.

1.1 DATA ENVELOPMENT ANALYSIS (DEA)

The DEA is a practice that is depleted to judge the comparative efficacy of the decision-making units (DMUs) that exist within an organisation. This method is nonparametric. DEA was first presented to the public in 1978 by Charnes, Cooper, and Rhodes. Since then, it has garnered a great amount of popularity due to its capacity to concurrently process various inputs and outputs. (DEA) is a mathematical approximate that was constructed to reckon the comparative effectiveness of a digit of decision-making units (DMUs) that transfer inputs into outputs. It is a skill that is frequently utilized in the disciplines of management, economics, and research. The DEA offers an approach that is not parametric and does not need any a priori assumptions to be made about the functional forms or distributional assumptions. Abraham Charnes, William Cooper, and Edwardo Rhodes were the ones who first conceptualised the DEA in 1978. They intended to design a system that could quantify the efficacy of organisations with many outputs and inputs, where the inputs and outputs were not immediately comparable to one another. This was one of their goals. In order to circumvent the drawbacks inherent in more conventional methods of efficiency analysis, DEA was developed.

1.1.1 Benefits of Data Envelopment Analysis

- Simultaneous Evaluation: DEA allows for the simultaneous appraisal of numerous DMUs, making it a powerful tool for comparative analysis.
- Nonparametric Approach: DEA does not demand any specific running model or distributional assumptions, making it flexible and applicable to various scenarios.
- Identifying Best Practices: DEA identifies the most efficient DMUs, providing benchmarks and insights for improving performance.
- Input and Output Flexibility: DEA accommodates different types of inputs and outputs, allowing organizations to evaluate their performance based on multiple dimensions.

- Handling of Multiple Decision-Making Units: DEA handles conditions which involves a substantial sum of DMUs with several outputs and inputs, making it suitable for complex real-world scenarios.

1.1.2 Types of DEA Models

- Input-Oriented Models: These models focus on cutting input levels while preserving the output stable.
- Output-Oriented Models: These models aim to boost the output stages while keeping the input stable.
- Input-Output Dual Models: These models strike a balance between input reduction and output maximization.
- Variable Returns to Scale (VRS) and Constant Returns to Scale (CRS) Models: VRS models allow for variable levels of efficiency, whereas CRS models assume constant efficiency across all scales.

1.1.3 Advantages of DEA

- No Need for Explicit Functional Form: DEA does not demand information of the functional relationship concerning outputs and inputs, compelling it relevant to a varied extent of scenarios.
- Benchmarking: DEA provides benchmarks for DMUs, enabling organizations to identify and adopt best practices.
- Flexibility: DEA can handle multiple inputs and outputs, accommodating complex decision-making environments.
- Evaluation of Inefficiency Sources: DEA identifies the sources of inefficiency by analyzing the relative performance of DMUs.
- Handling of Multiple Factors: DEA can incorporate various factors, such as technology, management, and environmental variables, in the efficiency analysis.

1.1.4 Disadvantages of DEA

- Subjectivity in Output and Input Selection: The diversity of inputs and outputs can impact the results, leading to subjectivity.
- Data Quality: DEA is sensitive to data quality, and inaccurate or incomplete data can affect the efficiency scores.
- Scale Invariance Assumption: DEA assumes that efficiency scores

1.2 APPLICATION OF DEA IN HEALTHCARE

The Data Envelopment Analysis (DEA) is an approach that is extensively utilized representing the purpose of determining the effectiveness of hospitals. It is common practise to use this method for determining how efficient a hospital is since it can accommodate the many output and input data that is required by the nature of a healthcare system. The application of DEA in a clinical setting is gaining traction and becoming increasingly common in the field of medicine. There is a significant amount of variation in the influence that interior and exterior environmental circumstances have on the functioning of health systems. Examples of external environmental impacts include demographic characteristics, financial patterns, trends in human resource management, and regulations. There are a variety of internal environmental challenges, some of which include hospital competence, amenities and features, technological advancements, healthcare delivery, and proprietorship structures. It is possible that the purpose of the research, as well as the variables of input and output, will be different depending on the circumstances. This is triggered by the numerous facets of healthiness care systems. When evaluating the efficacy of healthcare, a number of studies from across the world take into account not just economic and social difficulties, but also aspects of lifestyle such as rates of unemployment and levels of educational attainment. Others make use of financial indicators because the amount spent on healthcare has a considerable bearing on both public health and the efficacy of healthcare techniques. The DEA is an important device that is wrought to weigh the efficacy of healthcare delivery systems.

The DEA has the ability to evaluate both the strategic and operational facets of resource management. In addition to this, it enables businesses in the hospital services to evaluate the efficiency of their running methods. As a consequence of this, it is feasible to determine both the implementation and the citation set of health approaches, in addition to the effectiveness of the distribution of resources. DEA is a practice for judging the execution efficacy of administrative units that are known as Decision Making Units (DMUs). This slant is established on linear coding and calculates the accomplishment competence of organisational groups. According to Charnes, Cooper, and Rhodes (1978), the purpose of this method is to determine how well a DMU makes use of the resources at its disposal to yield a collection of outputs. In addition, in the year 1978, they devised a numerical coding technique for frontier reckoning and came up with the acronym DEA.

Even though there is an increasing need for health services, getting access to them remains a significant obstacle. The private sector in Kerala is the most prominent provider of specialist medical services, and it serves the vast majority of the state's population as well as its territory. However, the bed-to-patient ratio has not changed significantly over the past several years in comparison to the average around the world, which is a cause for concern. These government hospitals, such as community health centres and public hospitals, have also begun to upgrade their facilities in order to grant specialised medical care. (Sharma & Kama, 2013) Despite the large amount of money that has been invested by government agencies and the secluded segment in organization enhancements to increase service availability and performance for all users of the country's huge population, this infrastructure remains insufficient. In this scenario, it will be absolutely necessary for hospitals, whether public or commercial, to boost the effectiveness of the utilisation of the reserves at their dumping. Data envelopment analysis is a practise that was intended to discover operational efficacy in the method of rational and scale efficacy of companies and to select their benchmark and function rendering to benchmark, or to set benchmark if there isn't one already (Charnes et al. 1994). Data envelopment analysis is a method that was developed to find operational efficacy in the form of rational and scale efficacy of organisations. The relationship between individuals and their health is important, but healthcare services also provide preventative care and follow-up examinations after medical procedures. Because they both apply to very different parts of living a life, these two ideas need to be kept completely separate from one another. The term "healthcare infrastructure" refers to a expansive diversity of components, such as communal, financial, and physical capital, that are required to provide environments that are welcoming to a variety of patient groups. These components are essential for providing quality medical treatment. In spite of the many steps that have been taken to reform the industry, considerable progress must be made in order for the health care sector to preserve both its social and physical infrastructure. The nation is struggling with a number of issues, most notably those associated with its healthcare system. Coordination is necessary for many aspects of the medical industry, including but not limited to: the financing of medical services, including medical coverage; the frameworks for prescription drug guidelines and testing; the frameworks for planning; the evaluation of specialists and other medical experts; general hospital guidelines; and the framework for healthcare services.

1.3 KERALA HEALTH SECTOR

Kerala, an Indian state, has been widely acknowledged for its commendable health statistics, exhibiting a consistent pattern of robustness over time. In the pre-independence era of India, the esteemed Kings of Kerala enacted a key responsibility in advancing the realm of healthcare through the implementation of specific policies and focused endeavours. Kerala distinguishes itself amidst the cohort of developing nations by virtue of its notable advancements in the realm of healthcare. The state of Kerala is geographically demarcated into a total of 14 administrative districts. The state under consideration encompasses a total of 152 blocks and 1,018 villages within its geographical boundaries. Allowing to the authorized information endowed by the Population count of India in 2011, the populace of the state under consideration amounts to 33,406,061 individuals. This figure is further divided into two distinct categories, namely males and females, with respective counts of 16,027,412 and 17,378,649. These statistics, derived from the aforementioned census, shed light on the gender distribution within the state's population. The state exhibits noteworthy demographic morbidity, mortality, epidemiological, and health transitions that bear resemblance to those observed in numerous developed nations. Kerala, an Indian state, has garnered recognition as a paradigmatic region due to its notable achievements, encompassing a range of indicators such as diminished natal and demise tolls, diminished new-born and motherly death tolls, elevated life expectation at natal, and a commendable gender ratio. According to the most recent data, Kerala allocates approximately 5.6% of its annual budget towards the health and family welfare sector, thereby demonstrating a notable commitment to this domain. In comparison, the nation as a whole falls short in this regard, indicating a discrepancy between Kerala's prioritisation of healthiness and family interests and the broader citizen approach. The feasibility of these endeavours has been facilitated by the presence of a robust public healthcare system working in tandem with philanthropic medical organisations operating within the private sector. The optimisation of resource utilisation within healthcare organisations necessitates the imperative practise of performance evaluation. The imperative to assess the current level of technological efficiency within hospitals arises from the need to enhance overall hospital performance, elevate the eminence of patient care, optimise the utilisation of medicinal resources, and foster a healthcare system that is both efficient and sustainable. In order to accomplish this objective, the hospital administration has diligently formulated and executed a myriad of avant-garde management philosophies and strategies aimed at enhancing quality and promoting improvement within the healthcare setting. The ratio of outputs to resources used is known as efficiency. The enrichment of efficiency can be succeeded beyond the employment of two key strategies: the reduction of reserves and assets, and the augmentation of invention reasons. Nonetheless, it is imperative to acknowledge that within the realm of health care, the human element assumes paramount significance. The health statistics of the state of Kerala have witnessed a remarkable improvement over the sequence of the previous deuce eras, primarily attributable to the significant contributions made by the individual hospitals which are not governed by the state or central ministries. The proliferation of non-government hospitals in India has witnessed a remarkable surge, surpassing the established norms within the country and even rivalling their foreign counterparts. The private health sector encompasses a diverse array of entities, including non-governmental organisations (NGOs), benevolent establishments, enterprises, reliance, and diverse specialists and foundations. These entities collectively contribute to the obligation of a wide scale of health services.

Within the realm of medicine, the presence of recreational activities and leisurely pursuits is notably scarce. This observation may be attributed to the distinctive nature of this discipline, as it stands apart from other athletic endeavours by virtue of its inherent association with the inevitable cessation of life for all involved parties, be they active participants or mere observers. In the realm of recreational activities, an intriguing game has emerged, bearing resemblance to the classic "king-of-the-hill" format. However, its distinguishing feature lies in the collective objective shared by all participants, namely the deliberate destabilisation of the World Health Organization's (WHO) fundamental notion of "health." In the event that any individual should inadvertently overlook the precise elucidation, it is imperative to reiterate the following definition: Rendering to the World Health Organisation (WHO), Vigour is a comprehensive state that includes the ideal balance of physical, psychological, and communal well-being, rather than being limited to the mere absence of disease or infirmity. This comprehensive viewpoint recognises the complex and diverse character of health, highlighting the need of treating not only physical illnesses but also mental and social factors in order to attain total well-being. This concept emphasises the importance of achieving genuine health by acknowledging the interdependence of these aspects and striving for a state of balance and harmony.

1.4 SOCIO ECONOMIC PROFILE OF KERALA

As evidence of Kerala's long and illustrious past, historians point to the Muniyars as proof of an old civilisation that dates back to the Palaeolithic period. Marayoor, which is located in the Idukki area, has produced Muniyars that date back more than 2500 years. During the course of their work, archaeologists working in the Ernakulam district town have unearthed a great deal of local and foreign archaeological material that connects many time periods and cultures. According to human settlements that date back to the Iron Age, mediaeval times, and up until current times, it is believed that it was a significant commercial city for a period of 3,000 years, beginning around 1000 BCE. Since ancient times, Kerala has, without a doubt, been in the forefront of both the commercial and cultural exchanges with other nations.

1.4.1 About Kerala

The territory of Kerala is in the most southwestern region of the Bharat subcontinent. The territory of Kerala is home to a vibrant cultural legacy, a long and illustrious history, and strong ties to other countries. As the state with the highest literacy level in India, Kerala is a forerunner in many spheres, including education, health care, gender equality, social justice, and the preservation of rule and regulation. In addition to this, the newborn impermanence rate in Kerala is the smallest it is anywhere in the country. Kerala has a land size of 38,863 square kilometres and is located in southeastern India, with the Arabian Sea to the westward and the Sahyaparvath to the east. One of the five states that make up the South Indian language and cultural region, Kerala is an important cultural centre. Kerala's adjacent states are Tamil Nadu and Karnataka. Mayyazhi (Mahe), also known as Pondicherry (Puducherry), is a region that may be found inside the state of Kerala. Lakshadweep, which is in the spaghetti western split of the Arabian Sea, is a union territory; nonetheless, it shares cultural and linguistic links with Kerala.

In the years leading up to India's independence, Kerala was a princely kingdom that was ruled by a number of different monarchs. Later, on July 1, 1949, the previously separate princely realms of Travancore and Kochi joined together to become the present-day state of Travancore-Kochi. Later on, the region of Malabar in the state of Madras, which is now notorious as Tamil Nadu, was added to the territory of Thiru-Kochi. On November 1, 1956, the state of Kerala was officially established as a separate entity.

1.4.2 Territory

The tropical temperature, abundant monsoons, gorgeous terrain, water resources, forests, long beaches, and more than four rivers combine to create Kerala's one-of-a-kind topography, which is a result of all of these factors. When it comes to describing Kerala, the phrase "God's Own Country" is not an overstatement by any means. Geographically speaking, the state of Kerala may be found between the latitudes of 8 degrees 17' 30" and 12 degrees 47' 40", and between the longitudes of 74 degrees 7' 47" and 77 degrees 37' 12".

In terms of its terrain, the state of Kerala may be broken down into three distinct categories: the East-West-Malnad, the Intermediate, and the Coastal. Along the Sahyadri, Malnad may be found stretching from south to north. The area is home to a diverse array of animal species. Both tropical evergreen woods and chola forests may be found in this area. The Malanad district is the source of Kerala's most important rivers. One of the most famous biodiversity hotspots in the world may be found in the Palakkad district: Silent Valley. 2695 m. The highest point in the state of Kerala is known as the tallest elephant peak. The seashore runs in a south-north direction parallel to the Western Ghats on the western side. The region that is between the Malnad and the coastal regions. The terrain consists of both hills and plains. Rich water resources can be found across Kerala thanks to its 42 rivers that empty into the Arabian Sea and its backwaters in the west, as well as its three rivers, lakes, and streams in the east.

1.4.3 Weather

The geographical location of Kerala, situated at a mere 8 degrees from the equator, renders its climate predominantly tropical in nature. Kerala, a region known for its diverse climatic patterns, exhibits a tripartite division of seasons. The first of these is the summer season, which typically spans from the month of March to May. During this period, Kerala witnesses a rise in temperatures, accompanied by dry weather conditions. Following the summer season, the mid-south or south-west monsoon season prevails over Kerala, extending from June to September. This monsoon season is characterised by the arrival of moisture-laden winds The winters observed during the period spanning from December to February in this particular geographic region are comparatively milder in nature when juxtaposed with the harsher winter conditions encountered in various other parts of the Indian subcontinent. The climatic conditions prevailing in the region of Kerala are characterised by a notable absence of wind patterns and an ample supply of precipitation.

1.4.4 Districts

Kerala is divided up into 14 different districts. The district with the most land area is called Palakkad, while the district with the least land area is called Alappuzha. The district of Thiruvananthapuram is the one that serves as the capital. The district with the maximum inhabitants is Malappuram, while the district with the minimal populace is Wayanad. Kottayam is also known as the Cultural Capital of the Thrissur District, whereas Ernakulam is recognised as the Mercantile Capital of the state of Kerala. Both of these cities are located in Kerala. In addition to this, Ernakulam is the first district in all of India to attain 100 percent literacy. The Palakkad district is where most of Kerala's rice is grown. Idukki is the district with the fewest people per square km and the most trees. Idukki is home to the highest point in Kerala as well as the largest hydroelectric facility in the state. The zone of Kannur is place to the greatest digit of beaches.

1.4.5 Cultural heritage

Kerala is a state in India that has a rich historical past and a diverse cultural landscape. In spite of the many shifts that have occurred over the course of time, Kerala places a strong emphasis on the protection of its cultural legacy. variety in long-term foreign commerce, heritage in the arts and sciences, natural resources, way of life, high literacy rate, variety in traditions, diverse political ideas, roles, food, agriculture, and so on. Diversity in all of these areas contributes to diversity. The charm of Kerala lies in its rich cultural and geographical variety. The interaction of individuals hailing from a variety of backgrounds and social groups is the most significant causes promoting to the extension of Kerala's rich cultural life. Both in their professional and personal lives, the people of Kerala coexist peacefully with the cultures of the vast majority of the globe. The way of life in Kerala is a reflection of this fact. The culture of Kerala is superior in both its quality and its acceptance of diversity. Both within and outside of the country, people are impressed by the high literacy rate and level of life that residents of Kerala enjoy. The preservation of cultural traditions is widely seen as one of the most significant informational resources for understanding the evolution and development of contemporary societies.

1.4.6 Economy-At first glance

The year 2019 witnessed a notable deceleration in the trajectory of economic expansion across the globe, as well as within national and state contexts. It is postulated that the global economy is currently on a trajectory that may lead to a more severe recessionary period than the one experienced during the financial crisis of 2008-2009. The observed deceleration in the national growth rate is evident as it has declined from 6.1% in the monetary year 2018-19 to 4.2% in the fiscal year 2019-20. The state of Kerala experienced a deceleration in its Gross Domestic Product (GDP) expansion, registering a escalation rate of 6.49 percent during the monetary time 2018-19. This figure exceeded the corresponding GDP growth rate observed in the previous fiscal year. The Accelerated Gross State Domestic Product (GDP) at constant fixed prices, as per the provisional figures, exhibited a notable surge from `5.49 lakh crore in the fiscal year 2018-19 to `5.68 lakh crore in the subsequent fiscal year of 2019-20. The observed growth rate for the fiscal year 2019-20 stands at 3.45 percent, exhibiting a notable decline when juxtaposed with the growth proportion of 6.49 percent witnessed in the preceding fiscal year of 2018-19. According to the available data, it is observed that the Gross Domestic Product (GDP) experienced a notable increase of 8.15 percent, reaching a value of Rs 8.54 lakh crore during the fiscal year 2019-20. This growth is in comparison to the previous fiscal year, 2018-19, where the GDP stood at Rs 7.90 lakh crore.

The Gross State Value Added (GSVA) exhibited a growth trend at persistent values during the period of 2011-12 to 2018-19, with provisional figures indicating a value of Rs 4.89 lakh crore. Subsequently, in the accelerated figures for 2019-20, the GSVA experienced a further increase, reaching Rs 5.01 lakh crore. The observed growth rate for the fiscal year 2019-20 stands at a modest 2.58 percent, exhibiting a notable decline from the preceding fiscal year's growth rate of 6.2 percent. Nevertheless, it is noteworthy to observe that the mean growth rate during the period spanning from 2016-17 to 2019-20, amounting to 5.4 percent, surpassed the mean growth rate recorded between 2012-13 and 2015-16, which stood at 4.8 percent. The state of

Kerala, renowned for its commendable growth trajectory, experienced a notable deceleration in its growth rate during the fiscal year of 2019-20. This deceleration is particularly noteworthy as Kerala's growth rate had consistently outperformed the national growth rate in previous years. The deceleration in the rate of growth has been ascribed to the prevailing economic crisis experienced by the state over the course of the past three years. The state experienced the impact of Hurricane Oki in the year 2017, followed by consecutive instances of flooding in 2018 and 2019, which were precipitated by copious amounts of rainfall. The economy of the state has been significantly impacted by natural disasters, leading to adverse consequences for both the livelihoods of numerous individuals and the constructive zones of the economy.

The exacerbation of growth deceleration has been observed as a consequence of the closure measures implemented in retort to the COVID-19 epidemic. According to current projections, it is anticipated that the global economy will experience a contraction of approximately 3.2 percent by the year 2020. The anticipated trajectory of gross domestic product (GDP) expansion indicates a deceleration to 22.8 percent during the initial quarter spanning from April 2020 to June 2020. The Kerala State Planning Board has directed an estimation of the economic repercussions inflicted upon the Kerala economy as a result of the COVID-19 epidemic. It has been determined that the aforementioned crisis will lead to a substantial contraction of 26 percent during the initial quarter of the financial year 2020-21. The escalation of prices, coupled with a deceleration in economic growth, serves to intensify the prevailing economic crisis. During the initial half of the fiscal year 2019-20, the phenomenon of inflation persisted in a positive trajectory. However, it is noteworthy that the inflationary trend surpassed the elevated threshold set for the period spanning from December 2019 to February 2020. This occurrence can be attributed to the mounting pressures exerted by escalating food prices. According to the projected estimates, it is anticipated that inflation, as quantified by the widely used Consumer Price Index (CPI), will experience an upward trajectory, reaching a range of 6 to 7 percent in the year 2020. The state government has implemented measures aimed at ensuring the accessibility of goods to purchasers at affordable estimates, with the assistance of co-operatives such as Supplyco and Consumer fed. During the period spanning from 2011-12 to 2018-19, it is evident that the growth in value-added within the agronomy and amalgamated divisions experienced a persistent deceleration, with some instances even exhibiting negative trends. During the fiscal years 2018-19 and 2019-20, the observed growth rates were recorded as negative 2.38 percent and negative 6.62 percent, respectively.

As of the fiscal year 2019-20, the state's total land area amounts to 25.89 lakh hectares, which accounts for approximately 66.64 percent of the overall land area of 38.86 lakh hectares. The present extent of arable land, which spans approximately 20.26 lakh hectares, accounts for 52.13 percent of the overall land area. According to the available data, it has been observed that the proportion of land utilized for non-agricultural purposes stands at 11.73 percent, while the extent of land covered by forests amounts to 27.83 percent. The proportion of cultivable waste land and waste land is found to be 2.57% and 1.48% respectively. The observed data reveals a notable increase in both the total cultivable area and the area under multiple cultivated areas. Specifically, the total cultivable area experienced a growth of 0.73 per cent, while the area under more than one cultivated area witnessed a substantial increase of 4.92 per cent. These findings indicate a positive trend in the expansion of agricultural land and the diversification of cultivation practises. The observed phenomenon reveals a discernible augmentation in the magnitude of agricultural activities, as denoted by the shift from a numerical value of 126 percent to 128 percent. The year 2019-20 witnessed a notable upsurge in both paddy production and productivity, exhibiting growth rates of 1.52 percent and 5.24 percent, respectively, when compared to the preceding year, 2018-19. The year 2019-20 witnessed the attainment of the utmost production capacity within the span of the past decade, amounting to 3073 kilogrammes per hectare. The present study reveals a notable surge in the expanse dedicated to paddy cultivation, with a substantial increment of 46 per cent. According to the available data, the vegetable production in the state during the fiscal year 2019-20 amounted to approximately 14.9 lakh tonnes. The data reveals a notable surge of 23% in vegetable production during the period spanning from 2018 to 2019. The surge in vegetable production and expansion of cultivated land can be attributed to the assistance provided by various governmental bodies such as the State Government Institutions for Agricultural Expansion and Agrarian Wellbeing, Plant and Promotion Council, Kerala, Kerala Horticulture Mission, Self-Government Local Department, and the Kudumbasree. These entities have implemented vegetable development schemes aimed at bolstering the agricultural sector and promoting the welfare of farmers.

The COVID-19 disease has exerted a intense influence on the agricultural sector, mirroring the repercussions experienced across various industries. Notably, the global trade of agricultural commodities has encountered a state of stagnation, impeding the flow of goods and services. Concurrently, the domestic prices of numerous agricultural crops have experienced a precipitous decline, reflecting the economic ramifications of the prevailing crisis. Furthermore, the scarcity of labour has emerged as a critical challenge, impinging upon the operational efficiency of numerous processing units within the agricultural domain. The efficacy of government intervention in ameliorating the repercussions of various predicaments has been duly observed. The Subiksha Kerala Scheme, as recently declared by the Government, aims to tackle concerns pertaining to food security through the implementation of contemporary technologies and the expansion of cultivated land. This initiative places a significant emphasis on augmenting food production. The pivotal significance of financial institutions becomes increasingly pronounced as the economy transitions into a state of recession, as it necessitates the provision of loans to uphold the operational capabilities of executive entities and foster the process of financial recuperation. The implementation of intervention strategies by means of financial institutions constitutes a pivotal component of the comprehensive measures aimed at bolstering the economy amidst the escalating fiscal limitations encountered by the government. The observed trend reveals a notable escalation in the influx of agricultural credit, surging from `54,270 crore during the fiscal year 2016-17 to a substantial `73,034 crore during the fiscal year 2019-20.

The establishment of Kerala Bank marked a significant milestone in the advancement of the co-operative movement within the state. The corporate business and liaison office of Kerala Back, a prominent organisation, is situated in Ernakulam, a city in the state of Kerala, India. This office serves as the central hub for the company's administrative and operational activities, facilitating effective coordination and communication between various departments and external stakeholders. It is worth noting that Kerala Back's headquarters are situated in Thiruvananthapuram, the capital city of Kerala, further emphasising the organization's strategic presence across different regions of the state. The operational framework of Kerala Bank encompasses a vast network of 769 branches, strategically distributed across the region. These branches are further supported by the presence of seven Regional Offices, which serve as administrative hubs for the bank's operations. Additionally, the bank has established Credit Processing Centres (CPCs) at both the District Headquarters and Branches, further enhancing its operational efficiency and accessibility. The Department of Co-operation plays a pivotal role in offering diverse forms of aid to the populace, encompassing housing, healthcare, social security pension, and financial support. The recent trends in livestock population indicate a notable decline over the past two years. However, it is noteworthy that the 20th Livestock Census has documented a modest growth of one percent in the count of cattle, a substantial increase of nine percent in the count of sheep, and a remarkable surge of 25 percent in the count of chickens. These statistics shed light on the dynamic nature of livestock demographics and warrant further investigation to comprehend the underlying factors contributing to these contrasting patterns. The advent of the night emergency veterinary service represents a significant milestone in this particular domain. Incorporating the augmentation of an additional 20 blocks during the fiscal year 2019-20, the cumulative count of extant nocturnal emergency veterinary services presently encompasses a comprehensive total of 125 blocks. The extension of the aforementioned initiative is anticipated to encompass all blocks within the designated timeframe of the academic year 2021-22.

The annual fish production in the state of Kerala during the fiscal year 2019-20 amounted to a substantial quantity of 6.8 lakh metric tonnes. The present study reveals that the total production of marine fish amounts to approximately 4.75 lakh metric tonnes (MT), while the production of inland fish stands at approximately 2.05 lakh MT. However, it is crucial to observe that the upward trend witnessed in the fiscal year 2018-19 did not persist in the subsequent fiscal year of 2019-20. According to the available data, the recorded fish production for the fiscal year 2018-19 amounted to 8.02 lakh metric tonnes. In recent years, notable endeavours have been undertaken to enhance the calibre of fish seeds, leading to a discernible expansion in the expanse allocated for aquaculture in ponds. Specifically, the area dedicated to this practise has witnessed a rise from 5325 hectares to 5700 hectares during the period of 2019-20. Moreover, the quantity of cage aquaculture units has experienced a substantial surge, escalating from a mere 80 units to an impressive count of 1800 units. Similarly, the number of aq The observed temporal trend reveals a notable augmentation in the spatial extent of paddy cultivation and aquaculture, with the area expanding from an initial measurement of 1620 hectares to a subsequent measurement of 2500 hectares. The practise of zero water exchange prawn farming is currently being implemented on a vast expanse of 200 hectares. The observed data reveals a notable augmentation in the net irrigation area, which has escalated from 4.04 lakh hectares during the fiscal year 2018-19 to 4.09 lakh hectares during the fiscal year 2019-

20. The year 2020 marked a considerable revolving moment in the realm of water resources with the momentous inauguration of the Muvattupuzha Valley Irrigation Project.

The ongoing jungle protection and promotion within the territory has yielded positive outcomes. The findings of the recent assessments indicate a discernible augmentation in the extent of forest cover within the state. Based on the findings presented in the India State of Forest Report 2019, it is evident that the state in question has achieved a commendable position, securing the third rank in relation to its forest cover. Constructed on the discoveries presented in the report, it has been established that the total expanse of forested land, encompassing both natural forests and cultivated plantations, amounts to a substantial area of 21,144 square kilometres. The aforementioned figure corresponds to 54.42 percent of the aggregate land area encompassing the state. Based on the findings presented in the 2017 FSI report, it has been observed that the forest cover within the state has exhibited a notable augmentation, amounting to an increase of approximately 823 square kilometres. The preservation and upkeep of the environment constituted a paramount concern across all developmental endeavours within the state. The Haritha Kerala Mission, a prominent initiative, has been steadfastly dedicated to the crucial domains of water conservation and waste disposal. The Haritha Kerala Mission Pachathuruthu project, which was initiated in the year 2019, represents an innovative endeavour aimed at the preservation and conservation of indigenous biodiversity. The ongoing endeavour has successfully accomplished a total of 1261 instances of green shoots across diverse geographical locations within the state.

The government has undertaken concerted endeavours to guarantee food security by means of an expansive public distribution network, specifically in light of the COVID-19 virus crisis. The ongoing endeavour to digitise the comprehensive ration card data and establish a connection between the recipients and Aadhaar, in accordance with the National Food Security Act of 2013, is approaching its culmination. The realization of the 'One Nation One Ration

Card Scheme' has brought forth the introduction of the inter-state portability facility for ration cards. The observed data reveals a notable increment in the aggregate count of ration card beneficiaries, which surged from 87.1 lakh during the fiscal year 2019-20 to 87.9 lakh during the fiscal year 2020-21, as per the available records until the month of August in the latter year. In the fiscal year 2019-20, a substantial sum of `200.0 crore was allocated towards the provision of subsidies for a diverse range of card holders. Considering the COVID-19 disease, a comprehensive assemblage of essential provisions, colloquially referred to as a 'survival kit', comprising 17 distinct items, each valued at Rs 972, was gratuitously disbursed to a staggering 87.9 lakh households within the state. Furthermore, it is noteworthy to mention that a substantial allocation of 300 crore units of rations was disbursed to cater to the diverse needs of all segments within the familial structure. The proposed initiative entails the provision of complimentary allotments of either 5 kilogrammes of rice or 4 kilogrammes of atta per individual, specifically targeting migrant or guest workers. The manufacturing sector in the state of Kerala has exhibited consistent and notable growth in terms of value, particularly within the four years. The present inquiry pertains to the proportion of the manufacturing sector's contribution to the overall State Value Added (SVA) of Kerala.

The observed data indicates a notable rise in the percentage, which has escalated from 9.8% during the 2014-15 period to 12.5% in the subsequent years, specifically in 2019-20. Based on the Gross State Value Added (GSVA) data provided by the Department of Economic Statistics, it is observed that the manufacturing sector in the state of Kerala exhibited a development degree of 1.5 percent when measured at continuous values for the fiscal year 2019-20. The data for the fiscal year 2019-20 reveals that the manufacturing sector accounted for 12.5 percent and 10.1 percent of the total shares at fixed and current prices, respectively. The Kerala Micro Small and Medium Enterprise Facilitation Act of 2019 represents a significant endeavour within the purview of the Industries Department's comprehensive reform agenda aimed at enhancing the ease of conducting business activities, particularly pertaining to the establishment and functioning of Micro Small and Medium Enterprises (MSMEs). The inauguration of the Kerala e-Mart Business Portal marks a momentous stride in empowering micro, small, and medium initiatives (MSMEs) as well as public sector activities (PSUs) to streamline and augment their business operations in both domestic and global arenas.

The prevailing epidemic and its subsequent closure measures have had a detrimental impact on the micro, small, and medium enterprises (MSMEs) in the state of Kerala. The sector experienced challenges pertaining to the dynamics of demand and supply. Based on the empirical data collected during the initial eight-month period of 2020, it is evident that there has been a substantial decline in the commencement of units, investment, and employment when juxtaposed with the corresponding time frame in 2019. To refer the repercussions of the epidemic, the Government has implemented the Industrial Security Scheme as a means to rejuvenate the micro, small, and medium enterprises (MSMEs) in the state of Kerala. The coir sector has experienced a significant paradigm shift, resulting in a notable transformation. The data indicates a consistent upward trend in the exports of Kerala State Coir Corporation and Foam Mattings (India) Ltd. from the fiscal year 2015-16 onwards. The financial data reveals a notable escalation in the figures, as the amount surged from Rs 1,072.55 lakh during the fiscal year of 2016-17 to Rs 1,425.86 lakh in the subsequent period of 2019-20. The utilisation of husk has observed a notable increase from 12.5 percent to 14.8 percent due to the implementation of advanced defibring units. The production of coir yarn in the co-operative sector experienced a notable surge from an estimated 7,800 metric tonnes (MT) in the year 2015-16 to a substantial 20,000 MT in the year 2019-20.

The state of Kerala has demonstrated commendable achievements in the establishment and cultivation of a thriving start-up ecosystem within its boundaries. At present, it is noteworthy to mention that the state of Kerala holds the esteemed position of ninth in the hierarchy of start-up ecosystems, boasting a commendable count of 1,292 active start-ups. According to a Nasscom report on start-ups, Gujarat did better while Karnataka and Kerala did better. Within the framework of the Kerala Start-up Mission and its various affiliated entities, a substantial number of 2,500 officially registered start-ups have successfully established their operations within an expansive incubation area spanning over 4 lakh square feet. Remarkably, these ventures have garnered an impressive sum of Rs 1,500 crore in external investments, thereby attesting to their financial viability. Furthermore, these start-ups have also contributed significantly to the employment sector, generating a substantial value of Rs 1,00,000 crore in job opportunities.

The resurgence of the tourism industry in Kerala in the year 2019 has been notable, particularly in light of the adverse effects caused by the devastating floods of 2018. The present study reveals a noteworthy surge of 8.52 percent in the influx of international tourists to the state, juxtaposed with the preceding year. Similarly, a substantial upswing of 17.81 percent has been observed in the count of domestic tourists during the same time frame. In the fiscal year of 2019, the tourism industry in the studied region recorded a substantial revenue of Rs 10,271.06 crore from international tourism and a noteworthy sum of Rs 24,785.62 crore from domestic tourism. In the year 2019, the tourism industry experienced a notable growth, resulting in a substantial direct and indirect economic gain of `45,010 crore. This represents a significant increase of 24.13 per cent contrasted to the aforementioned year, 2018. The COVID-19 virus has had a extreme blow on countless segments of the international market, and the tourism industry is no exception. This particular sector has been grappling with substantial financial losses as a direct consequence of the ongoing crisis. The estimated financial impact on the tourism sector during the final three quarters of the year 2020 ranges from Rs 20,000 crore to Rs 25,000 crore. In response to the universal illness initiated by the unique (COVID-19), the governing body at the state level has recently introduced the Covid Loss Assessment Scheme.

This initiative aims to provide assistance to various stakeholders within the tourism sector, with the ultimate goal of facilitating its recovery and revitalization.

The schooling and health segments within the state have experienced significant transformations over the surge of the precedent four years. The enhancement of the educational institution's physical facilities has been undertaken. A total of 141 Higher Secondary Schools have been designated as "Centres of Excellence" through the allocation of a substantial Kifby Fund amounting to `5 crore for each school. The enhancement of the infrastructure in a total of 395 educational institutions has been successfully accomplished through the utilisation of the KIFB Fund, amounting to a substantial allocation of `3 crore per school. The successful execution of Kite's advanced educational initiative has facilitated the transformation of a substantial number of classrooms, precisely 45,000, across a network of 4,752 government and aided schools into technologically advanced learning environments. The commendable endeavours undertaken by Kite in order to ensure the seamless conduction of digital classes amidst the COVID-19 pandemic are worthy of admiration.

The vigour segment in the state of Kerala serves as a noteworthy exemplar for other states, not solely due to its notable accomplishments within the domain, but also owing to its exceptional proficiency in effectively catering to the public health requisites. In the year 2017, the health system demonstrated its capacity to effectively respond to the Nipah virus occurrence and the ongoing COVID-19 epidemic. The state of Kerala has garnered considerable recognition for its notable advancements in health indicators, including but not limited to elevated life prospect, reduced infant death percentage, diminished birth proportion, and decreased mortality rate. The efficacy in combating the COVID-19 pandemic was largely attributed to the robustness of the state's public health infrastructure. The Wet Mission initiative has been instrumental in catalysing a paradigm shift in the health infrastructure of the state. The establishment of the State Health Agency in July 2020 represents a significant stride undertaken by the government within the realm of health insurance. Commencing on July 1, 2020, the Karunya Health Insurance Scheme (CASP) will be executed on a basis of assurance, encompassing a substantial coverage amounting to `5 lakh. The amalgamation of various government-sponsored health insurance schemes, namely the Rashtriya Swasthya Bima Yojana (RSBY), the Comprehensive Health Insurance Scheme (CHIS), and the Senior Citizen Health Insurance Scheme (SCHIS), has been undertaken by Caspil. The Comprehensive Agriculture Support Programme (CASP) encompasses a substantial number of 41.41 lakh households, thereby exhibiting a significant reach and impact within the targeted population.

In a concise summary, it can be observed that the government has effectively executed a range of policies and programmes aimed at fostering the advancement of the productive forces within the economic domain, while concurrently safeguarding the well-being and upholding gender equity for all individuals.

1.5 HEALTHCARE SECTOR PROFILE IN KERALA - GOVERNMENT

The Human Development Index for Kerala in 2011 was the highest of any of the Indian states, based on the state's performance across a variety of significant measures. In comparison to India, the infant mortality rate in Kerala is significantly lower (12 per 1,000 live deliveries) and the maternal death proportion is significantly lower (66 per 100,000 live births) in Kerala than it is in India (178 per 100,000 live births). The literacy rate for males in Kerala was greater than that of India, coming in at 96% as opposed to 82%, while the literacy rate for females in Kerala was even higher, coming in at 92% as opposed to 65%. The state government of Kerala has placed a strong accent on primary health care (PHC) and community well-being, the state's vigour set-up, decentralised domination, monetary forecasting, girls' schooling, communal connexion, and a willingness to improve schemes in order to fill gaps that have remained identified. All of these factors have contributed to the state's recent health improvements. In calculation, the sum of medical facilities, sickbay beds, and doctors in Kerala saw a significant growth throughout this time period. Between the years 1960 and 2010, the quantity of medical practitioners amplified from 1200 to 36,000, while the digit of primary healthcare institutions amplified from 369 to 1356 within the same time period. Because of the increase in primary health care clinics and physicians, it became feasible to provide adequate treatment exactly where it was required, hence reducing the costs associated with patient care and relieving some of the strain on secondary and tertiary care facilities. Additional public health and social development efforts, like the persuade for harmless consumption water in Trivandrum, the state's capital, and the fight to provide primary education for both boys and girls, were initiated shortly after Kerala became a state. These contributed to cultivate the circumstances that were necessary for a thriving economy.

Table 1.1: Health Indexes of India and Kerala, SRS Bulletin 2020

sl no	Indicator’s	INDIA	KERALA
1	Birth Rate		
	Total	19.5	13.2
	Rural	21.1	13.1
	Urban	16.1	13.3
2	Death Rate		
	Total	6	7
	Rural	6.4	7
	Urban	5.1	7.1
3	Natural Growth Rate		
	Total	13.5	6.2

	Rural	14.7	6.1
	Urban	11	6.3
4	Infant Mortality Rate		
	Total	28	6
	Rural	31	4
	Urban	19	9

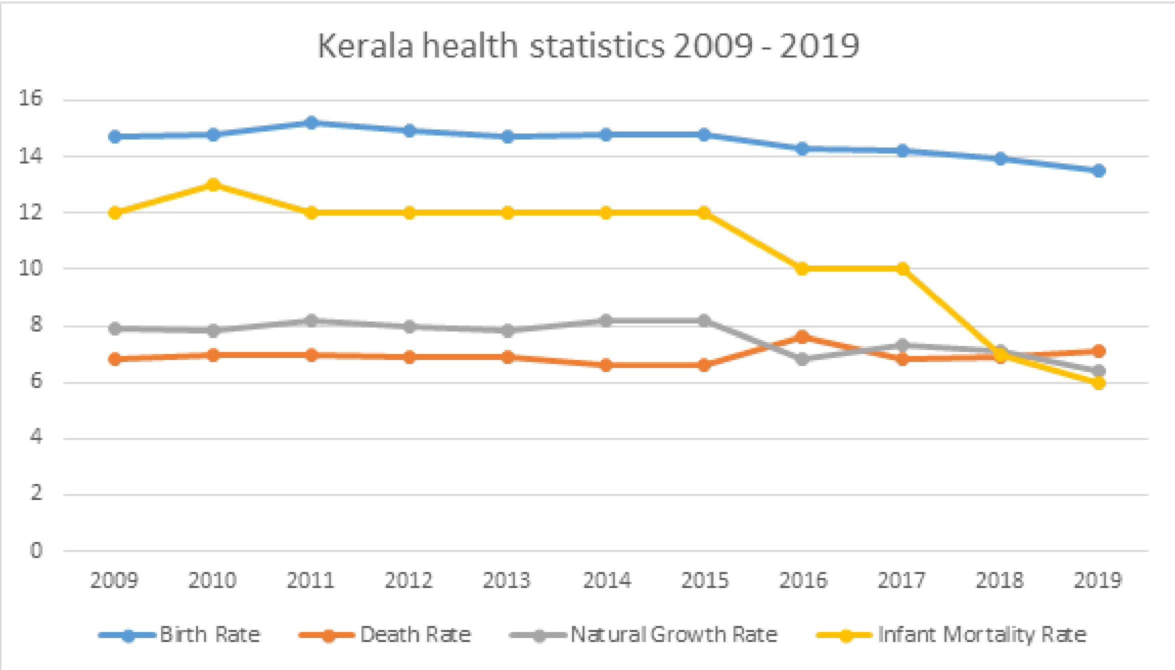

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Fig 1.1: Birth Rate, Death Rate, Natural Growth Rate and Infant Mortality Rate of Kerala from 2009 to 2019

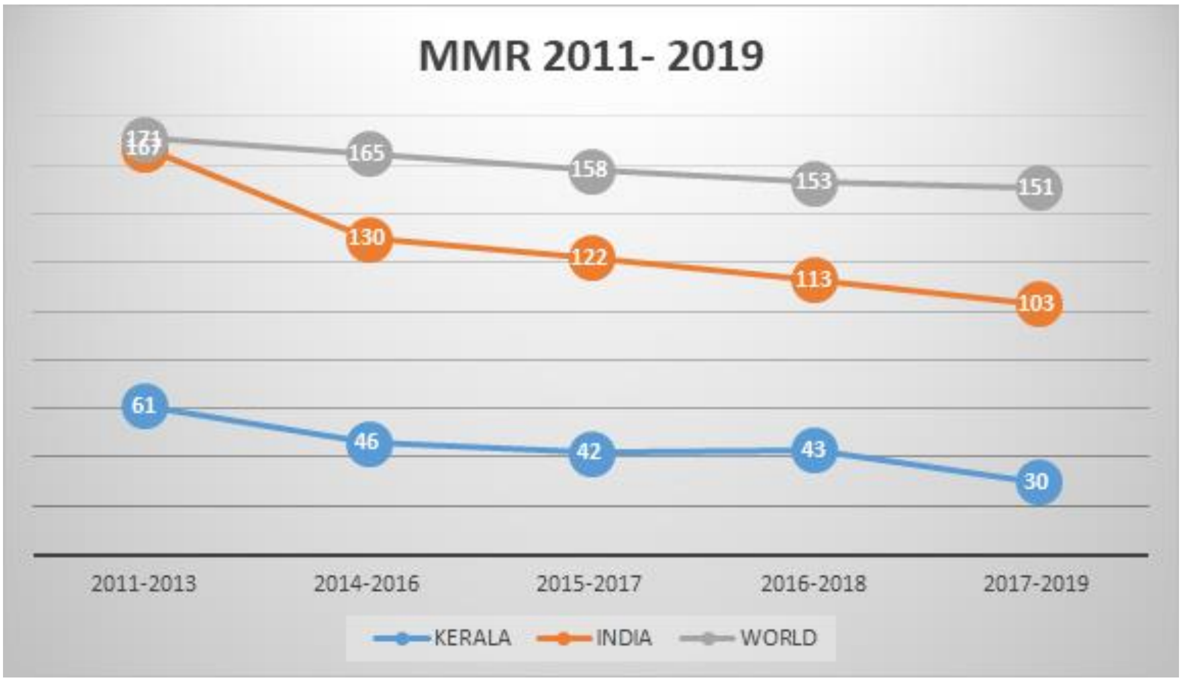


Fig 1.2: Maternal Mortality Rate in Kerala, India and World from 2011 to 2019

Table 1.2: Healthy States, Progressive India, Kerala - Fact Sheet 2019-20

Indicator	Score
Mortality Rate: Neonatal	5
Mortality Rate: Under-five	10
Gender Ratio at Birth	957
Full immunization coverage (%)	92.44
Proportion of institutional deliveries	92.29
TB Treatment Success Rate	88.21
Deficit of ANMs at Sub Centres in proportion (involving SC–HWCs) alongside the figure obliged as per IPHS 2012	3.81

Lack of Staff Nurses at UPHCs, PHCs, CHCs and UCHCs in proportion (containing PHC-HWCs and UPHC-HWCs) beside the sum required as per IPHS 2012/NUHM	57.40
Shortfall of Medical Officers at PHCs and UPHCs in proportion (counting PHCHWCs and UPHC-HWCs) adjacent to the integer obliged as per IPHS 2012/NUHM	0.00
Deficit of Consultants at district hospitals in proportion versus the integer involved as per IPHS 2012	6.94
State government health expenditure to total state spending (National Health Accounts Cell, NHSRC, MoHFW)	7.43
Index Score	**82.20**
Rank	**1**

Table 1.3 Organizational Structure Of Health Sector In Kerala Government

Districts	Medical colleges	Government hospitals	District hospitals	Taluk hospitals	Community health centres	Primary health centres	Sub centres	Grand Total
1. Thiruvananthapuram	1	2	2	8	22	54	478	567
2. Kollam	1	0	1	9	16	46	421	494
3. Pathanamthitta	1	2	1	4	12	35	261	316
4. Alappuzha	1	1	2	5	16	45	366	436
5. Kottayam	1	4	0	3	20	44	333	405
6. Idukki	1	0	2	4	12	34	308	361
7. Ernakulam	1	2	1	11	23	60	410	508
8. Thrissur	1	2	1	6	24	61	472	567
9. Palakkad	1	0	1	6	19	60	504	591

10. Malappuram	1	1	3	7	20	68	589	689
11. Kozhikode	1	1	1	7	16	51	401	478
12. Wayanad	1	1	1	2	9	19	204	237
13. Kannur	1	1	1	9	9	72	414	507
14. Kasaragod	1	1	1	5	6	33	247	294
Total	14	18	18	86	224	682	5408	6450

Table 1.4: List of government hospitals according to NABH classification

Districts	Medical colleges	501 & above hospitals	301- 500 bedded	101 – 300 bedded	0 – 100 bedded
1. Thiruvananthapuram	1	1	2	3	6
2. Kollam	1	1	0	5	4
3. Pathanamthitta	1	0	2	4	1
4. Alappuzha	1	0	2	5	2
5. Kottayam	1	0	2	4	1
6. Idukki	1	0	0	4	2
7. Ernakulam	1	1	0	7	5
8. Thrissur	1	0	0	7	2
9. Palakkad	1	1	0	4	2
10. Malappuram	1	0	0	6	4
11. Kozhikode	1	1	0	4	4
12. Wayanad	1	1	0	2	1
13. Kannur	1	2	0	4	5
14. Kasaragod	1	0	1	1	5

Total	14	8	9	60	44

1.6 STRUCTURE OF HEALTH SECTOR IN KERALA -PRIVATE

The healthcare sphere in Kerala is diverse and incorporates a range of private healthcare providers, hospitals, clinics, and other healthcare facilities. Here's a simplified breakdown of the organizational structure:

- Private Hospitals and Healthcare Facilities:

Corporate Hospitals: Large, multi-specialty hospitals owned and operated by private corporations. Examples include Apollo Hospitals, Amrita Institute of Medical Sciences (AIMS), and others.

Specialty Hospitals: These focus on specific medical specialties such as cardiology, orthopaedics', or cancer treatment.

Nursing Homes: Smaller healthcare facilities that offer a range of medical services, including maternity care and minor surgeries.

- Clinics and Diagnostic Centres:

Private Clinics: Individual or group practices run by doctors and other healthcare professionals. These can range from general practitioners to specialists.

Diagnostic Centres: Facilities that provide diagnostic services such as X-rays, MRI scans, blood tests, and pathology services.

- Pharmaceutical Companies:

Companies engaged in the manufacturing and distribution of pharmaceutical products and medications.

- Pharmacies and Chemists:

Retail outlets that sell prescription and over-the-counter medicines and healthcare products.

- Health Insurance Providers:

Private insurance companies that offer health insurance policies to individuals and organizations. These policies cover medical expenses and hospitalization costs.

- Professional Associations:

Various medical and healthcare professional associations play a role in the private healthcare sector, providing support, guidance, and advocacy for their members. Examples include the Indian Medical Association (IMA) and state-level medical associations.

- Regulatory Bodies:

Government bodies such as the Kerala Health Services Department and the Kerala State Pharmacy Council regulate and oversee the private healthcare sector, ensuring compliance with healthcare standards and guidelines.

- Non-Governmental Organizations (NGOs):

Some NGOs in Kerala operate healthcare facilities or provide support and services in partnership with private healthcare providers, particularly in underserved areas.

- Medical Colleges and Educational Institutions:

Private medical colleges and institutions in Kerala are responsible for training healthcare professionals, including doctors, nurses, and paramedical staff.

It's notable to shade that the private healthcare sector in Kerala, like in other parts of India, is subject to various regulations and standards to ensure the superiority of overhaul stipulated to patients. The sector is dynamic and continuously evolving to meet the healthcare ought of the populace.

For the best testimony on the organizational structure of the private health sector in Kerala, you should refer to official government sources, industry reports, and local healthcare associations.

1.7 KERALA CENSUS

Table: 1.5 Actual & Estimated census of Kerala

Districts	As per 2011 census	Estimated Population in 2022
1. Thiruvananthapuram	3,301,427	3,429,192
2. Kollam	2,635,375	2,737,364
3. Pathanamthitta	1,197,412	1,243,752
4. Alappuzha	2,127,789	2,210,134
5. Kottayam	1,974,551	2,050,966
6. Idukki	1,108,974	1,151,891
7. Ernakulam	3,282,388	3,409,416
8. Thrissur	3,121,200	3,241,990
9. Palakkad	2,809,934	2,918,678
10. Malappuram	4,112,920	4,272,090
11. Kozhikode	3,086,293	3,205,733
12. Wayanad	817,420	849,054
13. Kannur	2,523,003	2,620,643
14. Kasaragod	1,307,375	1,357,970
Total	33,406,061	34,698,873

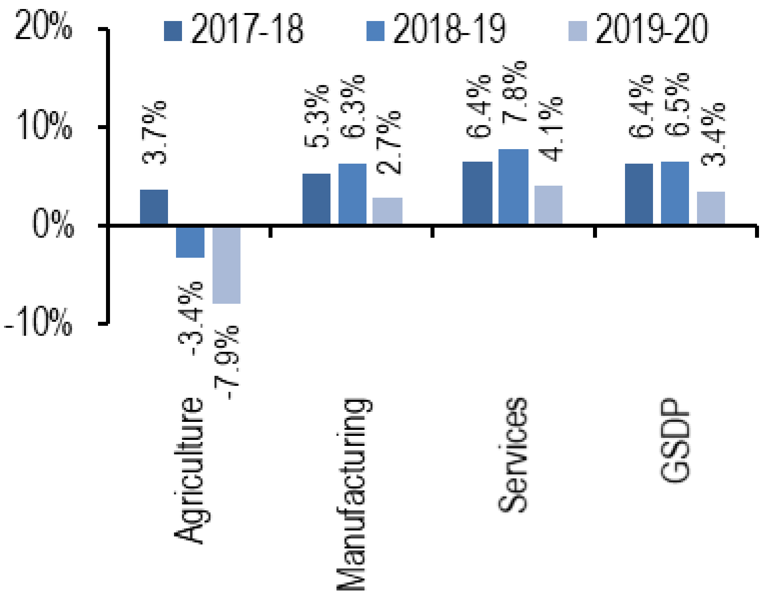
But as per the estimated mid-year Population 2021 (as on 1st July 2021) published by the Governor of India data, the total census of Kerala is 3,55,37,000

1.8 HEALTHCARE EXPENDITURE

The Gross State Domestic Product (GSDP) of Kerala is projected to experience a expansion ratio of 3.4% in the monetary year 2019-20, when measured at constant prices. This estimation indicates an expansion in economic output compared to the preceding year. The observed growth rate of less than 6.5% in the fiscal year 2018-19 is indicative of a deceleration in economic expansion.

In the fiscal year 2019-20, the economy was primarily driven by three key sectors, namely agriculture, manufacturing, and services. These sectors made notable contributions of 9%, 28%, and 63% respectively to the overall economic output. The observed data for the monetary year 2019-20 implies a decline in the growth rate across all three sectors when compared to the growth rate observed in the preceding fiscal year of 2018-19.

The per capita Gross State Domestic Product (GSDP) of Kerala for the fiscal year 2019-20, measured at constant prices, has been projected to amount to Rs 1,63,216. This figure represents a 3% increase compared to the corresponding value observed in the preceding year.



The allocation of Rs 2629.31 crore to the health sector in the Kerala Budget signifies a significant commitment towards the development and enhancement of healthcare services in the state. This substantial financial provision reflects the government's recognition of the paramount importance of a robust healthcare system in ensuring the well-being and welfare of its citizens. By allocating such a substantial amount to the health sector, the government aims to address the existing challenges and gaps in The health sector has been allocated a substantial sum of Rs. 2629.31 crore in the form of grants. The Virology Institute is set to receive a substantial funding of Rs 50 crore, which will undoubtedly bolster its research endeavours and contribute significantly to the advancement of virological studies. One of the notable endeavours encompasses the promotion of cancer treatment within the region, alongside the establishment of the Regional Cancer Centre (RCC) in Thiruvananthapuram, which serves as the designated state cancer centre. A substantial financial allocation of 280 million Indian rupees has been earmarked from the budgetary provisions to be directed towards the Malabar Cancer Centre. The pronouncement made by the minister signifies the intention of the state to execute a comprehensive cancer control strategy. The National Health Mission is set to receive a substantial allocation of Rs. 484 crore, while the Ayush Mission is slated to receive a comparatively modest sum of Rs. 10 crore. An allocation of INR 250.7 crore has been proposed to be disbursed to medical institutes. The esteemed Karunya Arogya Suraksha Padhathi is set to be endowed with a substantial sum of Rs 500 crore. Individuals diagnosed with sickle cell anaemia will be granted a financial allocation of Rs 2 lakh, as per the recent funding initiative. An allocation of Rs 16 crore has been designated for the Janani Janma Raksha initiative. The allocation of a substantial amount of Rs 5 crore has been proposed for the establishment and operation of dedicated units specialising in palliative care.

1.9 ROLE OF PRIVATE HEALTHCARE SECTORS IN KERALA

According to the data, private hospitals did not grow in number, but there has been a significant consolidation of major hospitals. Public policies that support a larger private sector. The development of super speciality hospitals and involvement in medical education have caused a scenario where local hospitals or nursing homes are losing their relevance, and a significant number of them have been phased out. Private hospital availability varies significantly by area. The private hospitals are demanding 30-50 % more than the existing Karunya Arogya Suraksha Padhati from the patients (Preetu Nair / TNN / May 8, 2021).

1.10 SHORTFALL IN HEALTH INFRA STRUCTURE

Kerala's much-lauded public health system is experiencing a crisis. Drug shortages and frequent failure of vital equipment are symptoms of its underlying disease. The average people who rely on government hospitals for their medical requirements are a troubled lot, notwithstanding the health minister and chief minister's constant claims that the State has a thriving healthcare sector. Due to a lack of medications and equipment, government hospitals have recently struggled to function. It will take months for the delivery of medications to hospitals to resume as it was before the delay in drug acquisition. Although they had previously denied it, the authorities have now grudgingly acknowledged that the State's medication supply is insufficient. The common people who rely on government hospitals for their medical needs are being harmed by the scarcity (Menon, 2019).

1.11 NEED FOR THE STUDY

The healthcare services industry in the state of Kerala has emerged as a notable sector among the various service industries present in the region. Moreover, it is noteworthy to highlight that the state of Kerala has consistently demonstrated a steadfast commitment to placing health care at the forefront of its development agenda across various developmental initiatives. The present study acknowledges the existence of challenges encountered by the healthcare system, both historically and presently. These challenges encompass the dual objectives of ensuring universal access to healthcare services for all individuals, while simultaneously enhancing the proficiency and expertise of healthcare professionals. Consequently, the imperative to assess health services and ascertain the efficacy of hospitals has emerged as a requisite measure to enhance the calibre of service provision and optimise resource allocation. Administrators responsible for overseeing hospital operations encounter a myriad of challenges encompassing not only the approach of healthcare amenities, but also the enhancement of operational efficacy within said services. The occurrence of this phenomenon can be attributed to the inherent interdependence between these services and individuals' well-being and way of life, as well as the fundamental role played by human resources in fostering genuine advancements in both economic and social spheres. The potential correlation between the advancement of a society and the effectiveness of its healthcare services may be unveiled, as human and economic progress exhibit similarities in their trajectories. The Kerala’s healthcare sector presents a unique set of challenges that differ from those encountered in other regions of the nation. Several emerging concerns have come to the forefront in recent times. These encompass a surge in the need for elderly care due to a swift alteration in the demographic landscape, the emergence of novel infectious diseases, the degradation of the environment due to insufficient waste management practises and pollution, and a rise in lifestyle-related ailments, among various other pertinent factors. Hence, it is imperative to assess the efficacy levels of all public healthcare facilities within the state.

In the current healthcare landscape, hospitals in Kerala are facing challenges in ensuring enhanced efficacy in the supply of their services. The proposition of augmenting and expanding infrastructure as a means to address prevailing challenges is not the sole panacea. Rather, it is imperative to judiciously utilise both new and existing infrastructure, while prioritising the delivery of high-quality outcomes. This necessity has become increasingly pressing in the present era.

The issue at hand pertains to the significant challenge surrounding the superiority, accessibility, and efficacy of healthcare provisions. In the event of surplus infrastructure, it may be judicious to allocate such resources to small-scale healthcare facilities or those lacking in adequate infrastructure. In light of the predominant conditions, it is commanding to determine the best distribution of supplies and its ensuing utilisation. In a analogous spirit, it is of the highest implication to have the roots of relative ineptitude acknowledged and identified.

The evaluation of operational efficiencies in medicinal hospitals is a prevalent practise in numerous developed nations. This is undertaken with the aim of optimising hospital operations and establishing control over the allocation, quality, and efficacy of resources. The health statistics of the state of Kerala have witnessed a remarkable improvement over the course of the past two decades, primarily attributed to the significant contributions made by the private sector. The proliferation of private sector hospitals has witnessed a remarkable surge, surpassing the established benchmarks within the Indian healthcare landscape and even rivalling their international counterparts. The private health sector encompasses a diverse array of entities, including non-governmental organisations (NGOs), charity establishments, missions, trusts, and various consultants and foundations. These entities collectively contribute to the obligation of a extensive scale of health essential services.

1.12 WHY KERALA IS SELECTED FOR THE STUDY

1. (Public Affairs Centre, 2021) published the data in which it declares the state of Kerala scored 1.618 in its overall indexing and is also lies in top 3 in all positive indexing. More over in National Health Mission ranking Kerala score the top rank.

2. (Kumar, 2021) portrait that how Kerala became an oxygen-surplus State during the COVID pandemic whereas the other states of India were facing COVID death due to lack of oxygen supply. Kerala was also providing medical oxygen to other states too.

3. It was evident that how the State of Kerala grabbed a position among the list of countries, even though it’s a state of India against its effectiveness against the control of COVID 19. Kerala was the state in which the first COVID case reported (Jan 30, 2020). The state managed the spread of COVID 19 effectively and delayed the peak of the disease.

There are studies which consider Kerala as a benchmark to other states in India in view of healthcare administration. The above said articles and studies also glorify Kerala for its eminent role in health industry. Does Kerala really deserve these titles? There is no studies yet conducted in Kerala and among the public healthcare settings in Kerala to rule out its efficiency.

4. The estimated population of Kerala in the year 2021 is reported to be approximately 35.8 million individuals, which is equivalent to 3.58 crores. This data has been sourced from the Unique Identification Aadhar India, with the most recent update available as of May 31, 2020. Furthermore, it has been estimated that the number of migrants to the state of Kerala amounts to approximately 34 lakhs, as reported by Mathrubhoomi in the year 2020. According to the scholarly work of Dr. Jajati Keshari Parida and Dr. K. Ravi Raman (2021), it has been observed that domestic migrant labourers hailing from different states and residing in Kerala are frequently susceptible to various ailments, encompassing both communicable and non-communicable diseases. This vulnerability can be attributed to the substandard living conditions and inadequate sanitation facilities prevalent in their dwellings. According to a recent publication by NewIndianXpress (2021), it has been brought to light that a significant proportion, specifically 55.6%, of migrant workers in the state of Kerala are afflicted with various grave ailments. The substantial influx of migrants has exerted additional strain on the healthcare infrastructure within the state of Kerala. The consideration of the efficacy of the healthcare sector within a state becomes crucial when it is confronted with the responsibility of providing care to a population that exceeds the anticipated number of individuals falling under its jurisdiction.

5. According to recent reports from reputable sources such as New Indian Xpress (2021) and Kerala Kaumudi Daily (2021), it has come to light that the state of Kerala is currently grappling with a significant dearth of human resources within the healthcare sector. The individuals under consideration are currently experiencing a deficit in the availability of human resources. Contrary to the assertions positing Kerala's pre-eminence in the realm of healthcare among other states, the chief objective of this learning is to discern the inherent deficiencies within the system and ascertain the precise causative factors contributing to the prevailing state of affairs in Kerala. This analysis tries to explore the comprehensive spectrum of the

government healthcare structure, spanning from sub-centres and primary healthcare centres to medical college hospitals. Additionally, it seeks to evaluate the role of private hospitals within the broader healthcare industry.

CHAPTER 2

LITERATURE REVIEW

CHAPTER 2

REVIEW OF LITERATURE

"A review of literature is an essential part of any research endeavor. It is a conversation with the scholars who have gone before you." - Judith Garrard

This section has looked at the studies that are related to the current study. This section has been divided into three parts depending on the study's geography. The studies on hospital efficiency undertaken in the state of Kerala were examined in the first part. The writing associated with the hospital condition in the remainder of India is managed in the subsequent fragment. Individual sick bay efficacy has been assessed in the third segment using data envelopment analysis from across the world.

2.1 STUDIES ON HOSPITAL EFFICIENCY IN THE STATE OF KERALA

(Barpanda & Sreekumar, 2020) In any industry, performance analysis is critical to comprehending the existing situation and, as a result, boosting overall efficiency. Performance metrics of excellence were studied as they were linked to technological efficacy in a trial of 20 clinics randomly picked in Kerala. Data envelopment analysis was utilized to determine effectiveness ratings for the study clinics (DEA). In terms of quality indicators, the survey indicated that the technically effective clinics were performing well. DEA may be used to compare clinic accomplishment in terms of both technical effectiveness and superiority. Input and output measurements were used to categorize the variables chosen for the investigation. The factors evaluated were weighted and analyzed utilizing the DEA model. The input elements under investigation include the sum of beds, the digit of skilled medical personnel, and the services provided. The outpatient rate, total of surgical procedures and mortality rate of each month were all examined as outturn variables. The research assesses each hospital's performance and seeks to establish a relationship linking the input and output influences. According to a complete collection of both DEA and the patient happiness study, "J" and "L" rate the smallest in conditions of competence among the institutions under consideration. In the instance of Aswini Hospital, in the Thrissur locality, the sickbay deficiencies competence in appropriately managing high numbers of arriving patients.

(K.R., 2017) The Indian Government started the National Rural Health Mission in recognition of the significance of healthiness in the practice of financial and public enhancement and for increasing residents' attribute of existence (NRHM). The area was meant to be the core throughout which all healthiness and family unit benefits facilities were to be designed and operated under the NRHM's decentralization concept. As a result, it is critical to comprehend each district's success in terms of NRHM implementation. By assessing the accomplishment of each district in Kerala, this research tries to reveal the effectiveness of the physical condition technique in Kerala. The comparative effectiveness of several districts in Kerala in completing NRHM objectives is evaluated utilizing data envelopment analysis (DEA) in this learning. The information was gathered from the Ministry of Health and Family Welfare's NRHM Centre's website. Kerala's NRHM data for the year 2014 is included in the database. A DEA model considers only two primary categories: input and output. Any consequence of the rustic condition program, such as assistance given and patients treated, might be considered an output in this research. Any of the elements that have a substantial impact on the generation of outputs might be considered inputs. For each district, this experimental template calculates a scalar effectiveness proportion and finds a bracket of comparable DMUs. When judged to be a reference set of DMUs with no slacks, 11 of the fourteen districts had an effectiveness ratio of 1; they were categorized as efficient. Because their efficiency ratios were less than one, three of them were inefficient. DEA identified districts that were generally more well-organized and allowed the user to distinguish between effective and inefficient districts. Kasaragod, Palakkad and Malappuram are not efficient, according to the DEA. Even though Kottayam is wasteful according to the CRS and VRS techniques, it has been able to grow well. Returns to scale are declining in these three districts. CRS is used in six of the fourteen districts. Each of Ernakulam, Idukki, Kozhikode, and Thrissur has one peer. Surprisingly, all four are Kottayam benchmarked.

(P & M, 2020) the researchers supervised a investigate to measure the working calculation of public sickbays in urban spheres of Kerala. The lessons target was to analyze the performance of government sickbays by evaluating their efficiency and identifying the sources of inefficiencies. The Data Envelopment Analysis is managed to evaluate each hospital's effectiveness (DEA). Labor and capital are the two types of inputs used in hospital manufacturing. The labour input may be broken down into different professional groups including physicians, nurses, and administrative personnel, while the principal input is denoted by the digit of hospital beds. Inpatient dates and Outpatient appointments are included in the output. The current study is exploratory in nature and is founded on data obtained from Government Hospitals in 2017. Using equally the CRS and VRS representations of DEA with an output alignment, this analyze attempts to quantify TE results in the running of public sickbays in metropolitan spots of the Thrissur district. The research used a production-based DEA. The production model considers hospitals to be service providers who employ labour and capital. In this study, labour and capital are categorised as inputs in hospital manufacturing. The labour input may be broken down into different professional groups including physicians, nurses, and administrative personnel, while the principal input is signified by the figure of hospital beds. DEA-SOLVER Cooper, Seiford, and Tone built the software. Kerala has 6698 government hospitals spread over 14 districts. For the objective of this study, six government hospitals in the Thrissur district's metropolitan regions were purposefully chosen. Six of the nine Government hospitals in the Thrissur district's urban regions were chosen at random. The Taluk hospital Kodungallur is on the efficiency border and in the recommendation set for unproductive Government hospitals, according to the findings. This hospital is referred to as a peer because of its outstanding methods, which inefficient government hospitals may learn from in order to achieve the position of completely efficient government hospitals.

2.2 STUDIES ON HOSPITAL EFFICIENCIES IN OTHER STATES OF INDIA

(Dar & Raina, 2024) This study seeks to assess the productivity and factors influencing public wellbeing in India at the sub-national level. The estimation of people health care efficiency has been conducted utilizing an input-oriented, bias-corrected Data Envelopment Analysis (DEA) model. In this template, living probability at labor and the newborn persistence proportion are considered as yields. Public fitness expenditure and per heads earnings are regarded as essential contributions. In the subsequent phase, "Tobit regression" is retained to observe the issues shaping efficacy. The findings indicate that the imply bias-corrected proficiency result throughout the states of India is 0.60, suggesting that, on mean, there exists a 40% incompetence inside the people health care method in India. The state of Maharashtra exhibits the peak efficiency score at 0.921, while Mizoram demonstrates the least efficiency score of 0.218. A total of fourteen states exhibit efficacy scores below 0.60, while two states achieve an competence score of exactly 0.60. Additionally, fifteen states surpass an efficiency score of 0.60. The influence of socio-economic factors surpasses that of medical factors in evaluating the productivity of public health burden in India. The presence of 40% wastefulness within the public strength sector in India indicates substantial wastage of resources allocated to public health initiatives.

(Mogha, Yadav, & Singh, 2015) The study was undertaken by academics to quantify the productivity of régime segment hospices in the state of Uttarakhand, India, using a Slack-based approach. The empirical of this analysis is to assess the comparative efficacy of public segment sanitoria located in Uttarakhand, India. The research used data from government sickbays obtained from the Directorate of Medical Health and Family Welfare, which is under the Government of Uttarakhand in Dehradun, India. The data specifically pertained to the year of 2011. The cross-sectional data considerations are conducted working the data envelopment analysis (DEA) slack-based attempt. The inputs applied were sum of doctors, beds and paramedical staff and the output was inpatients, outpatients, number of minor and major surgeries. The investigation revealed that among a whole 36 sickbays, only 10 sickbays demonstrated a comparatively higher level of overall technological effectiveness. The typical total technical efficacy of 54.10 percent implies that, on common, hospices have the probable to moderate their input levels by 45.90 percent while upholding the equivalent output levels. The analysis of slack reveals that, on average, there is potential to reduce the number of beds by 12.57 percent, doctors by 13.16 percent, and paramedical staff by 14.04 percent. Additionally, there is potential for expansion in the number of out-door patients by 17.53 percent, in-door patients by 66.55 percent, major surgeries by 208.23 percent, and minor surgeries by 110.73 percent, if all inept hospices were to operate at the level of effective hospices.

(Prakash & Annapoorni, 2015) A comprehensive investigation was undertaken to assess the running evaluation of public sanitoria in Tamil Nadu. The foremost objective of this scrutiny is to ascertain the technical efficiency (TE) levels exhibited by a total of thirty one district hospitals situated within the state. These hospitals fall under the purview of the esteemed division of medical sciences. In the context under consideration, it is noteworthy to acknowledge that district sanitoriums within the state of Tamil Nadu are designated as Decision

Making Units (DMUs). The variables selected for this scrutiny encompassed a range of inputs and outputs within the healthcare setting. The inputs considered were the number of beds, staff nurses, and assistant surgeons/civil surgeons. These variables were decided due to their relevance in assessing the capacity and resources available within a healthcare facility. On the other hand, the outputs examined in this study were the number of outpatients treated, major operations performed, and total deliveries conducted. These outputs were selected as they stipulate appreciated visions into the level of enduring care and services provided by the healthcare facility. By considering these variables, this investigation aims to comprehensively appraise the affiliation between the inputs and outputs to acquire a deeper interpretation of the operational adeptness and efficacy of the healthcare facility under study. The utilization of the Charnes and Cooper (BCC) model, which is known for its focus on output, was taken into account for the Data Envelopment Analysis (DEA) organization. This template incorporates the concept of variable return to scale (VRS), enabling a more thorough estimate of the efficacy of units. Furthermore, the units were classified and assessed based on the benchmarking approach, which enhances the accuracy and comparability of the analysis. The findings of this investigation reveal that a substantial amount of the hospitals under investigation, specifically nine out of the total 31 establishments, demonstrate a commendable level of efficiency, accounting for approximately 29 percent. Conversely, the majority of the hospitals, comprising 22 out of the total 31 establishments, exhibit a comparatively lower level of efficiency, amounting to approximately 71 percent. These less efficient hospitals are advised to enhance their performance by benchmarking against their peer group.

(Dutta, Bandyopadhyay, & Ghose, 2014) The prime objective of this artefact is to demeanor a complete scrutiny of the operational efficacy of 79 government-run secondary-level hospitals in West Bengal, which is classified as a medium performer state in terms of health indicators within the context of India. The primary means of this inquiry encompass the quantification of technical efficacy and the identification of the underlying determinants of inefficiency. The utilization of output-slanting data envelopment analysis (DEA) with changing quantity yield to scale has been employed as the primary approach for the initial objective. In order to fulfil the secondary objective, the researchers employed a methodology involving the utilization of two-part regression models. The outcomes of this analysis indicate that the collective mean efficacy of hospitals, as derived from the data, is 0.728. This value implies that, on average, hospitals possess the potential to generate a minimum of 37 percent more output while utilizing the same input volume, provided they were to operate at an optimal level of productivity. The conclusion of the learning further elucidates that the primary source of inefficiency within the organizational framework is attributed to the personnel belonging to group D, with doctors ranking second in terms of their contribution to slack. The firsthand conclusion reveal that there occurs a negative correlation linking the average length of stay and the efficiency of a hospital. Moreover, the provision of complimentary medication by the hospital and the ratio involving clinician and non-clinician staff strength are also observed to have adverse effects on hospital efficiency. Similarly, the outpatient bed day and the share of backup admissions are discovered to be adversely associated with hospital efficacy. Conversely, the ratio of nurses to non-nurses exhibits a positive impact on hospital competence.

(Tigga & Mishra, 2015) A comprehensive investigation was undertaken to gauge the technical efficacy of the healthiness practice in India through the devotion of Data Envelopment Analysis (DEA). The initial level of this investigation endeavour is to assess the efficacy and success of the health care system in the nation of India. In the present investigation, the researchers have opted for the output-oriented model. A comprehensive selection of data has been procured from a total of 27 states. The current study is predicated solely upon the utilization of data procured from secondary sources, specifically the Family Welfare Statistics, 2011, which is published by the esteemed Central Ministry. Additionally, the District-Level Family and Provision

Measure, conducted during the period of 2007-08, focusing on Reproductive and Child Health (RCH), has been employed as a supplementary source. Lastly, the National Health Profile, 2012, compiled by the esteemed Central Bureau of Health Intelligence (CBHI), has also been utilized in this investigation. The variables under investigation pertain to the quantification of health personnel per 1,000 individuals, encompassing medical doctors, registered nurses, and paramedical staff, as well as the quantification of health facilities per 1,000 individuals, including primary health centres (PHCs), community health centres (CHCs), and sub-centres (SCs). In contrast, the output variables encompass the rates of infant survival and the proportion of institutional deliveries. The findings of the conducted research unveiled that within the cohort of 27 states subjected to investigation, a scant six states were discerned to possess a health system that operates with commendable efficacy. The efficiency being referred to in this context is distinguished by the attainment of current output levels through the optimal combination of inputs, as observed from the perspective of the output approach. The states mentioned above, namely Bihar, Goa, Kerala, Maharashtra, Tamil Nadu, and Uttar Pradesh, exhibit a distinct disparity when compared to the remaining 21 states, which are positioned at a significant geographical distance from the frontier. Kerala has been widely acknowledged for its exceptional efficiency, thus emerging as a prospective blueprint for states grappling with inefficiency.

(Jat & Sebastian, 2013) A comprehensive investigation was undertaken to estimate the technical effectiveness of government district sanitoria in the state of Madhya Pradesh, India, utilizing the technique of data envelopment analysis (DEA). The primary empirical of this research endeavour was to employ the performance of data envelopment analysis (DEA) in order to calculate the technical efficacy (TE) of government district sanitoria situated in the region of Madhya Pradesh, India. The specific area of focus within these healthcare facilities was the establishment of maternity healthcare assistance. Between the temporal span of January and December in the year 2010, an extensive compilation of data was undertaken, encompassing a total of 40 district hospitals. This data was meticulously procured from the esteemed state department of health and family welfare, specifically from their comprehensive health management information system, in conjunction with other pertinent documents of relevance. The implementation of the Drug Enforcement Administration (DEA) was predicated upon the fundamental principles of unpredictable returns to scale and input tendency. The variables under consideration encompassed medical practitioners, specifically doctors and nurses, as well as the physical resource of hospital beds. The observed outcomes encompassed a range of maternal healthcare indicators, including the completion of three antenatal checkups, successful deliveries, caesarean sections, provision of postnatal care within 48 hours of delivery, medical termination of pregnancies, as well as the broader aspects of male and female fertilization. Additionally, the study also accounted for the utilization of inpatient and outpatient services. The findings of the report indicate that the district hospitals exhibited a total efficiency (TE) rating of 0.90, with a standard deviation (SD) of 0.14. Additionally, the scale efficiency (SE) rating of these hospitals was determined to be 0.88, with a standard deviation of 0.15. A notable observation from the conducted research was that precisely twenty district hospitals, accounting for fifty percent of the total sample, exhibited a commendable level of technical efficiency. These hospitals can be considered as the exemplars, forming what can be referred to as the "best practice frontier." The latter portion exhibited a state of technical inefficiency, as evidenced by an average technical efficiency (TE) score of 0.79, with a standard deviation (SD) of 0.12. This suggests that the aforementioned hospitals possess the capacity to achieve equivalent outputs while utilizing 21% fewer inputs than their current utilization levels. The study revealed that a significant proportion of district hospitals, specifically twenty-six out of the total sample, were observed to exhibit inefficiency based on the established scale. This accounts for approximately 65% of the district sanitoria integrated in the investigate. The average score obtained by these inefficient hospitals was determined to be 0.81, with a standard deviation of 0.16.

(Purohit, 2016) performed a study to focus on effectiveness of healthcare system in India utilizing Gujarat state and its district stage statistics for 2012-13. Using data envelopment analysis, the researcher investigates the components that contribute to the relative functioning of several districts (DEA). IMR was employed as an output metric. They experimented with a subset of variables that showed low correlations using principal component analysis. Ayurveda, Siddha, Naturopathy, Yoga, Unani, and Homoeopathy doctors and pharmacists were among the professions with four factor scores that were utilized for DEA. The researchers have explored efficiency rankings based on Charnes, Cooper, and Rhodes scores (or constant returns to scale technical efficiency scores). Thus, their findings about the effectiveness of the district-level health system in Gujarat State suggest that some districts are less effective at using resources like physicians, beds, and workload per health institution. Other districts may also require additional of these inputs to improve their output and efficacy. Thus, it is indicated that Valsad's efficiency has to be improved more than that of other districts, whilst Ahmadabad and Surat require additional medical personnel as well as amenities. Even Vadodara and Rajkot score poorly in conditions of health staffing and resources, thus further suggestions may be helpful for these districts as well. As a result, the outputs exhibit a combination of both inefficiency and insufficiency of inputs.

(Coutinho et al., 2021) By comparing India's health scheme to that of its counterparts in the BRICS and the OECD nations, the research seeks to gauge the effectiveness of the Indian health system.) The variables needed to gauge the input and output of the healthcare system were determined. Efficacy frontline was discovered by means of a Data Envelopment Analysis (DEA) methodology using the levels of the BRICS and OECD nations. India is therefore equaled to its counterparts (the BRICS) and to the OECD nations. India, which rated fourth, was discovered to drive at the effectiveness frontline with Russia, China, Brazil, and South Africa. India competes on the effectiveness edge with nations like Greece, Canada, Japan, Korea, Turkey, Mexico, Spain, Sweden, Switzerland, Chile, Great Britain, and Israel when measured against OECD nations. Nations with reduced health care efficacy, such as Germany, the U S A, the Czech, Slovakia, and Lithuania, must render sensible consumption of their reserves. According to the study's conclusion, emerging nations like India may work to enhance the quality of their healthcare systems by emulating those of their matches and the best 10 OECD nations. Most of the OECD nations in the best 10 have entire healthiness care in place, as well as developed doctor and nurse densities and bed-to-patient ratios. They choose identified medications over generic ones and adhere to evidence-grounded therapy.

(Akula & Singh, 2021) Data envelopment analysis practice is used to evaluate efficacy, and for satisfaction level, the experts working in Government and Private Sanitoria of Punjab are taken into consideration. The researchers also wanted to determine the level of patient satisfaction from the hospitals they had chosen for the study. To verify the accuracy of the instrument's content and the inpatients receiving care at Punjab's tertiary hospitals, which might be either private or public. The study's focus is Punjab, which has recently been ranked as one of the asserts with the greatest per capita salaries. Additionally, the patients who met the minimal requirements to be labelled an inpatient patient—admission to a medical facility for at least one day and one night—joined the research. Hospitals for the research were chosen from Malwa, Chandigarh, Majha, and Doaba, three diverse regions of Punjab. Hospitals are chosen using a sample quota system. Sanitoria of various sizes are chosen, and size is based on hospital bed capacity. According to research, smaller hospitals have an average efficiency of.80, which is greater than that of bigger and medium-sized hospitals. Large hospitals have an efficiency of.71, whereas medium-sized hospitals have an efficiency of.75. The learning's outcomes also demonstrate that the relationship between the quantity of specialist doctors and patient happiness is thought to be negatively moderated by efficiency. According to survey findings, hospitals with higher levels of efficiency have a lessening impact on patients' satisfaction with their care.

(C Purohit, 2015) The researchers use data from the state of Bihar and its districts during 2012–2013 to examine the effectiveness of the health- care technique at the sub-state level in India. Despite being a territory with significant economic and social disadvantages, Bihar's IMR is fairly close to the national average. Utilizing Data Envelopment Analysis, they investigated the factors that contributed to the relative performance of several districts. IMR served as the researchers' output variables. They experimented with a subset of variables that showed low correlations using principal component analysis. For DEA, quaternary part scores related to protected birth, fewer than 24 hours of postpartum hospitalization, the total sum of women receiving postpartum care, and the total sum of women with vaccination cards were employed. The researchers have concentrated on scaling technical efficiency with constant returns. Their findings on the effectiveness of the district-level health technique in Bihar show that several districts are inefficient in their use of resources like physicians, beds, and job per health facility. Other districts likewise require more of these inputs to improve their productivity and effectiveness. The results show a combination of inefficiency and inadequate inputs. The National Rural Health Mission's (NRHM) monies for underperforming districts appear to have been directed in the best possible way. In order to improve the efficacy of the state health system, more research about individual input usage at the level of each health institution as well as training inputs for health employees for the best use of period, workforce, and factual inputs may be helpful.

(De et al., 2012) The purpose of this investigation is to pinpoint the conditions that seem to be less effective with time in enhancing healthiness implication as well as significant variables that help distinguish between effective and ineffective conditions. This paper provides a DEA model that may be used to weigh the effectiveness of the Indian state-level health systems. It uses several government statistics in India relating to health and economics to compare health systems across India's major states throughout five distinct time periods (from the fifth to the tenth Five-Year Planning periods of India). It examines the effectiveness of various territories, which might be thought of as decision-making units (DMU), in creating health conclusions by using a variety of health care assets (in terms of substantial and human setup) as inputs. By comparing outputs (such as infant survival rate and woman life expectancy) with flexible inputs (such as doctors and beds) and ecological variables, the efficacy of the health care sectors in 15 of India's major states is evaluated. In order to enhance health outcomes, it is therefore an effort to assess the relative "efficiency" of health care methods. Here, using a two-stage method, a semi parametric model of the health manufacture process is estimated. In the initial stage, the DEA is used to estimate the output efficiency score of each major state in India in relation to discretionary health inputs to outputs. Findings show that unproductive states like Madhya Pradesh, Orissa, Assam, Uttar Pradesh, Rajasthan, and Bihar lack enough health facilities and human resources.

(Chitnis & Mishra, 2019) The goal of this study is to employ data envelopment analysis (DEA) and super efficacy DEA to estimate the accomplishment of effectiveness of Indian private hospitals. To determine which hospitals are the most effective, an analysis using a combination of four input and one outcome variable is conducted. The one output is Total Income, and the four inputs are Total Capital (TC), Gross Fixed Assets (GFA), Energy Expenses (EE), and Compensation to Employees (CE) (TI). A sample of 25 private sickbays is weighed using DEA in the first stage, and the implementation of the competent hospitals is differentiated using super-efficacy DEA in the second stage. Seven hospitals were found to be the most effective at employing DEA in the initial stage, according to the data. In the next step, super-efficiency DEA assessment identifies Fortis Hospital Ltd. as the super-efficient hospital. The outcomes have management repercussions and give the decision maker (DM) the necessary direction for remedial measures.

(Mogha et al., 2012) The study evaluates the relative effectiveness of a few Indian private hospitals. 55 private sector hospitals' 2009–2010 performance is evaluated utilizing DEA-based CCR and BCC models from the PROWESS database of the Centre for Monitoring Indian Economy. Operating income and net profit were two outputs that were taken into consideration, along with net fixed capital, energy costs, wages and salaries, and raw material costs. According to the report, 10 hospitals can serve as role models for optimum operating procedures for the other 45 ineffective institutions. According to the DEA research, in order to retain the current level of inputs, each hospital must grow its output by an average of 23.70 percent. The inefficient use of resources has a considerable collision on the complete functioning of hospitals. In the chosen clinics, Wockhardt Hospital Ltd. has been identified as a standard. Slack analysis shows where fixed capital use may be improved. The sensitivity analysis shows that even once the best performance is excluded, the hospitals' efficiency scores remain consistent.

(Shetty & Pakkala, 2010) This article compares the technical effectiveness of healthcare in India's main states using a set of health metrics. To gauge technical effectiveness, the paper claims to look at health outcomes like decreased infant mortality and improved life expectancy at birth. To assess the effectiveness of the healthcare system and manage negative data Data Envelopment Analysis (DEA) is employed, and the Non-Proportional Range Directional Model (NP-RDM) is applied. With relation to the ideal state, this template assesses the relative efficacy of the states. Applying the NP-RDM of the DEA formulation demonstrates that certain states benefit from relative efficiency advantages due to superior health outcomes, while others benefit from the least amount of resource use in the healthcare sector. This study identifies two groups of states that are to blame for the nation's low health results. While the additional class of states just has insufficient healthcare supplies, the first category of states uses health inputs inefficiently. They serve as evidence that health documents must be streamlined for an effectively utilization of existing resources to deliver the greatest healthcare services in the nation.

(Gandhi & Sharma, 2018) The main goal of this consideration is to conduct an evaluation of the recent performance of hospitals in India, with the aim of offering policymakers and practical managers valuable insights and information. In this study, the utilization of three interconnected methodologies, namely Data Envelopment Analysis (DEA), the Malmquist Productivity Index (MPI), and Tobit regression, has been employed to scrutinize the technical efficiency of a select number of Indian private hospitals. To fulfil the aims of the study, a selection was made of 2 output variables, namely total revenue and profit after taxes, as well as 4 input variables, namely cost of labour, net fixed resources, current assets, and other operational expenses. Based on the findings derived from the research conducted by the Drug Enforcement Administration (DEA), it has been determined that a total of 20 out of the 37 hospitals examined meet the criteria for efficiency as outlined by the Cooper, Charles, and Rhodes model of Data Envelopment Analysis (DEA). Similarly, an additional 14 out of the 37 hospitals have also been identified as efficient according to the aforementioned model. The empirical evidence pertaining to the Multidimensional Productivity Index (MPI) reveals a notable upsurge in productivity levels within the private hospital sector in India throughout the duration of the research. This observed augmentation can largely be attributed to the advancements in technology. The outcomes derived from the Tobit regression scrutiny reveal that sanitoria that are affiliated with chains, located in multiple cities, and offer specialized care exhibit a higher degree of technical efficiency.

(Davey et al., 2015) The main endeavor of this paper was to shepherd a comparative exploration of public and private health training facilities in India, with a specific core on their adherence to primary healthcare criteria. The present investigation employed the free web-based tool DEAOS to conduct a study employing the Data Envelopment Analysis (DEA) approach within the domain of operations research (OR). The study employed fundamental radial models in the envelopment form, which are commonly utilized in the field of linear programming. A comparative analysis was undertaken in the Muzaffarnagar district of Uttar Pradesh, India, wherein two privately-owned medical college training health centres, one situated in a rural setting and the other in an urban environment, were evaluated for their efficacy in comparison to two government-operated health centres, namely the Sub-Center (SC) and the Urban Health Post (UHP). These government health centres were conveniently located within a radius of 5 kilometres from their corresponding training centres. Thus, the study encompassed four distinct units, comprising one Rural Health Training Centre (RHTC), one Urban Health Training Centre (UHTC), one SC, and one UHP. In the given scenario, it is observed that the geographical proximity between SC and RHTC was approximately 0.5 kilometres, whereas UHP and UHTC were found to be within a radius of 5 kilometres. To ascertain the efficiency of each healthcare facility, the authors diligently conducted regular visits to all four establishments, namely the SC with RHTC and UHTC with UHP. Over a span of six months, commencing on January 1 and concluding on July 1, 2014, meticulous observations were made regarding the input and output histories of these provisions. This rigorous approach was undertaken to ensure the accessibility of adequate comparable information for comprehensive analysis. The input constraints consist of two distinct groups, which will be the focus of the research analysis. These groups will be subjected to various experimental conditions and measurements in order to investigate potential differences or similarities between them. The purpose of this Group 1: The presence and accessibility of medical practitioners within both public and private healthcare training establishments, encompassing Lady Medical Officers, Assistant Professors, and Hospital Specialists. In the composition of Group 2, it was observed that it encompassed a comprehensive assemblage of individuals who were deemed essential for the provision of primary healthcare services. This included personnel such as staff nurses, public health educators, medico-social workers, laboratory technicians, chemists, administrative employees, and other individuals who were involved in the general functioning of the healthcare facility. The output parameters of this study consist of two distinct groups. Group 1: The examination of the numerical representation pertaining to both the overall and specific categories of individuals seeking medical attention on an outpatient basis, as observed by medical practitioners within the realm of primary healthcare provisions. Group 2 encompasses a comprehensive array of primary healthcare services that are rendered by the staff. These services encompass a wide range of medical interventions, such as the treatment of minor injuries, the provision of pharmaceutical resources, family planning initiatives, the promotion of health within educational institutions, the facilitation of adolescent health, the administration of antenatal care, the conveyance of reproductive and child health services, the conduct of family health surveys, the implementation of immunization protocols, the provision of laboratory services, and the dissemination of health education activities. The comparative analysis of patient volumes observed in the presence of medical practitioners revealed that the government health facilities, encompassing the services of Sub-Centres (SC) and Urban Health Posts (UHP), exhibited a higher degree of efficacy in delivering primary healthcare services when likened to the private training health centre facility services group.

(Mogha et al., 2014) This investigation employs data envelopment analysis (DEA) to estimate the technological efficacies of 50 privately-owned sanitoria in India over the period spanning from 2004–2005 to 2009–2010. In stark contrast, it is noteworthy to highlight that the mean overall technical efficiency (OTE) exhibited by sanatoria in India throughout the whole duration of the study manifests itself as 79.40 percent. This finding unequivocally suggests that, on average, hospitals in the aforementioned context are required to augment their outputs by a considerable margin of 20.60 percent, while maintaining the surviving level of inputs. The present study discloses that, within the designated time frame, a mere five hospitals have demonstrated a comparatively higher level of efficiency. Based on the analysis of the relative technical scale-wise efficiency (RTS-wise efficiency) in the context of hospital operations, it has been observed that sickbays functioning under the decreasing returns to scale (DRS) exhibit a comparatively higher average overall technical efficiency (OTE) in comparison to hospitals functioning underneath the increasing returns to scale (IRS) paradigm. This observation advises that the hospitals implementing the innovative intervention of increasing their size-scale within the context of the integrated referral system (IRS) may potentially enhance their overall treatment effectiveness (OTE). In accordance with the goal analysis, it has been posited that the adoption of the exemplary practices exhibited by highly efficient hospitals, which serve as the benchmark or peer-set for evaluating performance, would facilitate a notable enhancement in the production capacity of inefficient hospitals.

2.3 STUDIES ON HOSPITAL EFFICIENCIES AROUND THE GLOBE

(González-de-Julián, Vivas-Consuelo, & Barrachina-Martínez, 2024) This study aims to construct models for assessing the efficacy, encompassing health consequences, of the main health care within the Clínico – La Malvarrosa Well-being District in Valencia. The assessment of productivity was conducted utilizing Data Envelopment Analysis (DEA), characterized by yield induction and varying revenues to scale, employing group records spanning the years, two thousand fifteen to nineteen. The inputs expressed in rates per 10,000 populace, include medical and nursing personnel as well as pharmacy expenditures. The outputs include the number of sessions, instances of sickbay crises, appointments, preventable hospitalizations, stoppable death, and the efficiency of pharmaceutical prescriptions. The exogenic variables include the calculation of the inhabitants aged 65 years and older, those aged over 80, and the case-mix. Three distinct kinds were constructed, each utilizing identical inputs while varying the sequences of outputs associated with healthcare endeavor, effects, and a dual focus on both. This methodology was employed to investigate the impact of these diverse approaches on overall efficiency. Each model undergoes analysis in two distinct contexts: first, devoid of exogenous variables, and subsequently, incorporating each variable individually. The results pertaining to efficiency exhibit variability contingent upon the model employed. Notably, certain primary healthcare centres consistently operate on or near the efficient frontier, whereas others persistently demonstrate inefficiency. The consideration of healthcare activity outputs leads to an enhancement in efficiency scores, resulting in an increase in the number of competent Primary Healthcare Centres (PHCs). Nevertheless, it is observed that the PHC score exhibits a declining trend over the assessed timeframe. The reduction is notably more significant when solely considering activity outputs.

(Er-Rays, M'dioud, Ait-Lemqeddem, & Ezzahiri, 2024) This research endeavours to scrutinize the technical efficacy of 82 MNCSN within the framework of the Primary Healthcare Establishments Network (PHCEN) in Morocco for the year 2021, while also identifying the factors that impact their efficiency. The estimation of technical efficacy was conducted utilizing the Data Envelopment Analysis (DEA) methodology, specifically adopting an input orientation approach. The analysis of factors influencing the technical efficacy of maternal and child healthcare was conducted using Tobit regression. At the outset, the mean adeptness score of the 82 MNCSN was recorded by the side of 0.789 for regular gains, with 36 MNCSN attaining a notch of one. Nevertheless, the MNCSN exhibited the minimal effectiveness score, quantified at 0.0323. In the subsequent phase of analysis, the Tobit regression indicated that Model 2 exhibited greater significance in comparison to Model 1. The explanatory variable

Rural Dispensary demonstrated a robust arithmetical impact and a favourable effect on motherly and baby health. This was subsequently shadowed by variables including elevated-jeopardy gravidities established and extreme-danger Gravidities. The outcomes of the findings indicate that the reserves designated for MNCSN in Morocco are not surviving employed as efficiently as those in certain other African and European nations. Consequently, it is imperative for the Ministry of Health in Morocco to conduct a comprehensive review of the functions of MNCSN, with the objective of enhancing the provision of maternal, newborn, and child healthcare amenities across diverse settings, whether urban or rural.

(Lobo, Rodrigues, André, Azeredo, & Lins, 2016) A comprehensive investigation was undertaken to explore the usage of Dynamic Network Data Envelopment Analysis (DNDEA) in the evaluation of university hospitals. The leading reason of this consideration was to judge the use and productivity of university sanitoria by employing a dynamic network-based approach. By utilizing DNDEA, a sophisticated analytical framework capable of capturing the dynamic nature of hospital operations, a comprehensive evaluation of university hospitals was conducted. The judgments of this lessons shed light on the performance and productivity of university hospitals, providing valuable insights for healthcare administrators and policymakers. The initial means of this inquiry were to devise a comprehensive assessment instrument that would enable the evaluation of operational efficacy within federal university general hospitals. The proposed model is founded upon the principles of dynamic network data envelopment analysis (DEA), which aims to facilitate the decision-making processes undertaken by managers. The present study undertakes a longitudinal analysis to discover the interrelations between the magnitude of care, teaching, and examination, with a specific focus on their efficiency. The analysis of the network structure takes into account the interplay between the scope of care, training, and examination, while the vigorous measurement focuses on the cycle spanning from 2010 to 2013. The DMUs, which refer to the 31 federal general university hospitals, are under the administration of the Brazilian Ministry of Education (MEC). These establishments are herein delineated by their corresponding universities. The variables employed in this scrutiny were obtained from the esteemed Ministry of Education Information System. The variables reflected in this finding encompass the sum of beds, the technology sum index, and the human resources factor. The outputs under consideration in this study pertain to outpatient visits, which have been adjusted built on the involvedness of the cases and the budget allocated for such outputs. The findings of the study unveiled that the average scores pertaining to health care, education, and investigation during the specified timeframe were 58.0%, 86.0%, and 61.0%, correspondingly. In the time 2012, which marked the pinnacle of performance, it was observed that in order for all units to attain the frontier, certain increments and decrements were deemed necessary. Specifically, an entail rise of sixty five percent in OPD trips, thirty-four in entries, twelve in degree scholars, thirteen in multi-proficient population, forty-eight in PG scholars, and seven percent in investigation tasks were required. Conversely, a reduction of nine percent in health pupils was found to be essential for achieving the desired outcome. In the fiscal year under consideration, it is imperative to allocate an additional 0.9% of the financing budget in order to effectively enhance the care output frontier.

(Dénes, Kecskés, Koltai, & Dénes, 2017) A comprehensive investigation was undertaken to explore the utilization of Data Envelopment Analysis (DEA) in the assessment of healthcare implementation within recuperation of departments situated in Hungary. The primary target of this inquiry is to employ the technique of data envelopment analysis (DEA) for the purpose of quantifying the efficiency levels exhibited by rehabilitation departments specializing in the treatment of musculoskeletal diseases. The present investigation relies upon the data derived from the 2014 nationwide annual survey conducted under the auspices of the National Statistical Data Collection Programme. A comprehensive survey was conducted to identify a total of 80 musculoskeletal rehabilitation departments, employing a rigorous process of exclusion criteria. The analysis encompassed the consideration of a total of 2 outputs and 4 inputs. The outputs of interest in this study encompass the count of patient days and the count of patients discharged. These outputs are influenced by a set of inputs, namely the count of hospital beds, the count of employed physicians, the count of employed nurses, the count of professional healthcare employees, and the count of non-physician professionals. These inputs collectively shape the dynamics of the healthcare system under investigation. The process of analysis can be divided into two distinct components. The present examine is intended to investigate the scale efficacy of a given system by employing output-oriented radial models. These models were chosen due to their ability to effectively analyse the problem at hand. Subsequently, an assessment is conducted to ascertain the efficacy and potential for enhancement within each department. This evaluation is carried out by employing output-oriented variable return to scale slack-based models, which are tailored to address the specific challenges at hand. The results of the examination reveal that the employed Data Envelopment Analysis (DEA) model effectively assesses the operational efficacy and success of rehabilitation departments. The analysis presented herein elucidates the disparities in operational efficacy among the departments under scrutiny, while concurrently delving into the inefficiencies that arise in connection with economies of scale. The slack values serve as a direct indicator of operational deficiencies within specific domains, thereby providing precise quantification of the necessary modifications.

(González-De-Julián, Barrachina-Martínez, Vivas-Consuelo, Bonet-Pla, & Usó-Talamantes, 2021) A comprehensive investigation was undertaken to explore the applications of Data Envelopment Analysis (DEA) in the context of Primary Health Care (PHC), with a specific focus on the incorporation of exogenous variables and their influence on health outcomes. The study aimed to shed light on the potential aids and limitations of utilizing DEA as a device for rating the efficacy and value of PHC systems. Through a rigorous scrutiny of relevant literature and empirical data, the rese the consumption of data envelopment analysis (DEA) was hired as a organizational tactic to appraise the operational efficacy of a total of 18 primary healthcare centres situated within a health district located in the Valencian Community, Spain. The utilized sources of information encompassed the automated outpatient medical records, namely the Ambulatory Data Method and the Drugstore Recommendations Manager. Additionally, the Infirmary Least Information Set, the Inhabitants Evidence Scheme, the Monetary Material Scheme, the catalogue of tragedies from the Hospice Data Scheme, and the databases for Hospice Apothecary of the Regional Ministry of Healthiness were also incorporated. The present analysis has been conducted utilizing the dataset from the calendar year 2015. The utilization of the variable return to scale (VRS) and output orientation method was employed in the study. The variables considered in this study encompassed the proportions of general consultants, nurses, and costs, while the resultant variables comprised sessions, emergencies, preventable hospitalizations, and prescription proficiency. The findings of the study indicate that there is a negative correlation between the quantity of general doctors' and nursing consultations, transfers, and pharmacological spending within BHUs (Basic Health Units) and the incidence of corrected emergencies. Specifically, BHUs that exhibit a higher level of activity, characterized by a greater number of consultations and referrals, as well as increased pharmaceutical expenditure, but with lower prescription efficiency, tend to experience a lesser frequency of amended emergencies. This observation suggests that the effective management of patients by their primary care physicians, characterized by increased frequency of consultations and greater investment in pharmaceutical interventions, may lead to a decrease in the existence of medical emergencies.

(Shen, Hsu, Lung, & Ly, 2020) A comprehensive investigation was undertaken to explore the enhancement of efficiency assessment in the domain of psychiatric halfway houses. The research focused on employing a context-dependent data envelopment analysis approach as a means to attain this empirical. The exhibit study introduces a novel methodology, namely context-dependent data envelopment analysis (DEA), as a means to assess the operational efficacy of halfway houses. The primary objective is to facilitate appropriate modifications within the existing economic framework. The present study incorporated data obtained from a total of 38 halfway residences and psychological health recuperation institutions, which were subjected to rigorous evaluation by the esteemed Ministry of Health and Welfare of Taiwan in the year 2014. The variables employed in this study encompass the number of qualified staff members, the organisation area under consideration, and the quantity of beds available. The output variables encompass the domains of human resource management, restoration service attribute management, and problem-resolution proficiency. The empirical evidence indicates that a total of fifteen halfway houses can be categorized as belonging to the medium level. These establishments can be further delineated by scrutinizing their charm score and advance score, thereby enabling their classification within a specific quadrant. The findings of this study can be effectively utilized to allocate community resources in a manner that enhances operational strategies and fosters the growth of halfway houses that embody appealing and forward-thinking principles. By doing so, it is plausible to mitigate the institutionalization of individuals with mental illnesses and curtail the squandering of medical resources that arises from prolonged hospital stays.

(Helal & Elimam, 2017) A comparative study was undertaken to gage the ability of health service regions in the Kingdom of Saudi Arabia, specifically focusing on the years 2014 and 2006. The research employed the methodology of Data Envelopment Analysis (DEA) to calculate and estimate the efficacy levels. The top aim of this analysis was to gage the efficacy of healthcare services rendered by government sickbays across diverse districts within the Kingdom of Saudi Arabia. In the year 2014, the study encompassed a total of 270 community hospitals associated with the Ministry of Health in the Kingdom of Saudi Arabia. These hospitals were strategically strewn across 20 administrative districts, ensuring a comprehensive representation of the healthcare landscape within the country. The model incorporated inputs such as the quantity of clinic beds, the digit of physicians, the nursing workforce, and the paramedical workforce. The output encompassed the quantification of individuals who visited admitted patients, the quantification of inpatients, the quantification of heirs from the radiography service, and the quantification of heirs from laboratory tests. The utilization of the BCC Model and CCR Model has been observed in the researcher's study. The findings of the study indicate that in the year 2014, the government sanitoria in the various areas of the Kingdom of Saudi Arabia demonstrated an average productivity efficiency of 92.3%. Furthermore, the average domestic manufacture proficiency of these districts, as observed in the delivery of health packages via their respective sanitoria, was found to be 94.7%. Additionally, the mean peripheral productivity proficiency in the different cities within the districts of the Kingdom of Saudi Arabia was determined to be 97.5%. The present study reveals that an examination of the relative competence markers of government hospitals, specifically in relation to the distribution of Saudi Arabian districts in the year 2006, has yielded noteworthy findings. Notably, the average overall productivity efficiency has been determined to be 90.2%. Upon conducting an in-depth examination of the aforementioned indicator, it has been determined that the average construction efficacy of the amenities rendered within by the various districts within the Kingdom of Saudi Arabia stands at an impressive 94.7%. Furthermore, it is worth noting that the standard external manufacture efficacy for these services has been found to be even higher, reaching an impressive 95.4%.

(Omrani, Shafaat, & Emrouznejad, 2018) The present study undertook an investigation into an integrated approach combining fuzzy clustering, cooperative game theory, and data envelopment analysis (DEA) to measure hospice efficacy. The objective was to develop a novel model that could effectively evaluate the performance of hospitals within a cooperative game framework. By incorporating fuzzy clustering techniques, the model aimed to capture the inherent uncertainties and complexities associated with hospital data. The proposed model holds potential for enhancing decision-making processes and resource allocation strategies in the healthcare region. The present study employs a methodology that draws upon the principles of fuzzy C-means for the purpose of clustering provinces. Additionally, cross-efficiency DEA is utilized to approximate the performance of sanitoria within each bunch. Finally, the Core and Shapley value approach is employed to comprehensively rank the efficient hospitals. The input variables encompass the comprehensive assessment of the sum amount of human resources, the quantification of health tools within each sickbay, and the fortitude of the number of active beds available. The outputs that have been chosen for analysis encompass the quantification of inpatients, outpatients, and exceptional patients individually, while the quarter output pertains to the measurement of bed-days. The present study undertakes an evaluation of the outcomes derived from the efficiency estimation of a total of 288 hospitals situated within the geographical boundaries of Iran. The hospitals have been systematically categorized into distinct clusters, wherein the outcomes have been duly ascertained. Specifically, within Cluster 1, a sum of 11 sickbays have been detected as efficient, while 46 hospitals have been classified as inefficient. Within the confines of cluster 2, a comprehensive analysis of 36 hospitals has revealed that a total of 10 hospitals have demonstrated commendable levels of efficiency, while the remaining 26 hospitals have been deemed inefficient in their operations. Within the confines of the third cluster, it has been observed that a total of 64 hospitals exhibit a notable degree of inefficiency. Cluster 4 encompasses provinces of substantial size and advanced development. Within this particular cluster, it has been observed that out of the total of 72 hospitals that have been subjected to rigorous evaluation, a notable subset of 17 hospitals have demonstrated commendable levels of efficiency.

(Wang, et al., 2016) A comprehensive investigation was undertaken to evaluate the functioning and influences of maternal and child health sickbay facilities in the Guangxi Zhuang Autonomous Region, China. The study employed the rigorous methodology of Data Envelopment Analysis to conduct a comparative analysis between county level hospitals situated in poverty-stricken areas and those in non-poverty regions. The chief goal of this inquiry endeavour is to discern the key considerations that influence hospital efficacy, with a particular focus on the Maternal and Child Health Hospital (MCHH). By delving into the intricacies of productivity and efficiency, this examine seeks to shed light on potential avenues for enhancing the performance of MCHH. In the year 2014, an assemblage of data was meticulously gathered from a representative subset comprising 32 county-level Mother and Child Health Hospitals (MCHHs) situated in the province of Guangxi. The questionnaire was meticulously crafted in alignment with the overarching objectives of the survey, with a particular focus on encompassing sections pertaining to the input component as well as the output component. The issuance of the document in question can be attributed to the Guangxi Zhuang Autonomous Region health department, a governing body responsible for overseeing healthcare matters within the region. The task of completing said document was undertaken by the diligent personnel working within the county Mother and Child Health Hospitals (MCHHs). The variables under consideration encompass Total Expenditure, Quantity of Doctors, Quantity of Nurses, and Quantity of Open Beds. The output variables encompass the aggregate revenue, the count of cases and disaster visits, alongside the tally of released affected role. The findings of the study unveiled that the mean values pertaining to methodological competence, net technological efficacy, and scale productivity of the clinics were 0.875, 0.922, and 0.945, correspondingly. The decisions of this inquiry wink that a significant proportion of the sanitoria under investigation demonstrated a level of efficiency. Specifically, it was observed that approximately half of the hospitals exhibited efficiency in their operations. However, it is prominently that a notable portion of the sanitoria, namely 9.4% and 40.6% of the total, were found to possess weak efficiency and inefficiency, respectively. These results shed light on the varying degrees of operational effectiveness within the hospital sector, highlighting the need for further investigation and potential interventions to enhance overall efficiency. Within the subset of hospitals exhibiting low levels of productivity, a notable majority, specifically 61.1%, were found to be situated within economically disadvantaged nations. The comprehensive data analysis reveals a substantial disparity in the abundance of surplus medical resources between impoverished regions and non-impoverished regions. The decisions derived from the Tobit regression model indicate a positive relationship between technical efficacy and total yearly revenues, the quantity of discharge patients, as well as the quantity of outpatient and emergency appointments. Conversely, a negative correlation was observed amongst technical efficiency and total expenditure, as well as the factual sum of open beds. The experimental judgments indicate that there occurs no significant correlation between technical efficiency and the quantity of healthcare personnel.

(Kujawska, 2021) A comprehensive investigation was undertaken to discover the topic of Health System Efficiency in European Countries, employing a methodological framework known as Network Data Envelopment Analysis. The primary objective of this scrutiny is to examine and gage the efficacy of fitness routines across various European nations, utilizing comprehensive data derived from EUROSTAT. The utilization of both the network DEA model and the slack-based model has been observed in the relevant literature. The utilization of a non-oriented model is employed in this particular context. The present study encompasses a comprehensive sample of 30 countries, consisting of the 28 member states of the European Union, in addition to Norway and Iceland. The fitness routine takes into consideration two pivotal aspects, namely lifestyle (LF) and core health maintenance funds. The study encompassed a comprehensive examination of various lifestyle factors, namely alcohol consumption, smoking habits, and the presence of excess body weight. The fundamental pillars of medical care encompass a triad of indispensable components, namely medicinal workforce, hospice beds, and financial resources. The evaluation of well-being category and beneficial life expectation is commonly regarded as subjective in nature, yielding direct outcomes. In the context of this discussion, it is pertinent to note that the intermediate product under consideration is represented by a link. Specifically, the focus lies on the expenditure allocated towards prevention measures, which is postulated to be a proportionate representation of the Gross Domestic Product (GDP). The present study has successfully ascertained that the health systems in five distinct countries have been unequivocally recognised as exhibiting complete efficiency. These nations have additionally attained comprehensive efficacy in both the domains of lifestyle determinants and healthcare provisions. The empirical testing shows that the overall efficacy levels of health systems across various nations are notably suboptimal, with a mean efficiency score of 0.619. Furthermore, upon closer examination, it is observed that the average competence score within the LF division stands at 0.580, indicating a slightly lower performance compared to the overall average. It is important to note that there exist substantial disparities in efficiency levels among different countries within this division. Within the domain of the MC division, it is observed that the mean efficiency value across all countries is 0.72. Nevertheless, it is worth noting that the disparities among nations are relatively inconsequential. The present discourse pertains to countries that exhibit inefficiency in their operations, prompting the need for a comprehensive analysis of the requisite modifications to attain optimal efficiency.

(Li, Wang, Ni, & Wang, 2017) A study was undertaken with the objective of comprehensively understanding the efficacy and output of public hospices at the county level in Anhui, China. This investigation employed the data envelopment analysis (DEA) model and the Malmquist index to evaluate the performance of these hospitals. The ultimate aim was to propose measures for enhancing the future development of these healthcare institutions. The identification of 12 country-level hospitals in Anhui Province was conducted by the researchers, taking into consideration factors such as geographical dispersion and economic development levels. The researchers employed the simple random sampling technique in order to select four county-level public hospitals as the designated study sites. The data were systematically gathered by a trained investigator at the designated research site during the period spanning from June to August in the year 2016, and subsequently finalised by the hospital. The data collection spanned a duration of six years, specifically encompassing the years 2010 to 2015. The variables under consideration encompass the count of practicing physicians, the count of registered nurses, the count of available hospital beds, and the aggregate expenditure. The present study examines the output indicators pertaining to the quantity of emergency appointments, the quantity of discharged patients, and the quantity of hospitalized patients. The pertinent data, which was gathered in the field and subsequently organized, was furnished by the administrative divisions of the hospitals. The calculation of dynamic efficacy and Malmquist index circumstances for the 12 universities was conducted utilizing Data Envelopment Analysis (DEA) models. The findings of the examination indicate that over the period of 2010-2015, the collective normal relative service productivity of twelve county-level public sanatoria was determined to be 0.926. Furthermore, it was observed that the number of hospitals that attained a satisfactory level of efficiency, as determined by the Data Envelopment Analysis (DEA) method, varied across the years. Specifically, the number of sanitoria achieving operational DEA scores for each year from 2010 to 2015 were 4, 6, 7, 7, 6, and 8, respectively. During the aforementioned temporal interval, it is noteworthy to observe that the mean value of the widespread production adeptness stood at 0.983, while concurrently witnessing a deterioration in the entire productivity factor. Throughout the stage spanning from

2010 to 2015, it was opined that the aggregate production efficacy of five hospices surpassed a value of 1, while the remaining hospitals exhibited values below 1.

(Gok & Sezen, 2011) A comprehensive investigation was undertaken with the aim of scrutinizing the efficiencies of hospitals within the application of Data Envelopment Analysis (DEA). The primary objective of this research endeavour is to thoroughly examine the operational efficiencies exhibited by hospitals situated in the country of Turkey, specifically focusing on the diverse ownership structures that these healthcare institutions possess. The temporal scope of this investigation encompasses the years spanning from 2001 to 2006, thereby providing a comprehensive analysis of the aforementioned hospitals' performance during this specific time period. The evaluation of hospitals' performance has been effectively conducted through the utilization of various methodologies such as Data Envelopment Analysis (DEA), Malmquist Index calculations, super efficiency analysis, and slack evaluations. These approaches have been employed to comparatively assess the performance of hospitals and derive meaningful insights. The present study encompasses a comprehensive collection of data obtained from various hospitals situated across the vast expanse of Turkey. The data spans a significant temporal interval, commencing from the year 2001 and extending up until 2006, thus encapsulating a six-year duration. The primary source of data acquisition was predominantly derived from the Annual Statistical Health Report, a publication issued by the Ministry of Health. Hospitals can be grouped into distinct sorts based on their organizational affiliations and operational characteristics. These categories encompass: (1) public hospitals, which are primarily funded and operated by governmental bodies with a focus on delivering healthcare amenities to the general population; (2) education and research hospitals, which serve as hubs for both medical education and scientific research, often affiliated with academic institutions; (3) university hospitals, which are closely associated with universities and play a crucial role in medical education, research, and patient care; and (4) private hospitals, which are privately owned and operated entities that offer medical services to individuals seeking specialised care or personalised healthcare experiences. The utilisation of the Efficiency Measurement System (EMS) was employed as a means to evaluate the productivity of sickbays. The evaluation of hospital efficiencies was oversaw using two distinct methodologies. The early assessment implied the categorization of hospitals into distinct groups, followed by a subsequent evaluation of all hospitals within a unified dataset. The empirical evidence suggests that the implementation of improvement activities is imperative across all cohorts of hospitals. Based on the empirical observations, it has been determined that both state and private hospitals exhibit comparable slack values in terms of inputs and outputs. Similarly, a parallel pattern is observed in the case of education-research and university hospitals, wherein their slack values are found to be akin. The findings of the study indicate a notable enhancement in the efficiencies of state hospitals, juxtaposed with a decline in the average efficiencies of private hospitals. This trend is particularly pronounced subsequent to the implementation of reforms within the state-owned hospital sector.

(Alatawi, Niessen, & Khan, 2020) A comprehensive investigation was undertaken to scrutinize the operational efficacy of public healthcare facilities in the Kingdom of Saudi Arabia, employing the widely recognized methodology of data envelopment analysis (DEA). The lead author diligently gathered the hospital data for the year 2017 from esteemed sources such as the authorized arithmetical, R and D of the Supervision of Indicators and Evidence and the Executive of Inquiries and Revisions. These entities are linked with the Ministry of Health (MOH) and possess the necessary buff to grant approval for such data collection endeavours. The period of data collection spanned from May to July of the year 2018. The categorization of the general sanitoria in the illustration is based on their dimensions, specifically the sum of beds they possess. These hospitals have been classified into four distinct groups: small hospitals, which have rarer than 200 beds; lower-average hospitals, which have a bed capacity fluctuating from 200 to 299; upper-medium hospitals, which have a bed volume vacillating from 300 to 499; and large hospitals, which have 500 or more beds. This categorization follows the framework established by Gok and Sezen. The selected independent variables encompassed in this study are as follows: (1) the quantity of hospital beds available within the healthcare facility; (2) the count of medical doctor actively practicing within the hospital; (3) the number of full-time nurses employed in the hospital; and (4) the total quantity of allied health employees, including pharmacists, midwives, medical technicians, medical radiologists, and physiotherapists, who are actively engaged in their respective r The variables employed in this investigation encompass a comprehensive range of outcome measures. Firstly, the sum of patients availing outpatient treatment within a given year serves as a crucial indicator. Secondly, the count of patients discharged after receiving inpatient treatment during the same time frame is of paramount importance. Additionally, the total number of surgical operations conducted throughout the year is a key metric to be considered. Moreover, the quantity of radiological investigations performed within the hospital premises within the aforementioned period is a significant variable. Furthermore, the total of laboratory tests administered throughout the time is a noteworthy parameter. Lastly, the hospital mortality rate, which denotes the percentage of inpatient demises occurring through hospitalization to the total sum of inpatients within the same year, serves as a vital indicator of patient outcomes. The empirical analysis conducted in this study has yielded noteworthy findings, revealing that a substantial proportion of public hospitals, specifically 75.8% (69 out of 91), can be classified as being technically inefficient. The findings of the study disclose that the mean efficacy score observed among the hospitals under investigation was 0.76. This numerical value suggests that these healthcare institutions had the potential to decrease their resource allocation by approximately 24% without compromising the provision of essential wellbeing facilities. According to the findings of the study, it has been observed that small hospitals, with an efficiency score of 0.79, exhibit a higher level of efficacy balanced to their equivalents, namely medium-sized and big hospitals. The outcomes of this training indicate that hospitals positioned in the principal region unveiled a higher level of efficacy, as evinced by their efficacy score of 0.83, in comparison to their counterparts located in alternative geographical locations. A notable observation emerges from the analysis of hospital operations, wherein a substantial majority, specifically 62.6% of the sampled hospitals, were found to be functioning below the optimal threshold in terms of scale efficiency. This finding underscores the imperative for these hospitals to undertake strategic measures aimed at enhancing their operational efficiency, primarily through the modification of their production capacity. The comprehensive examination of performance has successfully discerned the prevalent issue of excessive reliance on physician resources and the concurrent insufficiency in the establishment of health amenities as the primary drivers of inefficiency within the system.

(Masiye, 2007) A comprehensive investigation was undertaken to assess the accomplishment of the health system, explicitly focusing on Zambian sanitoria. The study employed the technique of data envelopment analysis, a widely recognized practice for evaluating proficiency and productivity. The present study involved the collection of data from a representative sample of 30 hospitals located across the geographical expanse of Zambia. The variables considered in this study encompassed the total non-labor cost, the count of medical doctors, the count of nursing and other clinical staff, and the count of nonclinical staff. The variables under consideration in this study encompass Ambulatory care, Inpatients, Maternal and Child Health (MCH), as well as Laboratory tests, X-rays, and operation theatres. The data utilized in this study was collected in the year 2003. The findings indicate that Zambian hospitals, as a collective entity, are functioning at a level of efficiency amounting to 67%. This observation suggests that there exists a notable degree of resource misallocation and squandering within these healthcare facilities. The outcomes of the learning indicate that a mere

40% of hospitals demonstrated a commendable level of efficiency when assessed in relative terms. The investigation additionally unveils that the magnitude of healthcare facilities constitutes a significant origin of inefficacy.

(Silwal & Ashton, 2017) A comprehensive investigation was undertaken to gauge the operational productivity of public sanitoria in the country of Nepal, employing the methodology of data envelopment analysis (DEA). The primary point of this research endeavour is to delve into the prevailing patterns pertaining to inputs, outputs, and productivity alterations within the realm of Nepalese public hospitals, spanning the temporal domain from 2011–2012 to 2013–2014. The present investigation was undertaken within the confines of 32 public hospitals situated in the nation of Nepal. These hospitals were categorized into two distinct levels, namely district level (comprising 23 hospitals) and higher level (comprising 9 hospitals). The duration of this study spanned across three consecutive fiscal years, commencing from 2011–2012 and concluding in 2013–2014. The designated units of analysis (DMUs) utilized in this particular investigation consisted of a total of 32 hospitals located within the nation of Nepal. These hospitals were further categorized into two distinct levels, namely 23 zone level hospitals and 9 higher level sickbays. The study encompassed a comprehensive analysis of these DMUs over a span of three consecutive monetary years, specifically from 2011–2012 to 2013–2014. The determination of the trial size was contingent upon the disposal of data. The variables considered in this study encompassed the Annual Salaried Expenditure, Annual Non-Salaried Expenditure, Annual Total Recurrent Expenditure, Numbers of Available Hospital Beds, and Full-Time Equivalents. These inputs were meticulously examined to ascertain their influence on the outputs, which comprised the total numbers of Inpatient discharges, total numbers of Outpatient visits, and numbers of total Emergency visits. The findings of the investigation unveiled a noteworthy decline in the overall productivity of the hospitals under scrutiny, amounting to a decrement of 6.9% on an annual basis during the period spanning from 2011 to 2012, up until 2013 to 2014. Among the comprehensive set of 32 hospitals under scrutiny, it is noteworthy to observe that a mere 37.5% of these healthcare institutions experienced an upsurge in productivity. Conversely, the remaining 20 hospitals, constituting a substantial majority, witnessed a decline in their productivity levels. The decline in technology change exerted a significant influence on the overall reduction in total factor productivity, despite the observed increase in efficiency.

(Top et al., 2020) The primary idea of this study was to evaluate the worth of healthcare methods across a sample of 36 African nations, with the secondary aim of conducting a comparative analysis of these effectiveness levels. In order to evaluate the efficacy of the intervention, the researchers employed the technique of data envelopment analysis (DEA). The variables employed within the framework of the Data Envelopment Analysis (DEA) encompassed several key indicators. These indicators entailed of the percentage of total health expenses in relation to the Gross Domestic Product, the density of medical professionals and hospital resources per 1,000 individuals, encompassing doctors, nurses, and hospital beds, the level of unemployment, and the Gini coefficient. The conclusions outcome variable quantity were the life expectation at labor and the newborn death value. Following the application of the Data Envelopment Analysis (DEA) technique, a Tobit regression model was subsequently employed to ascertain the various issues that exert impact on the efficacy of the healthcare systems within the nation. The findings derived from the analysis conducted by the Drug Enforcement Administration (DEA) unveiled that a significant proportion of 58.33% (n=21) out of the total 36 healthcare systems assessed in the African continent exhibited a commendable level of effectiveness. Senegal emerged as the nation most commonly referenced in scholarly discourse as an exemplar of inefficiency when juxtaposed with its more efficient counterparts. The results obtained from the Tobit regression analysis indicate that the Gini coefficient and the nurse’s number per 1000 individuals have a statistically substantial impact on the incompetence amounts observed within national healthcare systems. The present study's findings underscore the imperative for national healthcare schemes to optimize the utilization of both public and private health resources in a manner that is both efficient and cost-effective, with the goal of achieving comparable well-being outcomes. The assurance of efficacy and efficiency within these systems can be attained by conducting a complete estimation of the effectiveness of healthcare systems and health amenities across nations through a global comparative analysis.

(Ahmed et al., 2019) The leading plan of this study is to assess the hi-tech ability of health approaches in the Asian region. In order to ascertain the high-tech efficacy of health systems in Asian nations, the researchers commissioned a method known as output-oriented data envelopment analysis (DEA). The employed DEA model utilized health outcome measures that were comparable across different countries, including healthful life expectancy at birth and infant mortality per 1000 live births, as input variables. These measures were used to assess the overall health status of each country. Additionally, per-capita health spending, which served as a proxy for all healthcare resources, was considered as the output variable in the model. This approach allowed for a comprehensive analysis of the relationship between health outcomes and healthcare expenditure across countries. The investigation of the factors influencing efficiency scores involved the utilization of smoothed bootstrap models and censored Tobit regression techniques. To assess the coherence of the proficiency scores, a sensitivity scrutiny was conducted. The primary findings derived from the present investigation indicate that a substantial proportion, specifically 91.3 percent, of the 46 Asian nations scrutinized exhibited inefficiencies in the provision and utilization of their healthcare assets. The majority of nations exhibiting high levels of efficiency were found to be Cyprus, Japan, and Singapore, while only one nation, namely Bangladesh, was observed to fall within the lower middle-income category. The augmentation of health system efficiency has been found to yield positive effects on health system outcomes across various categories of nations. Specifically, high-income nations, higher middle-income nations, low-income nations, and lower middle-income nations have been observed to experience improvements of 6.6 percent, 8.6 percent, and 8.7 percent, respectively, in their health system outcomes as a result of this enhancement. The efficiency score exhibited a substantial influence from factors such as population density, bed density, and the proportion of children successfully completing primary education.

(Al-Shammari, 1999) Using a multi criteria Data Envelopment Analysis (DEA) technique, this research aims to gage and analyze the operating effectiveness of healthcare institutions (hospitals). DEA identifies the comparatively inefficient hospitals in relation to the best practice hospitals and offers management with information on the observation set's relatively best practice hospitals. It also shows how significant these inefficiencies are. For a three-year period, the paper chooses a set of inputs and outputs for 15 hospitals. The amount of bed days, sum of doctors, and figure of healthcare workers are among the hospital input parameters that are covered. The following output metrics are included: patient days, minor operations, and major operations. LINDO (linear, interactive, discrete optimizer) , an IBM PC optimization modeling system, is used to solve the DEA models.

(Kirigia et al., 2004) A comprehensive investigation was conducted by esteemed scholars in Kenya to gauge the technical efficacy of public health facilities. The primary goals of this study encompass the discernment of technical efficacy levels exhibited by distinct primary healthcare institutions situated within the geographical boundaries of Kenya. Furthermore, this research endeavour aims to propose performance benchmarks tailored specifically for those institutions that demonstrate suboptimal performance. Additionally, an integral facet of this study involves the quantification of surplus inputs and the subsequent recommendation of appropriate strategies for their utilization. The authors argue that for the purpose of enhancing the efficacy of Ministries of Health in fulfilling their stewardship role, it is imperative to undertake analogous investigations in the remaining countries within the African Region of the World Health Organization (WHO). Kenya boasts a comprehensive network of approximately 350 public health facilities, strategically distributed across the nation. In this investigation, a total of 32 health facilities, which accounts for approximately 9.1 percent of the public health facilities, were selected as the sample. The authors conducted on-site visits to each healthcare facility included in the sample, meticulously examining the records pertaining to the input and output of said facilities. The study encompassed a comprehensive examination of the various inputs employed by health centres, including general doctors, nursing officials, occupational therapists, physiotherapists, laboratory scientists, laboratory technicians, organizational and general employees, dental mavens, public health associates, beds, and non-wage repeated costs. These inputs were identified as integral components of the operational framework within health centres, contributing to the overall provision of healthcare services. The latter encompasses a conglomeration of expenditures pertaining to various utilities, including but not limited to postage and telegrams expenses, telephone costs, electricity expenditures, water and travel incidentals, as well as fuel costs. Additionally, it encompasses costs associated with medications, X-ray supplies, oxygen, dressings, and non-pharmaceutical items. Furthermore, it encompasses expenses related to patients' diet, disposable goods, employee costumes and clothing, stati Based on the comprehensive data compiled from various health facilities, it has been observed that a total of ten intermediate inputs are generated by these establishments. These inputs encompass a range of medical services, such as consultations for ailments like diarrhoea, malaria, sexually transmitted infections (STIs), urinary tract infections (UTIs), and intestinal worms. Additionally, health facilities also provide essential prenatal care, immunizations, family planning services, as well as routine outpatient visits, among others. Based on the empirical evidence presented, it has been determined that a substantial proportion, specifically 44 percent, of public health facilities exhibit a notable lack of effectiveness.

(Cetin & Bahce, 2016) This learning directs to evaluate the efficacy of the health areas in 34 OECD nations by engaging the effort-slanting data envelopment analysis (DEA) approach, considering mutually steady and varying returns to scale guesses. The study employed life probability at birthing and the newborn death ratio as the primary outcomes of interest. Additionally, the sum of consultants, patient beds, and healthiness spending per capita were utilized as input variables in the analysis. In the initial phase of the study, a comprehensive analysis was conducted on a total of 34 nations, as per the parameters set forth by the Drug Enforcement Administration (DEA). Subsequently, in order to improve the homogeneity of the sample and guarantee the generation of more precise and reliable outcomes, a meticulous process was undertaken to eliminate 8 outlier countries. This strategic elimination of outliers aimed to refine the composition of the group under investigation, thereby facilitating a more accurate interpretation of the findings. The analysis reveals that within the cohort of 26 nations under scrutiny, a noteworthy observation emerges: while 11 of these countries exhibit commendable levels of efficiency in their respective health sectors, it is imperative to acknowledge that the remaining 15 nations still possess untapped potential for enhancing efficiency within their health systems.

(Ngobeni et al., 2020) Data envelopment analysis (DEA) is laboring in the investigation to gauge the technical effectiveness of the nine provinces of South Africa in delivering healthcare. To do this, it is necessary to identify, evaluate, and compare the many methods that particular provinces might benchmark their performance against that of their peers in order to raise efficiency ratings. According to the DEA approach, companies that receive 100% are technically efficient, whereas those that receive less than 100% are technically inefficient. The infant mortality rate is the output of this findings, which uses the total health spending for 2017–18 and the number of medical professionals as inputs. The latter 3 models employ the variable return to scale (VRS), whereas the former 3 models use the constant returns to scale

(CRS), both with the goal of minimizing input. The lessons judgments revealed that amongst the health models 1 and 6, the mean technical proficiency ratings ranged from 35.7 to 87.2 percent. As a result, inefficient provinces might increase input usage by between 64.3 and 20.8 percent. The technical efficiency boundaries for each of the six models are established by the Gauteng province. The North West province has the second-best performance. Only under the VRS do other territories. The trio additional regions are ineffective. The study came to the conclusion that it gives three policy choices based on VRS models 4 to 6. The efficacy benefits from reducing health spending waste in four unproductive provinces total R17 billion under policy option 1 (model 4). Policy Option 2 (Model 5): The same provinces might potentially save money by cutting seventeen thousand healthiness staff, preferably in undermined regions. In accordance with the sixth model, trio unproductive boonies would have to lay off 6940 health employees, but the same provinces, including KwaZulu-Natal, could save R61 million on health care costs. The potential resource savings from making unproductive provinces more efficient might be utilized to renovate existing hospitals and establish new ones, relieving pressure on the public health system. Since overcrowding is apparently harming public hospitals' performance and health outcomes, this might potentially lower the per capita numbers and perhaps their recital. Additionally, the possible funds might be utilized to hire and educate medical.

(Oikonomou et al., 2015) This research examines the effectiveness along countryside Healthiness Centres (HCs) and Provincial Surgeries in Greece's 6th Healthiness Realm, which includes Southerly and Spaghetti western Greece. Using a weight-restricted, output-oriented model, Data Envelopment Analysis (DEA) was used to determine pure technical efficiency (PE), scale efficiency (SE), and total technical efficiency under constant and variable returns to scale (TE). Two successive accord boards of primary health care specialists served as the basis for choosing the model's inputs, outputs, and relative weights (PHC). The proper weight constraints were assigned to the technical equipment, medical staff, and nursing staff that were selected as inputs. The outputs chosen were acute, chronic, and preventative consultations; each output was built up of smaller subcategories with varying degrees of relative importance. Through the distribution of a questionnaire to each HC in the specified region, data were gathered. The study determined that of the 42 HCs that gave complete data, 9 were technical efficient, 5 were scale efficient, and 2 were total efficient. The 6th Health Prefecture's HCs had mean TE, PTE, and SE values of 0.57, 0.67, and 0.87, respectively. The findings show a notable disparity in the HCs of Southern and Western Greece's productive process efficiency. Technical inefficiency dominated all other types of inefficiency. Using their existing production factors, the HCs of the 6th HP could potentially generate 33 percent greater output on average. These findings suggested that most rural health care facilities could significantly increase their level of efficiency. From the perspective of how to improve efficiency, the emphasis on prevention and the management of chronic diseases, as well as more extensive structural and organizational reforms, are explored.

(Gouveia et al., 2015) The primary focus of this investigation revolved around the deployment of value-based Data Envelopment Analysis (DEA) as a means to identify the optimal basic healthcare practices. The current study purposes to conduct a comprehensive functioning evaluation of 12 health centres located within a specific region in Portugal. To achieve this goal, a value-based data envelopment analysis (DEA) practice is retained. This consider combines the principles of an additive DEA model with the concepts of multi-criteria decision analysis, thereby ensuring a robust and comprehensive assessment of the health centres' performance. By utilizing this innovative methodology, the conclusions seeks to specify valuable intuitions into the productivity and effectiveness of these well-being centres, ultimately influencing to the heightening of healthcare services in the region. In light of extensive deliberations with a cohort of esteemed decision-makers, this discourse proffers a duo of methodologies for evaluating the attainment of primary healthcare (PHC) accessibility. The examining and sequel of health units were established on the basis of a comprehensive set of 15 markers. In light of the health goals set forth by Regional Health Authorities and ACES, it is important to note that the selection of indicators is not within the purview of the units. However, it is plausible for them to engage in discussions with the CEO/Clinical Council to determine the specific targets to be achieved in relation to these indicators. The dataset employed for the present analysis pertains to the year 2010, and has been sourced from diverse information systems utilized by the accounting and management department, alongside the medical office. The study facilitated the discernment of optimal methodologies, determinants of suboptimal performance, and deficiencies within the realm of best practises by the individuals responsible for decision-making. Consequently, this comprehensive analysis engendered opportunities for transformative interventions. The discovered insights proved to be valuable in facilitating informed decision-making regarding the prospective goals of principal investigators (PIs), as well as in implementing corrective actions to address any identified issues. The study was able to derive the inference that certain units experienced financial gains as a result of incorporating indicators that manifest the presence of specific attributes, such as a higher proportion of long-standing registered users who, in turn, exhibit a greater prevalence of chronic ailments.

(Mourad et al., 2021) The target of the research is to weigh up in what way the health care approaches of realms with inhabitants of over 50 million people have managed the COVID-19 deadly disease since it started spreading in late December 2019. To achieve this, six variables—the total of medical professionals, hospital beds, overseen Covid-19 tests, impacted cases, regained cases, and death cases—were applied to seven scenarios using the DEA approach. The Tobit analysis was utilized to give information on the relative efficacy of drivers. In addition, the study used a number of statistical tests to confirm the selection of the variable quantity and the results of the DEA models. Less than partially of the nations evaluated are relatively competent, according to the DEA data. Additionally, the Tobit regression analysis demonstrated that the quantity of impacted and retrieved instances had the immense sway on the productivity ratings. Lastly, the conclusions of the Spearman, Mann-Whitney, and Kruskal-Wallis H tests show that the selected DEA models have an internal validity and are resilient. The current study's findings have significant ramifications for decision-makers who are interested in performance improvement over time. The verdicts emphasize the significance of succeeding the highest standards of comparative efficacy by connecting the resources of healthcare systems with the desired outcomes.

(Xu et al., 2021) Data Envelopment Analysis (DEA) and four distinct machine learning (ML) methodologies are combined in this study to measure the efficiency and evaluate the COVID-19 rejoinder performance of the United States. First, using four inputs—the number of tests, public financing, healthcare workers, and hospital beds—DEA is used to assess the effectiveness of fifty U.S. states. Then, the number of recovered COVID-19 instances and the number of confirmed COVID-19 cases are taken into account as desired and unwanted outputs, respectively. The COVID-19 rejoinder recital was predicted using 15 ecological factors, which were categorized into societal exclusion, health policy, and socio-economic trials and in the next phase using other methods like LR, CART, BT and RF. The findings revealed that 23 states, with an average proficiency score of 0.97, were effective. The best prediction results were also generated by the BT and RF models, while CART outperformed LR. The most significant influences on efficacy were urban, physical stillness, the quantity of tests per inhabitants, inhabitants' density, and the total number of hospital beds per population.

(Stefko et al., 2018) This research commissions the methodology of data envelopment analysis (DEA) to assess and quantify the level of geographical productivity exhibited by healthcare institutions operating within the Slovakian context. The timeframe under consideration spans from the year 2008 to 2015, allowing for a comprehensive examination of the efficiency trends over this period. By utilizing DEA, this learning intentions is to provide a rigorous and objective appraisal of the healthcare institutions' performance, shedding light on their ability to optimize resource allocation and deliver quality healthcare services within the geographical boundaries of Slovakia. The Medication Execution Government is a state commandment execution intervention inside the U S Subdivision of Righteousness. The Medication Execution Government is widely recognized as a prominent approach for judging the efficacy of the healthcare arrangement, alongside its application in various other domains of the economy. The present study introduces the window technique as a supplementary approach to the fundamental DEA models, with the aim of evaluating healthcare technical proficiency in specific territories and quantifying inherent provincial inequalities and variations. The selection of the window DEA approach was motivated by its capacity to facilitate year-to-year comparisons of outcomes and enhance discriminatory power, especially in cases involving limited sample sizes. In the context of a four-year window data envelopment analysis (DEA) model that focuses on output-oriented evaluation of technical efficiency across eight distinct regions, a set of specific production variables has been identified. These variables encompass two stable inputs, namely the number of beds and the number of medical staff. Additionally, three variable inputs have been considered, including the quantity of entirely health apparatus, the sum of MRI devices, and the integer of computerized axial tomography equipment’s. Lastly, dual balanced yields have been chosen for evaluation, which are the use of beds and the average nursing time. These carefully selected production variables form the basis for conducting a comprehensive assessment of technical efficiency within the specified regions. Access to the database was facilitated by several esteemed institutions, namely the National Health Information Centre, the Slovak Statistical Office, and the online databases Slovstat and DataCube. These esteemed organizations played a pivotal role in providing the necessary resources for data retrieval and analysis. The primary objective of this research endeavour is to quantitatively assess the impact of non-standard variables in the context of Data Envelopment Analysis (DEA) on the evaluation outcomes pertaining to the effectiveness of healthcare facilities. Additionally, this study aims to ascertain the sufficiency of these variables in evaluating the monitored processes, specifically focusing on the utilization of medical technologies such as Magnetic Resonance (MR) and Computed Tomography (CT). The findings of the analysis unveiled a discernible correlation between the temporal fluctuations in the values of the variables and the resultant efficacy estimates in each respective location. The observation of high levels of efficiency was noted in both locations exhibiting low values of the variables over time, as well as in locations demonstrating the inverse relationship. The discoveries of this learning exposed a noteworthy observation regarding the gradual incorporation of input side variables, specifically the "number of MR, number of CT, and number of medical equipment," and their limited impact on the overall projected efficiency of healthcare facilities.

(Ibrahim & Daneshvar, 2018) In this scholarly paper, the researchers employ a modified version of Data Envelopment Analysis (DEA) to conduct an in-exhaustive assessment of the effectiveness of the healthcare organization in Lebanon. In order to achieve the aforementioned objective, the researchers employ a customized variant of the data envelopment analysis (DEA) technique. This particular methodology is utilized to evaluate the efficacy of the healthcare system in Lebanon during the time period spanning from 2000 to 2015. The researchers have made a deliberate selection of two input variables, namely the proportion of gross domestic product allocated to total health spending and the quantity of hospital beds. Additionally, they have identified four outcome variables for their investigation, namely existence anticipation at natal, motherly transience share, newborn death proportion, and the incidence of afresh diseased individuals through the acquired immunodeficiency virus (HIV). The empirical testimony derived from the read implies that the healthcare system in Lebanon has exhibited enhanced efficacy subsequent to a substantial reformation that transpired in the year 2005. Moreover, this finding serves to illustrate that the augmentation of operational and technological facets within the healthcare system can yield outcomes where a reduction in health expenditures does not necessarily correspond to a decline in efficiency. Based on the findings presented in the report, it is posited that the healthcare system in Lebanon has the potential to effectively manage an surge in health petition, provided that additional resources are allocated and the current trajectory of technological advancements and operational improvements is sustained.

(Dincă et al., 2020) This study endeavours to ascertain the greatest efficacious healthcare systems within a test comprising 17 European Union Representative States. The selected nations have been categorized into two primary clusters, namely Beveridge and Bismarck, based on their respective health system financing approaches. The present study incorporates a comprehensive set of five input variables, which serve as instrumental descriptors of the intricate interplay between fiscal and human capitals, the healthcare system's setup, the level of medical expertise, and the utilization of healthcare services. These variables have been meticulously chosen to encapsulate the multifaceted nature of the research domain under investigation. In terms of the output aspect, our investigation encompassed an analysis of four metrics that serve as indicators of the overall health condition of the populace, while also shedding light on the effectiveness of both preventive and acute medical interventions. Based on the application of the Data Envelopment Analysis (DEA) methodology, it has been determined that Sweden, the United Kingdom, and Romania possess healthcare systems that exhibit a high level of effectiveness. The limitations imposed on each indicator and scenario yield varying degrees of inefficiency scores, with the Beveridge group demonstrating, on average, a higher level of efficiency compared to the Bismarck group.

(Karsak & Karadayi, 2017) The goal of this paper is to discuss performance assessment in the healthcare industry, which is becoming more and more important for most nations due to rising health costs, improved quality, and increased competition in the industry. Health care managers and policymakers emphasize the importance of creating a reliable performance evaluation system for healthcare companies. The accomplishment of 26 districts in Istanbul, a metropolis with almost 15 million residents, as it relates to health care is evaluated using an blurred data envelopment analysis (DEA) framework in this research. For the purpose of evaluating performance, the suggested methodology considers both quantitative and qualitative data that are expressed as language variables. Furthermore, the learning hypothesizes that heaviness suppleness in DEA valuations can result in inappropriate allowance arrangements for various efforts and yields, possibly leading to inflated competence notches for a figure of choice-creation items (in at this time, regions). A weight restricted imprecise DEA model that restricts weight flexibility in DEA is presented as a solution to this issue. The suggested hazy DEA tactic outlines a farther practical executive-making process for assessing the comparative health-care recital and similarly makes it possible to identify Istanbul's top region in expressions of health-care execution. This document incorporates the superiority measurement—which was disregarded in other trainings—into the assessment of districts' accomplishment in providing health care. Additionally, it avoids artificial weight flexibility, which could skew the comparison of healthcare performance.

(Singh et al., 2021) In the context of the escalating mortality rate stemming from noncommunicable diseases (NCDs) within the framework of the Sustainable Development Goals (SDGs), the current learning undertakes an evaluation and juxtaposition of the productive efficiency exhibited by the healthcare systems at the national level within the ASEAN region. The utilization of the Malmquist Productivity Index serves as the fundamental framework for a nonparametric data envelopment analysis methodology. This approach enables the evaluation and comparison of various components, namely total factor productivity modification, technical modification, and technological amendment, within a given region. The present study aims to judge and juxtapose the technical efficacy of the national healthcare system within the territory. This evaluation is conducted through the utilization of two distinct alternative models. Specifically, the health care outcomes of life expectancy at birth and the mortality rate from non-communicable diseases (NCDs) are employed as equivalent indicators for together models. The findings indicate that the mean value of total factor productivity for Model I and Model II stands at 0.983 and 0.974, respectively. This indicates that the productivity of the national healthcare system experiences a decline of 1.7 percent for Model I and 2.6 percent for Model II. The present analysis reveals that the observed trends in life expectancy within the healthcare system of the ASEAN region have not exhibited the anticipated level of improvement. Furthermore, it is evident that the mortality rate stemming from the progressive and persistent non-communicable diseases (NCDs) has not demonstrated a notable decline over the course of a decade. The recommendation posits the necessity of conducting a meticulous examination at the microlevel for each nation to recognize the primary features contributing to the inefficiency of its healthcare system, with the ultimate objective of enhancing its performance.

(Zavras et al., 2002) This essay's objective is to gauge the comparative effectiveness of the basic well-being care facilities operated by the Social Security Institute, the main public insurance company in Greece (IKA). The Statistical Unit of IKA served as the source for the efficiency data. We used Data Envelopment Analysis to examine information from 133 centres across the country. The number of employees, split into various groups, and the population served by each health center were input factors. An indicator of the population being coverer's ageing and fragility was the number of pensioners enrolled in each healthcare facility. The study's findings showed that facilities having the high-tech capabilities to conduct laboratory and/or radiographic tests scored more efficiently. Additionally, the most effective centres had qualified screened inhabitants between 10,000 and 50,000. Such studies should serve as the foundation for the planning of health sector reforms. A national health care chart might be built using the model as the foundation, aligning available resources to the population's requirements for health care and valid demographic, socioeconomic, and epidemiological data.

(Du et al., 2011) Researchers have expressed a keen curiosity in steering lessons within the realm of health finances, with the aim of providing potential solutions to mitigate the alarming escalation of healthcare expenditures and enhance the overall efficacy of the healthcare system in the United States. This inquiry utilizes data envelopment analysis (DEA) as a methodological attitude to assess the efficacy of sanitoria. A cohort of general acute care sanitoria in the state of Pennsylvania was subjected to an additive super-efficiency model, as outlined in the following. The inclusion of the survival rate as a metric for assessing health outcomes has been incorporated into the existing repertoire of output factors, alongside the customary array of input and output variables. In the state of Pennsylvania, an examination was conducted wherein a sample of 119 general acute care hospitals was utilized. The researchers employed an additive super-efficiency model to analyze the records acquired from these hospitals. The study utilized data from the American Hospital Association's (AHA) Annual Surveys for the year 2006, as well as two hospital reports that were published by the Pennsylvania Health Care Cost Containment Council (PHC4) for the fiscal year 2006. These sources served as the primary information providers for the research conducted. The aforementioned documents encompass the Hospital Financial Analysis and the Hospital Performance Report, both of which serve as comprehensive sources of data pertaining to the fiscal status of hospitals situated within the state of Pennsylvania. The Hospital Performance Report is a comprehensive source of information that offers insights into the risk-accustomed mortality rates associated with 31 commonly performed medical dealings and actions as classified by the ICD-9. Consequently, the model developed by the researchers takes into account not only the quantity but also the excellence of the output. The discoveries derivative from the projected Data Envelopment Analysis (DEA) model possess the potential to effectively discern inefficiencies within hospital operations, thereby enabling hospitals to address these issues while upholding the quality of patient care.

(Ersoy et al., 1997) In this scrutiny, the technique of Data Envelopment Analysis (DEA) has been employed to evaluate the technical efficacy of a sample comprising 573 acute general hospitals located in Turkey. The target of utilizing DEA is to objectively measure the execution and effectiveness of these sanitoria in terms of their utilization of resources and production of outputs. By employing this analytical approach, the examination aims to offer an ample assessment of the technical adeptness levels exhibited by the aforementioned sickbays within the Turkish healthcare system. The present study delves into an investigation of the various inputs that influence to the overall functioning of a healthcare system. Specifically, the number of beds, primary care physicians, and specialists are scrutinized in order to comprehend their impact on the outputs of inpatient discharges, outpatient visits, and surgical procedures. By thoroughly examining these factors, a comprehensive understanding of the intricate dynamics within the healthcare system can be attained. Based on the empirical evidence, it has been observed that a significant proportion, specifically less than 10%, of acute general hospitals in the country of Turkey exhibit a level of effectiveness that is comparable to their international counterparts. According to empirical observations, it has been observed that hospitals characterised by inefficiency tend to exhibit a notable tendency to employ a higher proportion of specialists, approximately 32% more than their efficient counterparts. Similarly, in the realm of primary care, inefficient hospitals tend to have a significantly greater number of primary care physicians, approximately 47% more than efficient hospitals. Furthermore, it has been observed that the number of staff beds in inefficient hospitals is substantially higher, approximately 119% more, when compared to their efficient counterparts. These findings shed light on the distinct disparities in personnel allocation between hospitals of varying efficiency levels. Moreover, it is noteworthy to mention that these entities exhibit a diminished aggregate output. In a precise manner, it was observed that there was a notable decline in the number of surgical operations, with a reduction of 57 percent. Similarly, there was a discernible decrease in the count of inpatient hospitalizations, exhibiting a decline of 16 percent. Furthermore, a meaningful decline of 13% was observed in the number of outpatient visits. Moreover, through a comparative analysis between the Data Envelopment Analysis (DEA) and the ratio analysis method, the robustness and reliability of DEA are substantiated, as no discernible alterations in the outcomes are observed.

(Miszczynska & Miszczyński, 2021) The principal endeavor of this scrutinize was to assess and appraise the efficacy of Poland's healthcare structure. During the period spanning from 2013 to 2018, a Data Envelopment Analysis (DEA) model that prioritizes output was employed. This model was further enhanced by incorporating a 2-year window analysis extension. The inquiry was concluded by ascertaining the factors that exerted an influence on efficiency and identifying the origins of changes in productivity, specifically between the initial and final years of the designated paper period. The current search aims to elucidate the identification of efficient regions and substantiate the existence of geographic variability in their efficiency. The research conducted in this study has successfully identified the optimal and suboptimal performers within the category of "all-windows." Furthermore, the investigation has also shed light on the distinct efficiency patterns exhibited by individual entities within this category. The utilization of panel modelling was employed to validate the assertion that various determinants, including the number of medical personnel, the duration of the waiting list, and the possession of accreditation certificates, exert a discernible influence on the efficacy of health protection measures. The decision to conduct the analysis at the voivodeship level (NUTS2) was indeed justified, as it provided a suitable framework for the examination. However, it is equally imperative to delve into the data at a more granular level of aggregation. Given the myriad challenges confronting the Polish healthcare system, it would undeniably prove immensely beneficial. This research delves into an analysis of the efficacy of the healthcare system within the nation, concurrently examining shifts in its magnitude, underlying factors influencing it, geographical heterogeneity, and repercussions on the functioning of the sector.

(Harrison et al., 2004) The data envelopment analysis (DEA) methodology is handled in this study to assess the technical effectiveness of government hospitals in the United States. Studies that increase the effectiveness of federal hospitals are beneficial to clinic officials, health care legislators, taxpayers, and other investors. To assess hospital effectiveness, data from two hundred and eighty federal clinics in 1998 and two hundred and forty-five in 2001 were examined via DEA. According to the findings, federal hospitals' total efficiency boosted from 68% in 1998 to 79% in 2001. However, based on the $42.5 billion in federal hospital spending in 2001, more effective resource management might result in annual savings of $2.0 billion. This study emphasizes the significance of creating more focused strategies to eliminate inefficiency in the federal healthcare sector from a policy perspective.

(Hajialiafzali et al., 2007) The additional chief institutional provider of hospital care in that nation, the Iranian Social Security Organization, whose hospitals are owned by them, was the subject of this learning using Data Envelopment Analysis to assess their relative efficacy. The SSO's Annual Statistical Report for the period of April 2002 to March 2003 provided the data for the current study. Data are provided for all 59 SSO hospitals in the report. 57 of these 59 hospitals are not affiliated with a university. Quatern effort variable quantity were stated: the entire sum of Full Time Equivalent (FTE) therapeutic physicians, the entire amount of FTE nannies, the whole quantity of supplementary workers in FTE, and the typical numeral of wrought cots in order to capture key elements of hospital resources within the data at hand. Outpatient services, emergency care, inpatient care, number of patients released, number of procedures, number of patient days, and number of major surgeries are the output variables used. The effectiveness of 26 of the 53 hospitals was evaluated. With an average score of 90 percent, inefficient hospitals might potentially reduce all inputs by around 10% while upholding the equal level of output. In addition to the traditional DEA measurement, super-efficiency ratings, the identification of weak efficient hospitals, and peer frequency were used to rank efficient hospitals. The study offers helpful information for enhancing hospital administration, optimizing resource distribution, and enhancing hospital services.

(Piubello Orsini et al., 2021) The foremost idea of this findings was to weigh the efficacy of public hospitals within a specific region of Italy. This evaluation encompassed an analysis of quality outputs, identification of factors that contribute to inefficiency, and an examination of how effectiveness has evolved over time. The present investigation undertook an analysis of pre-existing data derived from the Veneto region, specifically focusing on the temporal span encompassing the years 2018 and 2019, with the aim of achieving the predetermined objective. In the present study, a nonparametric methodology known as multistage data envelopment analysis (DEA) was employed to analyze a sample comprising 43 sanitoria. The researchers classified three distinct domains of input, namely operating costs, labour, and capital investments (referred to as "Beds" in the study). The selection process involved the identification of two outputs pertaining to quality and five outputs pertaining to efficiency. Specifically, the chosen quality outputs encompassed outpatient visits, inpatient visits, outpatient visit profits, inpatient visit profits, and bed use rate. Additionally, the outputs related to efficiency included mortality rate and incorrect admission rate. The estimated proficiency scores were bifurcated into two distinct segments. A comprehensive analysis of the Slack platform was conducted. In addition, it is worth noting that a Tobit model was retained to conduct a regression analysis, wherein the DEA proficiency scores were reverted against both internal and external variables. The utilization of the Malmquist Productivity Index was employed as the final procedural measure. The empirical evidence presented in this consideration reveals that, on a mean source, the healthcare amenities within the Veneto region exhibited a commendable level of operational efficiency surpassing the threshold of 95%. The coexistence of technical and scale inefficiencies was observed to be a recurring phenomenon, necessitating the implementation of a downsizing strategy in 77 percent of hospitals exhibiting inefficiencies. This strategic approach was deemed necessary in order to enhance overall efficiency levels within these healthcare institutions. The inputs that have been recognized as requiring major drops are the full-time employee (FTE) organizational personnel and operators. The duration of patient stays and the scale of the sanitorium relative to the population it served constituted pivotal factors in ascertaining the efficiency score. The primary factor that led to a decline in efficiency over time (0.974) was attributed to technical changes (0.908), rather than changes in efficiency itself. The present report endeavours to identify requisite modifications that necessitate implementation, encompassing both managerial and policy dimensions. The magnitude of the hospital's physical dimensions constitutes a noteworthy facet contributing to its inefficiency. The empirical evidence presented in this study indicates that a reorganization of non-medical personnel within hospitals holds promise for enhancing productivity levels. Furthermore, it is worth noting that heightened levels of technological investment have the potential to yield greater efficiency.

(Hajiagha et al., 2022) In order to predict hospital efficacy using data envelopment analysis (DEA), this examination suggests a three-staged methodology. The strategy seeks to get around the restriction on the quantity of inputs and outputs in relation to the quantity of DMUs. Principal component analysis is first used to identify the principal components of each input and output (PCA). In order to create a two-tier pyramid of efforts/yields and design a increment system established on rationalized differences of apparatuses, these major sections are then entered into a factor analysis (FA) procedure. Then, utilizing data from Iran's healthcare environment as a growing economy, a two-tier DEA technique is used to the resulting outline to assess the comparative efficacy of infirmaries. It is believed that the results of using the suggested PCA-FA-TLDEA methodology could encompass a sizable number of inputs/outputs that are already conferred in the works on sickbay efficacy, significantly enhancing the prejudiced power of traditional DEA methods. The above said approach increased prejudice from zero percent to forty five percent of the naïve data expression and, as seen in the examined hospitals. By utilizing PCA to isolate the principle elements from the inputs and outputs, the research suggests a novel three-stage DEA model. This reduces the number of inputs and outputs as well as their intercorrelations. Second, by using FA to the primary components, a hierarchy of inputs and outputs is created. The functioning of public hospices is then assessed using the TLDEA technique to the ladder of inputs and outputs.

(Asandului et al., 2014) The empirical of this lesson is to assess the effectiveness of society healthcare approaches in Europe utilizing a nonparametric technique called data envelopment analysis. 30 European nations' worth of 2010 statistics data have been used for this purpose. Three contribution variables—sum of physicians, figure of infirmary cots, and communal healthiness disbursements as a proportion of GDP—and three harvest variables—lifespan hope at natal, well-being-accustomed existence anticipation, and baby transience proportion—have been chosen by the researchers. The major conclusions of the study show that some affluent nations use their healthcare system inputs efficiently, while a number of emerging nations have also demonstrated high levels of efficiency. Conclusions expanded the list of input and output variables, highlighting the need for more research.

(Mehrtak et al., 2014) The researchers employed the methodologies of Data Envelopment Analysis (DEA) and the Pabon Lasso Model to assess the efficacy of general sanitoria across the Iranian Eastern Azerbaijan Province. The present study involved the collection of data from a comprehensive set of 18 general sickbays placed in the Eastern Azerbaijan (EA) province, which holds the distinction of being the largest province in the countries north-western region. The data collection process was undertaken by the Treatment Deputy of EA University of Medical Sciences (EAUMS), utilizing the sickbays' monthly performing documents. Subsequently, the collected data underwent a rigorous analysis and was effectively produced. The inputs employed in this investigation encompassed active beds, the count of doctors, nurses, and other healthcare professionals. The output encompasses the metric denoted as BOR, which stands for Bed Occupancy Rate, along with the numerical values representing the total count of surgical procedures conducted and the total count of patient discharges. The conclusions of this consideration uncovered that a notable proportion of hospitals, specifically 61 percent, demonstrated efficiency as determined by the Data Envelopment Analysis (DEA) methodology. In contrast, the Pabon Lasso model, another established approach, identified a slightly lower percentage of hospitals, specifically 44.5 percent, as efficient. In light of the findings, it is evident that the Pabon Lasso methodology indicates a significant proportion of hospitals, specifically 39 percent, exhibit complete inefficiency. However, an alternative approach utilizing the Data Envelopment Analysis (DEA) reveals a comparatively lower figure of 22.2 percent. In the comprehensive evaluation conducted by the Drug Enforcement Administration (DEA) and Pabon Lasso, it was determined that a notable proportion of hospitals, specifically 16.7% and 16.5% respectively, exhibited a relative level of efficiency. In contrast to the Pabon Lasso model, the Data Envelopment Analysis (DEA) appears to exhibit a greater propensity for identifying hospitals as efficacious. By employing a dual-model approach in tandem, the concurrent utilization of two distinct models has yielded findings that are mutually reinforcing and congruent, as both models unequivocally demonstrate the efficacy of hospitals under scrutiny. However, it is imperative to exercise prudence when juxtaposing their respective outcomes.

(Khani et al., 2012) The researchers wanted to utilize data envelopment analysis to evaluate the relative effectiveness of the hospitals in Ilam. The output-oriented data envelopment analysis (DEA) is the first method used in the suggested study of this document to compare the kin efficacies of nine sanitoria. The suggested model includes four different personnel kinds as input parameters: specialists, doctors, technicians, and other workers. The suggested model's outputs include the quantity of operations, hospital stays, and radiography. The researchers used a higher efficiency approach to compare the relative efficacy of their various efficient units as the use of DEA causes them to have more than single effectual unit.

(Zhang et al., 2021) Drawing upon data sourced from the China Civil Affairs statistics yearbook, the present investigation endeavours to scrutinize the spatiotemporal allocation of technological efficiency (TE) and productivity within nursing establishments during the period spanning 2012 to 2016. The utilization of Data Envelopment Analysis (DEA) and the Tobit model, which have garnered significant usage in the field, as a comprehensive benchmark for integrating multiple quality metrics, formed the basis for the analysis. Based on the empirical evidence, it is observed that nursing facilities exhibited average Total Efficiency (TE), Partial Technical Efficiency (PTE), and Scale Efficiency (SE) values of 0.909, 0.928, and 0.979, respectively, during the period spanning from 2012 to 2016. During the temporal span encompassing 2012 to 2014, a discernible decline was observed in the values of both the TE (Temporal Entity) and SE (Spatial Entity). However, subsequent to the aforementioned period, a notable resurgence in these entities was documented. In the Eastern area, the Total Efficiency (TE) exhibits a decline of 2 percent, resulting in a value of 0.98. Similarly, the Central region experiences a decrease of 7 percent, leading to a TE of 0.93. Lastly, the Western region demonstrates the largest reduction of 9 percent, yielding a TE of 0.91. The mean enhancement ranges for the 5 input indicators of the non-DEA effective nursing clinics were found to be 27.26 percent, 20.62 percent, 19.77 percent, 22.04 percent, and 38.84 percent, respectively. The enhancement of technical efficiency (TE) and productivity within nursing homes is contingent upon the presence of a heroic sum of social workforce, patients, and staff members aged 56 years or older. This assertion is based on the established criteria that exert an influence on the competence value of nursing homes. The Western regions exhibit the most diminished levels of technological efficiency (TE) within the domain of nursing homes, as the existing establishments fail to ensure equitable and optimal opportunities for access and utilization. Preceding the implementation of the healthcare reform in 2014, a discernible decline in efficiency and productivity was observed, potentially influenced by factors such as the demographic composition of the workforce in terms of age and gender, the availability of social workers, and the presence of elderly individuals within the system. Ultimately, this study culminates in the formulation of recommendations aimed at enhancing the efficacy of the dissemination and utilization of care services.

(Aristovnik, 2015) The article's primary goal is to assess the NUTS 2 regional healthcare systems' performance across the EU. Non-parametric approach is used to compare the relative effectiveness of 54 new EU member states (EU-13) and 151 areas in old EU member states (EU-15) from 2007 to 2012 using different regional inputs and outputs to define healthcare service. Doctors of Medicine and GDP per capita are the inputs. Life expectancy, death rate, and infant mortality rate are the outputs that are employed. The empirical findings demonstrate that efficiency varies greatly between the chosen locations. Generally speaking, less established provinces exhibit a comparatively high degree of competence, whereas capital areas—which primarily function as national medical centres and utilize a disproportionately high quantity of health resources—appear to be the least efficient locations. The empirical investigation also discovers evidence that securing adequate levels of healthcare resources in those areas that are considerably trailing behind might help to enhance health outcomes.

(Choi & Kim, 2015) The researchers wanted to examine the effectiveness of Korea's u-healthcare sector. The statistics handled in this analysis came from 31 healthcare-related organizations, all of which were listed in a reference that organized the key domestic smart care and U-healthcare enterprises in 2014. The Malmquist Productivity Index also examined productivity during a 5-year period, from 2008 to 2012. Input factors for this study were capital ($1,000,000), the number of workers, and revenue ($1,000,000). Equations 3.1 and 3.2 were used in this study to calculate the value of efficiency while setting the output value, and equation 3.3 was used to calculate scale efficiency. DMU performed with efficiency above average. 9 DMUs in the VRS model, or 29.0 percent, and 12 DMUs in the CRS model, or 45.2 percent each, demonstrated above-average efficiency. A service called U-healthcare combines the traditional medical sector with information technology (IT). It offers healthcare and medical services that one may use whenever they want, wherever they are, safely, and without restrictions. The future seems promising for this industry since the size of Korea's U-healthcare market surpassed 2 trillion Korean won in 2012. As of now, this study has used the Malmquist index and DEA (Data Envelopment Analysis) to assess the effectiveness of enterprises connected to Korea's U-healthcare. The findings indicate that company effectiveness was lower than anticipated in efficiency study, which examined cross-sectional data from 2012. However, according to the Malmquist index results, 61.3 percent of U-health-related enterprises have boosted their productivity over the course of five years of longitudinal data analysis. This study is significant because it is the first to judge the shifts in efficacy and proficiency in domestic U-healthcare and because it is thought to have a progressive influence on increasing the commercial viability of U-healthcare in Korea.

(Hofmarcher et al., 2002) The current report explores the temporal dynamics of productivity and efficiency within the hospital system of a specific province in Austria, spanning the years 1994 to 1996. The researchers developed non-parametric frontier models, specifically utilizing Data Envelopment Analysis (DEA), in order to analyze panel data. Their objective was to compare efficiency scores and efficiency time trends across various medical specialties. Two distinct methodologies were employed in order to measure output, as health outcomes are seldom amenable to direct measurement. In their initial approach, the researchers employed the quantification of case mix-accustomed clears and inpatient days. Subsequently, they incorporated confidence points, which are derived from the recently implemented judgment-linked group-type sponsoring system, into their subsequent methodology. In the capacity of decision-making units (DMUs) within the realm of medical domains, the researchers undertook the task of computing and contrasting the efficiency scores of individual hospital wards. According to the present group of data, it appears that the application of non-parametric efficiency analysis has not yet been extended to the computation of ward-specific efficiency scores. The two models under consideration yield diverse outcomes, thereby presenting a span of potential outcomes. In the first model, an normal efficiency level of 96 percent is computed through the utilization of a cautious output measurement approach. Conversely, the second model employs credit points as a metric for output measurement, resulting in an average efficiency level of 70 percent. The observed trend in the average competence levels of models 1 and 2 indicates a modest increase during the period spanning from 1994 to 1996, with minimal fluctuations. However, a more detailed analysis of specific healthcare facilities uncovers a multitude of unique efficiency enhancements that have transpired over the same time frame.

(Nistor et al., 2017) This inquiry contributes to the occurring narrative by granting a comprehensive analysis of the efficacy of the public sector, with a particular focus on the healthcare system of Romania, a nation in the midst of development. The empirical results in this study are generated using the effort-oriented-variable return to scale (VRS) template of Data Envelopment Analysis (DEA) and the Tobit regression manner. These two analytical approaches are employed at two distinct levels of analysis. The utilization of the Tobit regression technique allows for the identification and analysis of various factors that significantly influence the level of efficiency within a given context. In this inquiry, the Tobit regression technique is commissioned to ascertain the elements that impact the efficacy level of a sample comprising 20 representative hospitals. These hospitals are strategically located within the four administrative macro-regions under investigation. Furthermore, the DEA performance is employed to quantitatively gage the efficacy levels within the aforementioned hospitals. By employing DEA, this inquiry trains to provide a comprehensive calculation of the efficiency levels exhibited by these hospitals. The results obtained from the DEA analysis will serve as a valuable resource in identifying and understanding the strategies that can be implemented to enhance efficiency within the healthcare sector. Overall, the combination of the Tobit regression technique and the DEA method in this examination offers a robust framework for comprehensively examining the factors influencing efficiency levels in the selected hospitals. The findings derived from this inquiries endeavour will impact to the occurring essence of information and provide valuable perceptions for policymakers and healthcare authorities requesting to enhance efficiency in hospital settings. The input variables utilized in this study encompass the number of beds, doctors, and the non-salary operational expense. The output variables under consideration in this study encompass total operational revenue, case count, and hospitalization days. These metrics serve as key indicators of the operational performance and financial viability of the healthcare facility under investigation. By examining these variables, researchers can acquire beneficial discernments into the overall efficacy and success of the hospital's operations, as well as its ability to provide quality care and manage patient volumes. Consequently, an in-depth analysis of these output variables is crucial for comprehending the multifaceted dynamics and intricacies of the healthcare system. The sample consisted of approximately twenty hospitals. The selection of hospitals for inclusion in this study was predicated upon careful consideration of various administrative and developmental factors. The findings of this investigation afford the opportunity to draw comparisons with those of other developing nations, as the imperative of efficiency has emerged as a pivotal factor in the advancement of the public sector.

(Gok & Sezen, 2011) The primary intent of this exploration endeavour is to meticulously investigate and weigh the efficacy and enactment of hospitals in the Turkish healthcare system during the period spanning from 2001 to 2006. The focal point of this investigation revolves around the diverse ownership structures prevalent within the Turkish hospital landscape, namely state-owned hospitals, education and research-based institutions, university-affiliated hospitals, and privately-owned healthcare facilities. By meticulously scrutinising these distinct ownership types, this study aims to shed light on their respective effectiveness and ascertain any discernible variations in performance across the aforementioned time frame. The present study aims to elucidate the potential policy implications for decision-makers by delving into the effect of health care changes on efficiencies. Various methodologies have been employed in the comparative assessment of hospital performance, including Data Envelopment Analyses (DEA), Malmquist Index calculations for the estimation of annual recital changes in rapports of both direction and magnitude, super efficiency analysis, and slack evaluations. These analytical approaches have proven instrumental in facilitating comprehensive evaluations and comparisons of hospitals' operational efficiency and effectiveness. The variables under consideration encompass the quantitative measures pertaining to the number of beds, medical professionals, and specialists. The output variables encompass several key indicators within the healthcare domain. These include the quantification of outpatients, discharges, and surgical procedures, which are further classified into minor, standard, and big categories. Additionally, the digit of onsets, cot deployment degree, typical inpatient periods, cot proceeds percentage, and the inpatient-to-outpatient ratio are likewise considered as significant metrics. The conclusions of the analysis denote that the ownership structure of hospitals exerts a significant influence on their productivity levels. The discernible encouragement of health care modifications on sickbay effectiveness has been duly acknowledged, particularly in the context of both public and private healthcare institutions. In light of the inception of reforms within the state-owned hospital sector, it is noteworthy to observe a substantial enhancement in the average efficiency levels of these establishments. Concurrently, a contrasting trend is discernible in the private hospital domain, wherein a regression in standard competence has been detected.

Gap in the existing Literature

The COVID pandemic that impacted the globe underscored the critical importance of prioritizing healthcare settings. A significant number of developed nations have experienced a deterioration in health and hospital systems. To date, even nuclear-powered nations such as India are experiencing the repercussions of the pandemic. Recent reports indicate that Kerala allocates 5.8% of its GDP to the healthcare sector, surpassing the expenditures of 18 other states within the nation. Despite the absence of studies aimed at evaluating the efficacy of comprehensive government healthcare systems. The state experienced an outbreak of the Nipah virus and severe flooding in 2018, events that significantly impacted the state's economy. This has further exacerbated the challenges faced by the healthcare sector. The state was also lauded for its efficacy in combating COVID-19. Therefore, it is imperative to evaluate the efficiency levels of the healthcare systems in Kerala.

The body of research conducted worldwide has predominantly concentrated on a restricted set of inputs and outputs. Furthermore, the data gathered in these studies originates from official websites and publicly accessible domains. There has been a lack of research dedicated to the comprehensive examination of the data collection process. The research conducted in India has also concentrated on antiquated indicators such as the infant mortality rate and maternal mortality rate. There has been a notable absence of studies conducted in Kerala, as well as in India more broadly, that have effectively identified the appropriate healthcare delivery system encompassing primary, secondary, and tertiary healthcare services. No comprehensive study has yet been conducted that encompasses all private and public hospitals within a given state.

CHAPTER 3

RESEARCH METHODOLOGY

CHAPTER 3

RESEARCH METHODOLOGY

"Research is to see what everybody else has seen and to think what nobody else has thought."

- Albert Szent-Györgyi

This stage covers the study's research methodology, sample selection, research strategies to gather data from hospitals on their input and output as well as specifics on the algebraic techniques that were employed to analyse the figures. The research methodology is a framework that guides the researcher about the population, the sample size, the sampling technique to be adapted, the research design to be used, the methods to analyze the data, and other issues related to the fair conduct of research.

3.1 SAMPLING METHODOLOGY’S

This study combines two distinct objectives: the first is to assess the effectiveness of hospitals that were endured into concern, and the next is to compare the effectiveness of private and public participants in the healthcare industry. Utilizing linear mathematical programmes, the data envelopment analysis method is treated to estimate effectiveness in both public and private hospitals in Kerala. The focus of the study is Kerala, an Indian state that has been ranked first among all other states in the subject of healthcare.

The research covered all the healthcare institutions in the state. The study has taken the private and government medical college hospitals along with the other hospitals run by the state government and the private organizations. The study also taken the samples from primary health centres, community health centres, and sub centres.

(Iliyasu & Etikan, 2021) states that the probability sampling approach known as stratified sampling infers the cosmos's belongings in relative to a certain alterable. There are deuce basic outlines of stratified random sampling: proportional stratified sampling and disproportionate stratified random sampling. The number of components assigned to the various strata in proportionate stratified sampling types is comparative to the description of the strata in the target population. based on proportion. In other remarks, the extent of the sample obtained from each section in the target population is proportionate to the stratum's comparative extent. Each portion inside the population in the target population is given by denigrating each stratum with the exact same sample proportion. Every echelon catches the exact same sample percentage, guaranteeing that all constituent of the population has an uniform probability of being picked. The resultant illustration is a self-weighting sample. In disproportionate stratified random sampling, the percentage of items sampled from each stratum does not match the proportion of those elements in the population. The element has no reasonable likelihood of being picked at random from the population. The proportion does not smear with each layer. On the other hand, the strata include separate sampling fractions.

To account for the asymmetry in the sample, the population arrangement must be used as weights when estimating population variables. Contrarily, certain research projects may benefit more from disproportionate stratified sample than from proportionate stratified sampling.

The sampling method thus exercised in this examination is disproportionate stratified random sampling.

3.1.1 Sample Selection Of The Hospitals

All the government and private medical college hospitals are selected. In Kerala there are 14 government medical college hospitals and 20 private medical college hospitals. All the government hospitals like district hospitals, general hospitals, taluk headquarters hospitals and taluk hospitals are selected. There are 121 such hospitals in Kerala. All the private hospitals that are listed in the district administration website of government of Kerala are selected. There are 119 such hospitals in Kerala. There are 229 CHC's, 924 PHC's and 5414 sub centre's in Kerala State. At a 95% confidence level and 5% margin of error the standard sample size is 144, 272 and 359 respectively. Disproportionate stratified random sampling is done to collect samples from the CHC, PHC and sub centres. The total healthcare settings selected as samples under various categories are 1049 Hospitals have been classified based on the healthcare delivery system of India. That is the primary healthcare, secondary healthcare and tertiary healthcare. The secondary and tertiary healthcare includes hospitals which have again classified on the basis of the guidelines of NABH (National Accreditation Board for Hospitals & Healthcare Providers). It is a constituent board of Quality Council of India . It classifies hospitals based on bed capacity. Hospitals with bed capacity less than 100 as small hospitals, between 101 to 300 as medium and 301 to 500 as large and above 501 as tertiary care large hospitals. Stratified random sampling is used to collect the hospital samples. Firstly, each district is considered as a strata and from that strata the representative hospitals are selected. A common statistical approach is stratified random sampling, which separates a population into various subdivisions, or strata, varying on certain pooled traits. To guarantee that every stratum is incorporated in the sample and to sketch assumptions about certain demographic subsections, stratification is done. This technique is beneficial when the populace is diverse, and a direct random sampling might not generate trustworthy findings. Investigators can verify that their sample is delegate of the populace and avoid sampling unfairness by stratifying the populace.

Primary care, secondary care, and tertiary care are the three classifications that the researcher has assigned to the hospitals in India based on the structure of the country's system for providing medical treatment. Primary health care facilities include the primary health care centres (PHCs), community health care centres (CHCs), and sub centres. Secondary health care facilities include government taluk hospitals, district hospitals, general hospitals, and all other private hospitals. All hospitals affiliated with medical colleges, whether public and private, fall under the category of tertiary care. In the study, the researchers took great care in selecting samples from each category so that they could make meaningful comparisons amongst hospitals operating within the same cadre.

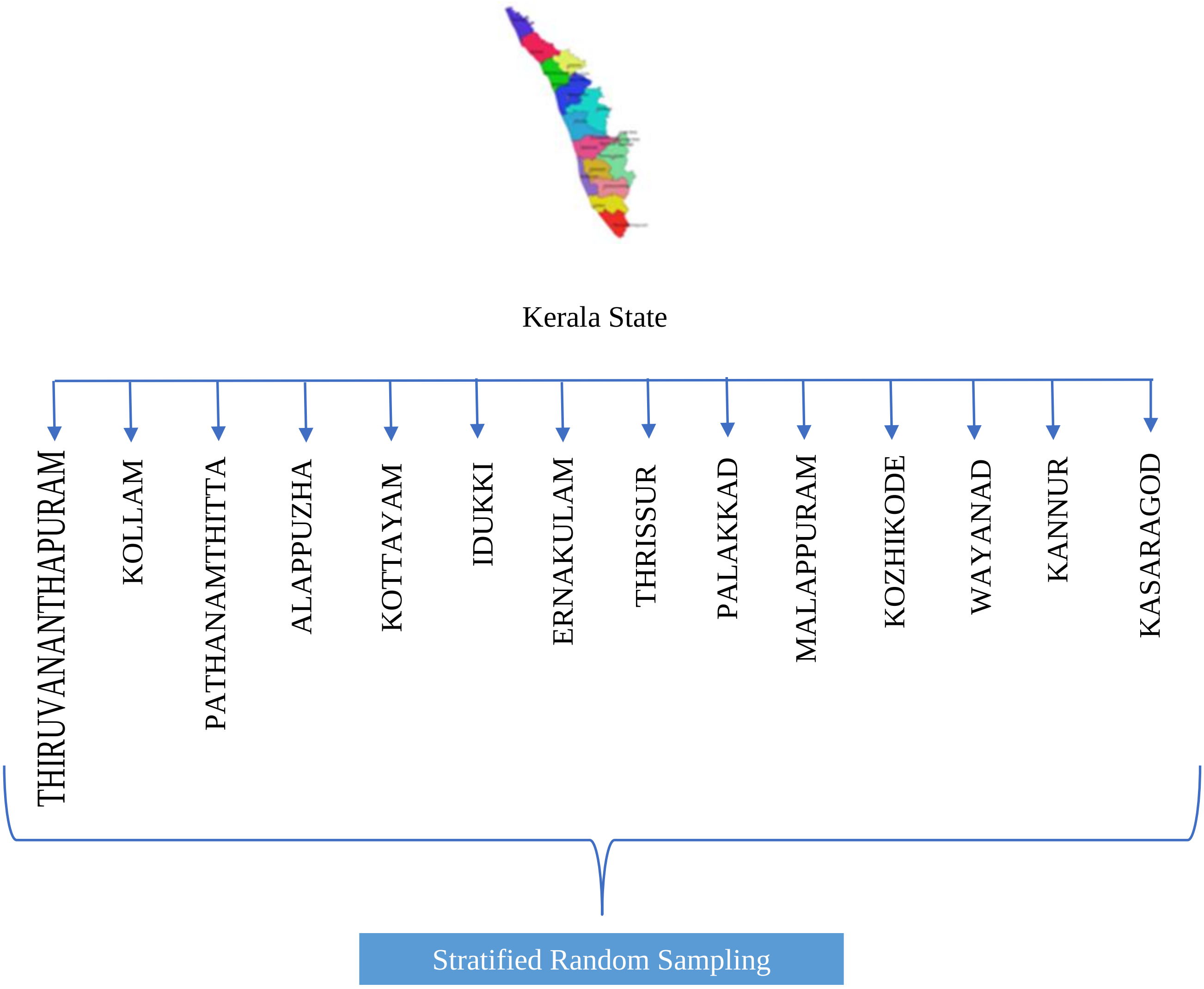


Fig: 3.1: Sampling Method

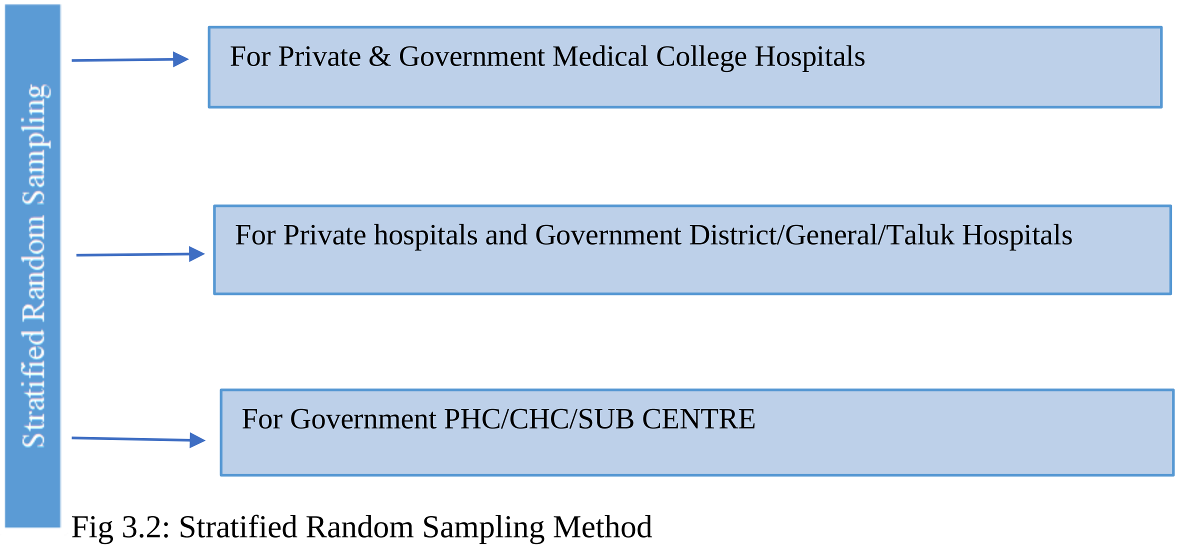


Fig 3.2: Stratified Random Sampling Method

Table 3.1: Hospitals in Kerala which have been selected for the study

HCDS	GOVERNMENT	TOTAL	PRIVATE	TOTAL	GRAND TOTAL
3^0 care	MEDICAL COLLEGE HOSPITALS	14	MEDICAL COLLEGE HOSPITALS	20	34
2^0 care	DISTRICT/GENERAL/TALUK HOSPITALS	121	PRIVATE HOSPITALS	119	240
1^0 care	CHC	144			144
	PHC	272			272
	SUB CENTRE	359			359
					1049

HCDS: Health Care Delivery System

3.2 DATA SOURCES

The data were gathered by visiting the healthcare sectors directly and by contacting the hospitals via telephone and emails. The data were also gathered by the use of Right To Information Act 2005 for the government hospitals. The official government publications and reports also helped to gather the data. The online information was gathered from Ministry of Health and Family Welfare (India), Federal Trial Scrutiny Establishment (India), annual reports of Hospitals , Kerala Health Department.

With the use of several statistical techniques, the acquired data were analysed to meet the objectives. Software called Data Envelopment Analysis Frontier was employed to carry out the analysis. All of the methods used for data analysis are described in depth in this section. Data envelopment analysis was handled to analyse the data and determine the effectiveness of the hospitals. As was said in the preceding paragraph, 1049 healthcare facilities from 14 districts in Kerala state are the source of the main data. To determine efficiency, data is gathered in the form of inputs and outputs.

3.2.1 Inputs from the hospital for data envelopment analysis

Table 3.2 Inputs for the study

Sl no	Inputs	Types	Number
1	Number of beds	Capital	Numbers
2	Number of Doctors	Staff	Numbers
3	Number of Nurses	Staff	Numbers
4	Number of services offered	Technology	Numbers
5	Number of Paramedical staffs	Staff	Numbers
6	Number of Administrative staffs	Staff	Numbers

7	OPD working hours /month	Technology	Hours
8	Specialized equipment's used	Technology	Numbers
9	Tele med consultations/month	Technology	Hours
10	Diagnostic services/year	Capital/ Technology	Numbers

The inputs include number of beds, doctors, nurses, paramedical staffs, administrative staffs, number of services offered, outpatient department working hours per month, specialized equipment's used in a hospital, tele medicine consultation hours in a hospital per month and number of diagnostic services done per year. These data are collected from the hospitals to calculate the efficiency of the corresponding hospitals. Four inputs are from staff type, four from technology and the remaining two belongs to capital type. Hours and numbers are calculated.

Efficiency is determined using DEA envelopment analysis and DEA Frontier software. Efficiency is determined using a linear mathematical method. There lie two sorts of efficacy: VRS efficacy and CRS efficacy. Technically referred to as VRS efficiency, it provides a precise estimate of hospital efficiency.

3.2.2 Outputs for data envelopment analysis

Table 3.3: Outputs to calculate efficiency

Sl no	Outputs	Types	Calculated in
1	OPD patient's	Case treated	Numbers
2	IPD patient's	Case treated	Numbers
3	Major surgeries	Case treated	Numbers
4	Normal deliveries	Case treated	Numbers

The output variables handled in this learning are number of outpatient department patient visited in the hospital in a year, number of inpatient department patients admitted in the hospital in a year, number of major surgeries conducted in a hospital in a year and number of normal vaginal deliveries conducted in a hospital in a year. All these are categories of cases cured and sum of cases. Some hospitals' information is gathered from secondary sources, while information for other hospitals is gathered by visiting the facilities and speaking with administrative staff members. Data for the government hospitals are collected through RTI act of 2005.

Number of beds, nurses and doctors are the parameters that usually considered while assessing the effectiveness of hospitals. But in this study other parameters like the number of other hospital staffs, OPD working hours, special equipment's used, diagnostic modalities and other variables are extensively covered. This will give a fresh insight for other studies to bench mark these variables for upcoming studies.

3.3 RESEARCH OBJECTIVES

The recommended study tried to investigate the following objectives in the environment of healthcare efficacy in the state of Kerala, India

1. To analyze the efficiency of the primary health centre, sub-centre and public hospitals using data envelopment analysis.
2. To find slack in inputs of PHC's, sub-centre and hospitals that contribute toward inefficiency.
3. To create Benchmarking model for PHC's, sub-centre and hospitals for operational working.

4. To create a key performing matrix for Healthcare Administration.

3.4 RESEARCH FRAMEWORK TO ACHIEVE OBJECTIVES.

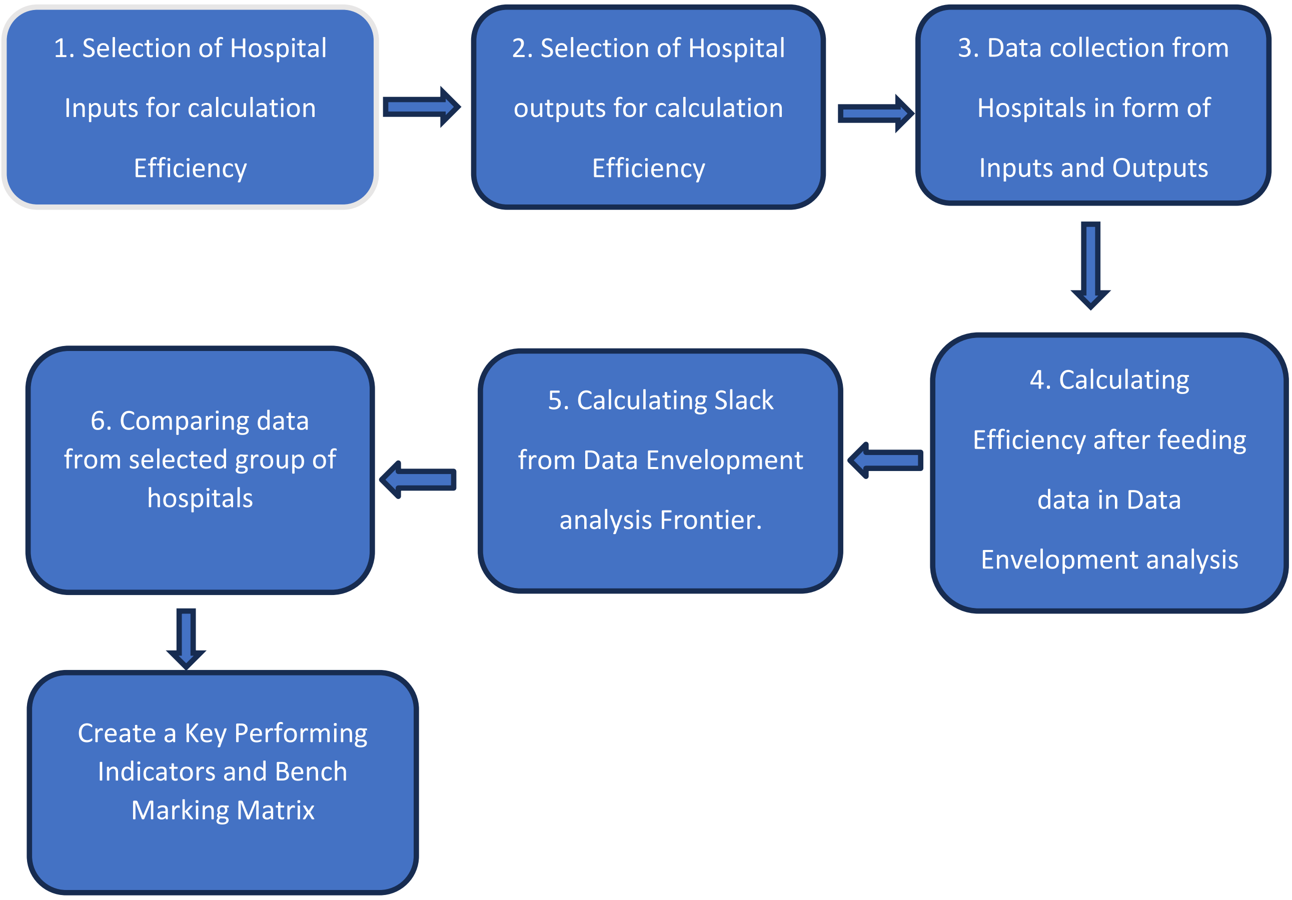


Fig 3.3: Research Framework of the study

This study is segregated into many stages, each of which has a step-by-step process for gathering and analysing data. It is a multi-stage procedure, with certain steps that must be completed in parallel and others that must be done in serial sequence, as shown below:

- The preference of input and output for the purpose of assessing efficacy is the first step. The finalised input and output for assessing efficiency were obtained from 1049 hospitals throughout all of Kerala. There are 121 public hospitals, 119 private hospitals, 144 community health centres, 272 primary health centres, and 359 subcentres among them. There are also 20 private medical colleges and hospitals, 14 state government medical colleges, and 121 public hospitals. Some hospitals' annual reports, which are issued yearly, contain secondary data that is accessible online. Some hospital statistics were chosen following a personal visit to the hospital's administrative office, where data was gathered for efficiency calculations. Some data was collected via e mails and the data from the government hospitals were collected through the Right To Information Act of 2005.

- Following data collection, a model is developed in Microsoft Excel. Data envelopment analysis will be utilized to calculate efficiency using the developed model. Dr. Joe, a professor at the Foise Business School's Department of Economics, is the creator of the Frontier software. There is a wide variety of software available on the market to calculate efficiency using data envelopment analysis, including Stata, Frontier Software created by Foise Business School, CEPA, open-source data envelopment cancel OSDEA, and DEAP software created by the University of Queensland. These tools are used to determine productivity and to conduct data envelopment analysis. This research employs Software for data envelopment analysis. This programme will provide efficiency as well as ineffective value from the data. Slack is a virtue that calls for upholding equality in data where there is inequality. A leeway variable in an improvement problem is a variable that is introduced to an unevenness prerequisite to make it decent. To increase efficacy, treatment quality, patient happiness, and comprehension of medical services, benchmarking is necessary. Best practises and practises backed by evidence are seen during the process, and possible areas for improvement are then identified.

- Why DEA is used in Healthcare Sector: Input and Output Selection Hospital inputs typically include labour, capital, equipment, supplies, and overhead costs. Outputs may encompass patient visits, surgeries, diagnostic tests, patient outcomes, and patient satisfaction measures. Selecting appropriate inputs and outputs is crucial to acquire the key portions of hospital operations and execution. DEA allows for the customization of input and output variables based on the specific goals of the analysis and the characteristics of the healthcare system under study.

  Efficiency Measurement and Benchmarking DEA measures the relative competence of hospitals by evaluating their inputs and outputs. It generates efficacy marks for every hospital, indicating the extent to which they are operating at their optimal levels. Efficient hospitals achieve a score of 1, while scores less than 1 suggest potential areas for improvement. DEA enables benchmarking, where hospitals can compare themselves to efficient peers and recognise appropriate preparations that can be adopted to enhance efficiency.

  Identification of Inefficiencies and Improvement Opportunities DEA helps identify inefficiencies in hospital operations by quantifying the gap between a hospital's current performance and the performance of efficient peers. By examining the DEA results, healthcare administrators can pinpoint the sources of inefficiencies, such as overstaffing, underutilized resources, or inefficient processes. This information allows for targeted improvement initiatives to be implemented, focusing on areas where the greatest gains in efficiency can be achieved.

  Resource Allocation and Planning Efficient allocation of resources is crucial in hospitals to ensure optimal utilization and cost-effectiveness. DEA provides insights into the allocation of resources by quantifying the contributions of different inputs to overall hospital efficiency. Decision-makers can identify which resources are underutilized or misallocated, authorizing them to brand learned judgments involving supply distribution, workforce planning, and investment strategies.

Evaluation of Policy Impacts DEA can weigh the impacts of strategy interventions and amendments on sickbay efficacy. By comparing efficiency scores before and after the execution of particular policies, administrators and policymakers can evaluate the value of their initiatives. This analysis helps refine policies, identify unintended consequences, and guide future decision-making to improve hospital efficiency.

Performance Evaluation and Contracting DEA facilitates performance evaluation and contracting in the healthcare sector. Healthcare providers and payers can use efficiency scores derived from DEA to gage the accomplishment of sickbays and healthcare networks. Efficiency-based contracts can be developed, where hospitals receive incentives for achieving or surpassing certain efficiency targets. This incentivizes hospitals to improve their efficiency, leading to cost savings and better resource utilization.

Comparative Analysis and Decision Support DEA enables comparative analysis by assessing the efficiency of multiple hospitals simultaneously. This analysis allows healthcare administrators to identify best practices, determine performance gaps, and make informed decisions regarding collaborations, mergers, or acquisitions. DEA also assists in prioritizing investments, assigning supplies successfully, and mounting evidence-based tactics to advance hospital efficiency.

Sustainability and Long-Term Performance Assessing hospital efficiency using DEA contributes to the durable execution of healthcare systems. Efficient hospitals tend to be more financially sustainable as they optimize resource utilization and reduce unnecessary costs. By identifying areas for improvement and implementing efficiency-enhancing strategies, hospitals can achieve long-term viability while providing high-quality care.

- Limitations and Challenges of DEA in Hospital Efficiency Assessment

  While DEA is a significant tool for judging hospital efficiency, it is essential to acknowledge its limitations and challenges. These include:

  Choice of Inputs and Outputs: Selecting appropriate input and output variables requires careful consideration. The choice may modify changing on the specific context and targets of the analysis. The enclosure or elimination of selected variables can influence efficacy scores and comparative assessments.

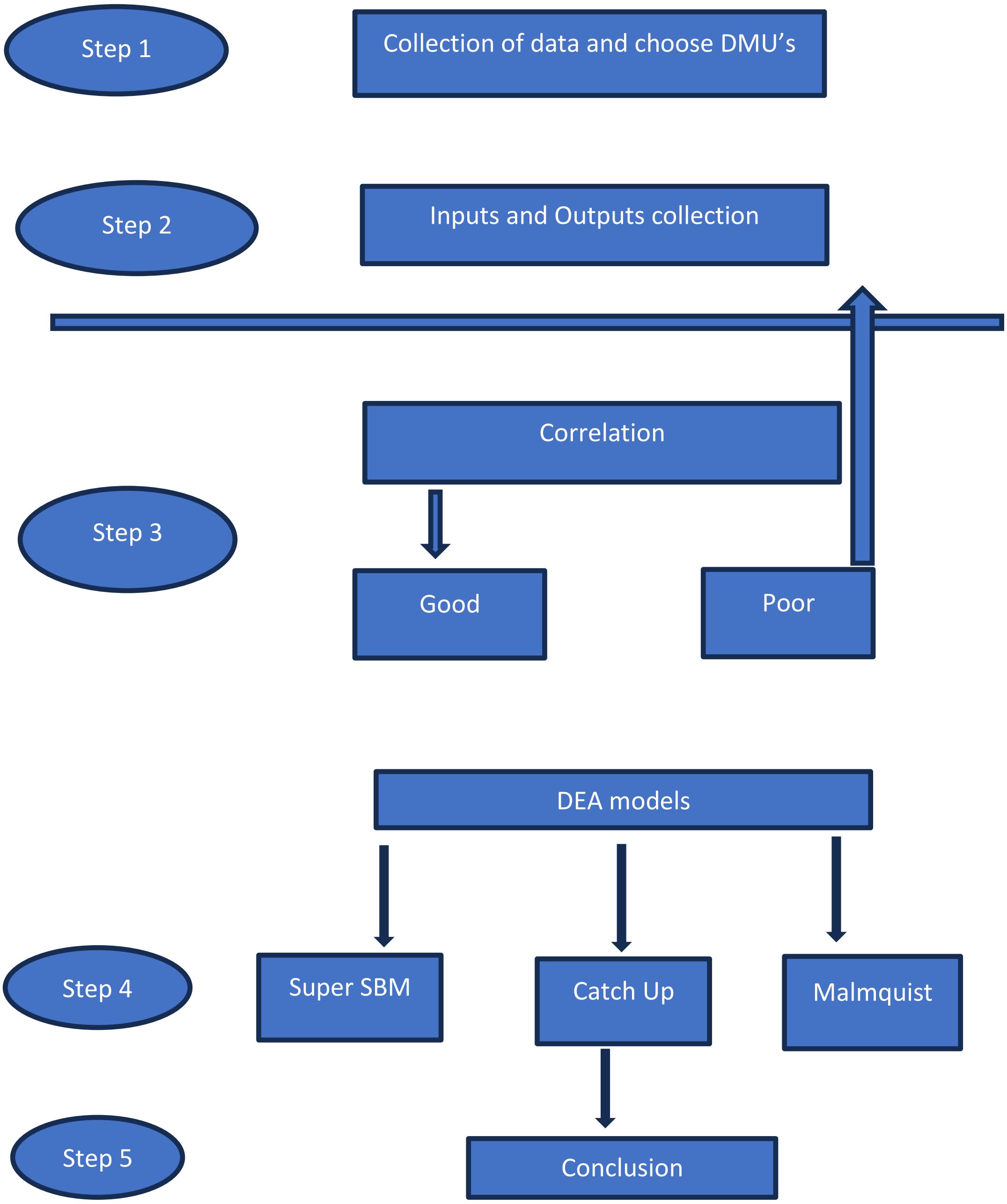


Fig 3.4: Steps to calculate efficiency.

Efficiency may be calculated using a variety of models, including constant and variable returns to scale. Efficiency is calculated using variable return to scale because it provides accurate technical efficiency. Three categories further divide variable return to scale:

Return to scale implies to the transformations in input and output that occur when all elements shift by an equivalent amount.

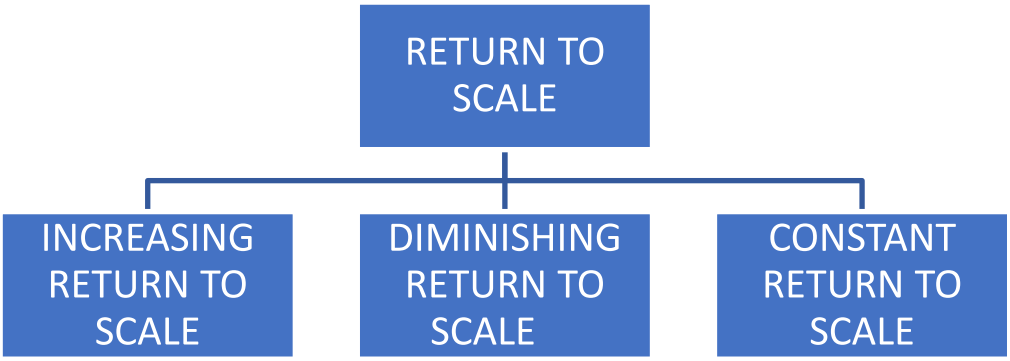


Fig 3.5: Types of Return to scale

1. Increasing Return to Scale

The terms "increasing return to scale" and "decreasing cost" allude to a situation in which output increases more quickly when all production-related components are enlarged. It means that if all information sources are increased by 2, the output will also increase more quickly than twice as quickly. As a result, it is described as having an increasing return to scale. There are many factors driving this development, including division and non-scale economies.

2. Diminishing Return to scale

Unavoidable losses or rising costs refer to the situation when output increases only little if all of the production variables are increased to a particular amount. Otherwise, if the inputs are multiplied, the output will not be a perfect multiple of the inputs. According to Lewin (1983), continuous losses must scale when a 20% increase in labour and capital is followed by a 10%

increase in production. The fact that inward and external economies are not exactly inside and external diseconomies is the main cause of the activity of persistent losses to scale.

3. Constant Return to scale

Constant return to scale or constant cost refers to a situation where output expands precisely in the identical way as input component expansion. Simply said, if input component parts are multiplied, output will also be multiplied. inner and outside economies are comparable to inner and outside diseconomies in this scenario. This situation occurs when diseconomies of scale are used to balance off economies of scale after reaching a certain generational level (Lewin & Morey, 1981). Homogeneous generation work is what this is. An actual example of this kind of job is Cobb-Douglas direct homogeneous creation work.

The generating work by Cobb Douglas, Q(L, K)=A(Lb)Ka, illustrates the three types of profits:

- If $a+b>1$, there are expanding return to scale.
- For $a+b=1$, we get steady return to scale.
- If $a+b<1$, we get diminishing return to scale.

Finding the effectiveness of Kerala's public and private hospitals is the final step. Utilizing information envelopment investigation, efficiency is assessed. A nonparametric technique for determining the operational productivity of fundamental leadership units is information envelopment analysis. DEA has a strong connection to developing economics hypotheses. For determining the relative efficacy of several basic leadership units with regard to various data inputs and outputs, DEA uses the linear programming method. The effectiveness of the healthcare sector at all levels is examined in detail in this study for the Kerala region. The paper's findings show how medical hospitals' efficacy affects their effectiveness and laxness.

To increase efficiency, the healthcare sector can adopt a benchmarking programme that compares its services to the best in the sector.

3.5 DATA ENVELOPMENT ANALYSIS

According to Demir et al. (2009), the envelopment findings of statistics is a linear mathematical programming-based technique for measuring the effectiveness of the general operation of hospital categorized units. It takes into account the obtainability of several data foundations in the form of inputs and outputs. To determine how relative efficacies can be established throughout the focus on inefficient units set, this study introduces the input/output technique. Efficiency usually suffers from the presence of several inefficient information sources and outputs linked to diverse underutilized resources, activities, and ecological elements. This problem can be described for a variety of organisations, such as large retail associations, supermarkets, banks, hospitals, etc. Since wages are assets that sustain the activity in this case, the estimation of the inputs as wages is considered to be the contribution for an efficiency measure. According to Eakins (1991), envelopment analysis of statistics is a linear mathematical programming-based practise for gauging the effectiveness of the general implementation of hospital inputs while taking into account the obtainability of diverse information foundations in the form of inputs and outputs. Emrouznejad (2014) explains how to estimate relative efficiency in situations when there are separate unbalanced information sources and outputs. According to Farrell and Fieldhouse (2009), an inefficient unit should be contrasted to a hypothetically advantageous unit that is used as a slanted average of capable divisions.

According to Dey (2013), in order for overall units to achieve this proportion of efficiency, a typical load configuration must be used. This immediately prompts the question of how such a simple load arrangement may be offered. Obtaining a typical arrangement of loads can result in two different types of problems. Above all things, measuring the sources of inputs and outputs may be challenging. According to Doyle & Green (1994), for instance, the loads on the outputs in the data likely correspond to the costs or quality of delivering the outputs, however it may be challenging to define these costs or qualities. However, some people may choose to organise their activities in a particular way such that the general assessments of the various outputs can be accurately different. This may be made obvious if an effort is made to compare the overall effectiveness of among the results are accomplishments and schools. Some studies may really value the successes of earlier research articles, and once everything is done, units may employ information sources and outputs differently, which will be needed for distributing different loads. This efficiency ratio and the assumption that just one simple load arrangement is needed make them unsuitable.

DEA employs linear programming techniques to calculate efficiency scores. The most common models used in DEA are the input-oriented and output-oriented models. Here are the equations used in these models to calculate efficiency:

Input-Oriented Model:

In the input-oriented model, the efficacy of a DMU is determined by considering the smallest number of inputs required to produce a given level of outputs.

The input-oriented proficiency score (E) for DMU i can be calculated as follows:

$E = \min \lambda$

subject to:

$\sum(s_j * x_{ij}) \leq \sum(s_j * x_{kj}) * \lambda$ for all $k \neq i$,

$\sum(s_j * x_{ij}) = 1$, for all j, (input weight constraint)

$\lambda \geq 0$, for all $k \neq i$, (efficiency score constraint)

In the above equations:

DMU i represents the DMU for which efficiency is being measured.

s_j represents the input weight (efficiency) of input j.

x_{ij} symbolizes the volume of input j used by DMU i.

λ denotes the efficiency score, with values stretching from 0 to 1. A score of 1 indicates a fully efficient DMU.

Output-Oriented Model:

In the output-oriented model, the efficacy of a DMU is determined by considering the highest number of outputs that can be yielded from a given level of inputs.

The output-oriented proficiency score (E) for DMU i can be calculated as follows:

$E = \max \lambda$

subject to:

$\sum(s_j * x_{ij}) \geq \sum(s_j * x_{kj}) * \lambda$ for all $k \neq i$,

$\sum(s_j * x_{ij}) = 1$, for all j, (input weight constraint)

$\lambda \geq 0$, for all $k \neq i$, (efficiency score constraint)

In the above equations, the symbols have the same meaning as in the input-oriented model.

3.5.1 Portion of the merits of DEA

- Proven to be useful in uncovering links that are concealed by practically all other methods of investigation.
- Capable of managing a variety of information sources, outputs, and inputs.

- Able can be utilized with any information output estimation that may be required.

The data envelopment analysis research on determining the benchmark best practise and on upgrading to the better techniques for shifting through and dismembering information and can realise innovative regulatory and speculative encounters.

It ought be clear that in order to successfully apply DEA, several crucial factors, including the following, need to be taken into consideration:

- When trying to determine efficiency, focus on the specific inputs rather than the masses.
- It is an examination of each individual unit with regard to its variables of data factors, which are referred to as independent elements, in order to produce the required outputs, which are referred to as subordinate elements.
- It is capable of outputting many values at the same time.
- Can modify for different circumstances.
- Capable of joining the blatantly visible slack elements.
- Don't need proof that the information and outputs are correct or good enough to use.
- Rather of concentrating on all aspects of the problem, its primary goal is to identify the most effective procedures to use in unresolved areas.
- It is feasible to locate slack values by working with variables.

The DEA refers to a collection of procedures and frameworks that have recently been entangled in the form of a set of models that can be summarised as follows:

- Extent model CCR (1978) provides an interpretation of an quantitative estimation of overall competence, recognises the resources, and verifies the proportions of the observed inefficient angles along these lines.

- The focused and scale inefficient angles are perceived by Model BCC (1984) by (I) evaluating unadulterated particular capabilities at the given size and (ii) recognising that on account of extending declining, or dependable returns to scale, possible outcomes are available for more misuse.
- The multiplicative model of Charnes et al. (1982, 1983) gives (I) a log-straight envelopment and (ii) a piecewise interpretation of the Cobb-Douglas method of the creation approach (via a reduction to the precursor model of Charnes, Cooper, and Seiford (1985).

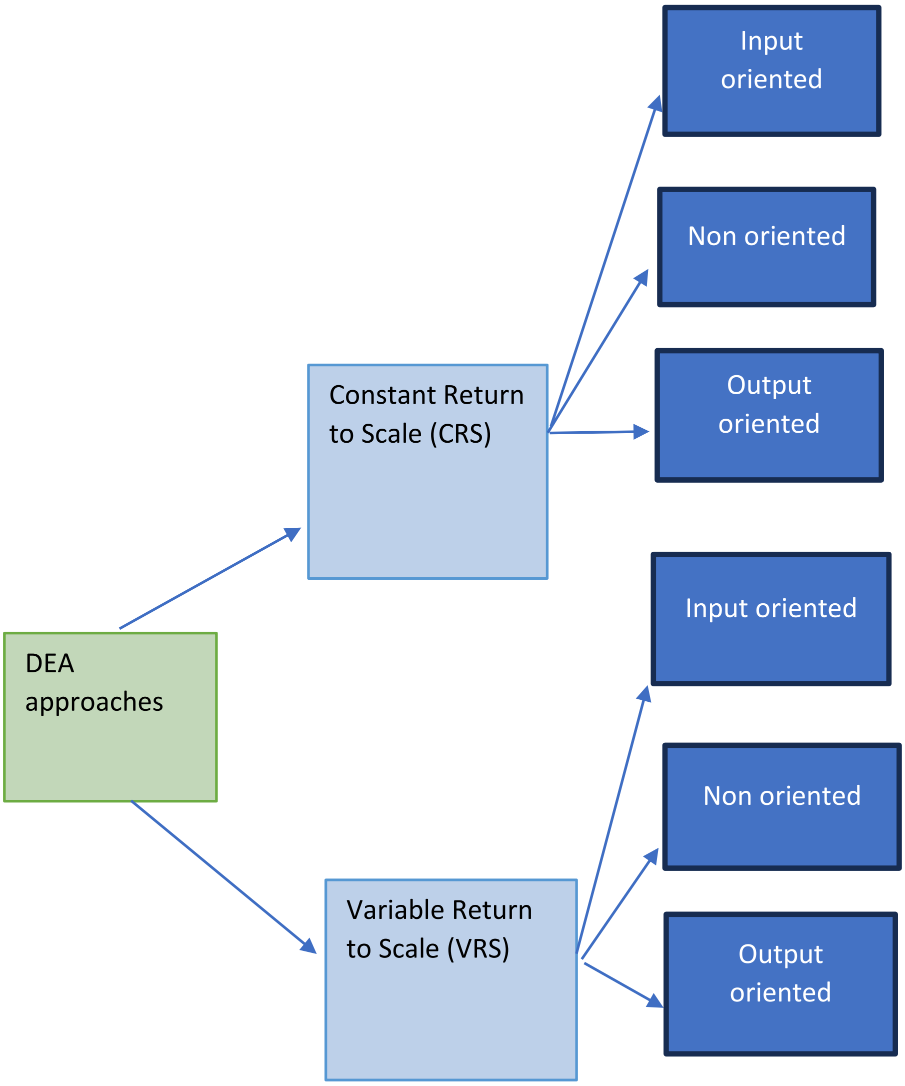


Fig 3.6: Data envelopment analysis approaches

They may utilise a variety of models, and in order to achieve efficiency, they may prioritise either the decline of inputs or the expansion of outputs. This section focuses on the basic numerical models mentioned above in an effort to establish correlations between the variables. More specifically, we investigate the CCR model.

In our research, we looked at proportion, the model of the BCC, the model of the additive, and the model of the multiplicative, and we utilized the CCR model to determine efficiency.

CHAPTER 4

DATA ANALYSIS &

INTERPRETATION

CHAPTER 4

DATA ANALYSIS & INTERPRETATION

"Without big data, you are blind and deaf and in the middle of a freeway."

Geoffrey Moore.

The statistics interpretation and analysis for this region has been broken down into three distinct parts. In the first phase of the project, an analysis of the data collected at Kerala's Primary Health centres, sub centres, and community health centres was carried out. In the second phase, an examination was conducted of Kerala's private hospitals as well as its public hospitals, and in the third phase, an examination was conducted of Kerala's private as well as its public medical colleges. Comparative papers have also been overseen in order to create an image of the sickbays in Kerala that operate effectively centred on the sum of beds available in each facility. These comparisons will lead to the development of a benchmarking hospital for each industry, and they will also assist in determining the key performance metrics.

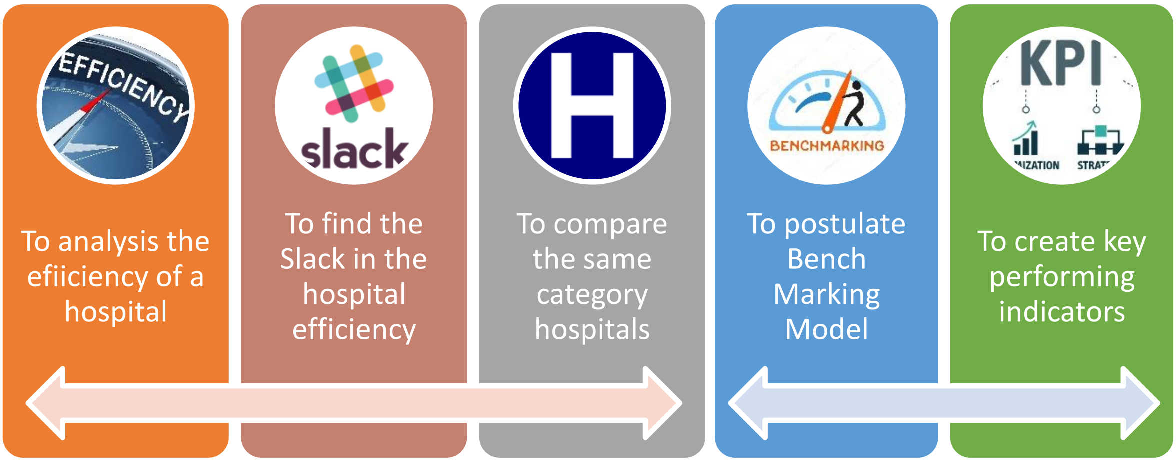


Fig 4.1: Different stages of Data Analysis and Interpretation

Data analysis and interpretation: Stage 1

4.1 DATA ENVELOPMENT ANALYSIS

The technique of data envelopment analysis, which was discussed in earlier chapters, may be utilized to ascertain the degree to which an organisation maximises its resources. In addition to this, it acts as a benchmark against which the efficacy of other groups may be evaluated. According to Frank (1988), slack value is a separate outcome of data envelopment analysis, and it is paired with inequality value to produce an equality constraint. This is done by comparing the two values. The strategy (or instrument) that will be used to finish this investigation is called information envelopment inquiry, which is also sometimes referred to as (DEA) "data envelopment analysis". This method is an information-driven assessment and benchmarking process. Fried (1993) contends that the massive amount of information (basic leadership units, information sources, and outputs) that is controlled by the DEA is accomplished by the use of complex computer computations. The effectiveness of hospitals may be evaluated using a more comprehensive set of measures using these system models.

4.2 SOFTWARE REQUIREMENTS FOR EFFICIENCY CALCULATION

Professor Joe Zhu, who is also the Professor of Operational Research at Foise Business College, came up with the idea for DEA Frontier, which is used for DEA models. These computer programmes benefit from Professor Zhu's considerable DEA teaching experience, which he has used here. The user should be able to discover Solver beneath the Data Tab. This feature, which was developed by Professor Zhu with the intention of reducing the plausibility of the display of DEA models when coding, should be located there. Installing the solver tab extra plugin menu is a must for using and constructing computer programmes for Excel 2007 and prior versions. If this menu is not present, DEA Frontier programming may not function properly. Utilizing the unique Additive model, CRS scale, VRS scale, and multiplier model, DEA programming gives effectiveness.

4.3 EFFICIENCY CALCULATION

The efficacy of the hospitals that were chosen for this study was first considered during the examination of those institutions. The fourteen different districts that make up the state of Kerala each provided one hospital for the research. The foundation for the selection of the hospitals is a method known as stratified random selection. Primary care, secondary care, and tertiary care are the three levels of care that make up India's healthcare delivery system, and these levels have been used to categorise the hospitals. The public health centre, community health centres, and sub centres are all included in the category of primary care hospitals. Random samples are taken from each of Kerala's 272 public health centres, and the overall effectiveness of those centres is determined. In addition, the slack that exists among the public health centres is computed and then compared with the centres themselves in order to derive a model for a bench marking public health centre from the data. Efficiency rates have been determined for 144 different community health facilities located throughout the state of Kerala. The centres were chosen at random. In addition to this, the slack in the units is estimated and compared among themselves in order to locate a community health facility that serves as a benchmark among them. In a similar manner, 359 different sub centres all located within the state of Kerala are chosen at random, and both their efficiency and their slacks are tallied. In addition to this, the sub centres are assessed in relation to one another in order to establish a benchmarking model unit.

All of the private hospitals as well as the government district hospitals, general hospitals, and taluk hospitals are included in the category of secondary care facilities. From among these options, 121 public hospitals and 119 private hospitals have been chosen. Comparisons have been made after in-depth analyses of both the successful and unsuccessful aspects of operation at each of these institutions. There is now a benchmarking hospital for each category, which was determined by selecting hospitals from each category and comparing them to themselves.

Tertiary care consists of hospitals that are affiliated with medical colleges, whether they are run by the government or by commercial organisations. In the state of Kerala, there are a total of 34 medical college hospitals, with 14 belonging to the government and 20 belonging to private institutions. Along with the laxity score, the efficiency of these hospitals was also taken into account. The analysis was conducted on hospitals that fall into the same group as one another.

4.4 EFFICIENCY AND SLACK CALCULATION USING DATA ENVELOPMENT ANALYSIS MODEL.

This component of the calculation of efficacy is broken up into three stages as a result of the categorization of the hospitals in accordance with the configuration of the healthcare delivery system in India. In the first part of the study project, the researcher will determine the levels of productivity and inefficiency at primary care centres, which will comprise PHC, CHC, and sub centres. In the subsequent part of the analyse, the examiner determines the levels of efficiency and slack that are present in both public and private hospitals, including government taluk hospitals, district hospitals, and general hospitals. The National Accreditation Board for Hospitals has developed a categorization system for hospitals called NABH (National Accreditation Board for Hospitals) to account for the fact that hospitals in this category range in size depending on their available bed capacity. In this context, hospitals with less than 100 beds are referred to as very tiny hospitals, those with hundred to three hundred beds as minor infirmaries, those with three hundred and one to five hundred beds as medium hospitals, and those with more than 501 beds as major hospitals. In the third and last phase of the project, all of the medical college hospitals, both public and private, are taken into account to establish how resourceful and wasteful each one is.

Return to scale (RTS) in Data Envelopment Analysis (DEA) refers to the relationship between inputs and outputs when the scale of production or operation is changed. DEA is a nonparametric method wrought to scale the proportional effectiveness of several decision-making units (DMUs), such as partnerships or establishments.

DEA considers numerous inputs and outputs and compares the efficacy of DMUs by analyzing their ability to convert inputs into outputs. Return to scale is one of the focal concepts in DEA, and it examines how the efficacy of DMUs changes when inputs and outputs are uniformly surmounted in ascending or descending fashion.

In DEA, there are trio categories of return to scale:

Constant Returns to Scale (CRS): CRS strikes while an growth in enters and outputs is proportionately scaled, resulting in no change in overall efficiency. In this case, the DMU's efficiency remains constant as its scale of operation changes.

It occur when the scale of operation of a decision-making unit (DMU) is changed, and the efficiency of the DMU remains constant. In other words, if all inputs and outputs are proportionately increased or decreased, the efficiency ratio of the DMU will stay the same.

Mathematically, CRS can be expressed as follows:

Efficiency at scale $\lambda \times$ Inputs at scale λ = Outputs at scale λ

In CRS, the increase or decrease in input and output quantities does not affect the effectiveness level of the DMU. It implies that the DMU is performing at an optimal measure and is utilizing resources efficiently. If a DMU exhibits CRS, it indicates that the DMU can increase or decrease its scale of operation without sacrificing efficiency.

Increasing Returns to Scale (IRS): IRS occurs whilst an upsurge in inputs and outputs indicates to a more than symmetrical improve in efficiency. It implies that the DMU becomes more efficient as its scale of operation increases.

It occur when the degree of process of a DMU is changed, and the efficiency of the DMU increases. In IRS, if all inputs and outputs are proportionately increased or decreased, the efficiency ratio of the DMU will improve.

Mathematically, IRS can be expressed as follows:

Efficiency at scale λ $<$ Efficiency at scale $\lambda \times$ Inputs at scale λ $=$ Outputs at scale λ

In IRS, the DMU becomes more efficient as it increases its scale of operation. This indicates that the DMU can take vantage of markets of dimension and achieve higher efficiency by expanding its operations. In other words, as the DMU grows, it benefits from lower average costs, increased specialization, and better resource utilization.

Decreasing Returns to Scale (DRS): DRS occurs when an upsurge in inputs and outputs directs to a less than symmetrical expansion in efficiency. It implies that the DMU becomes less efficient as its scale of operation increases. It occur when the degree of process of a DMU is changed, and the efficiency of the DMU decreases. In DRS, if all inputs and outputs are proportionately increased or decreased, the efficiency ratio of the DMU will decline.

Mathematically, DRS can be expressed as follows:

Efficiency at scale λ $>$ Efficiency at scale $\lambda \times$ Inputs at scale λ $=$ Outputs at scale λ

In DRS, the DMU becomes less efficient as it increases its scale of operation. This suggests that the DMU is experiencing diseconomies of scale, resulting in higher average costs and suboptimal resource utilization. In such cases, the DMU may benefit from downsizing or finding ways to improve efficiency at its current scale.

Analyzing the return to scale in DEA helps detect the appropriate measure of operation for each DMU. If a DMU operates at CRS, it indicates an optimal scale. If it operates at IRS, it can consider expanding to achieve higher efficiency. If it operates at DRS, it may need to downsize or find ways to improve efficiency. DEA feeds appreciated intuitions for decision-making and resourcefulness distribution in organizations.

By analyzing the return to scale, DEA helps identify the optimal scale of operation for each DMU. It determines whether the DMU is performing at an ideal scale (CRS), would benefit from increasing its scale (IRS), or should consider reducing its scale (DRS) to enhance efficacy.

In this study the hospitals have been classified according to the healthcare delivery system in India. The primary healthcare, the secondary healthcare, and the tertiary healthcare. In the primary healthcare it includes PHC, CHC and subcentres whereas the secondary healthcare includes the general hospitals, the district hospitals, the taluk hospitals, and the private hospitals. The tertiary healthcare includes medical college hospitals. This analysis portion have been divided into three stages according to the healthcare delivery system of India. Furthermore, these three stages have again divided into substages depending upon the level of hospitals. For example, the first stage of primary healthcare is sub divided into PHC, CHC and sub centre for the ease of evaluation.

4.5 ANALYSIS OF PRIMARY HEALTH CARE

4.5.1 Efficiency and Slack Of PHC

Table 4.1: Efficiency score of PHC

DMU Name	Input - Oriented CRS Efficiency	RTS
PHC Kowdiar	1.00000	Constant
PHC Karamana	0.96714	Increasing
PHC Ulloor	1.00000	Constant
PHC Kizhuvilam	0.65305	Increasing
PHC Navaikulam	1.00000	Constant
PHC Kalliyoor	0.66007	Increasing
PHC Vellayani	0.95022	Increasing
PHC Azhoor	0.91583	Increasing
PHC Nagaroor	0.77875	Decreasing
PHC Malayadi	1.00000	Constant
PHC Edava	1.00000	Constant
PHC Vettur	1.00000	Constant
PHC Thonippara	1.00000	Constant
PHC Madavoor	1.00000	Constant
PHC Chenkal	0.96823	Increasing
PHC Karode	1.00000	Constant
PHC Chembooru	1.00000	Constant
PHC Kollayil	1.00000	Constant
PHC Kallikadu	1.00000	Constant
PHC Veli	0.90824	Increasing
PHC Chavara	1.00000	Constant
PHC Achenkovil	1.00000	Constant
PHC Alappadu	0.96793	Increasing
PHC Azheekkal	1.00000	Constant
PHC Kallada	0.93701	Increasing
PHC Elamadu	1.00000	Constant

PHC Ezhukone	1.00000	Constant
PHC Eravipuram	1.00000	Constant
PHC Kumil	1.00000	Constant
PHC Kunnathoor	1.00000	Constant
PHC Melila	1.00000	Constant
PHC Mylom	1.00000	Constant
PHC Neduvathur	1.00000	Constant
PHC Perayam	1.00000	Constant
PHC Perinad	0.92695	Increasing
PHC Thalavur	0.70510	Increasing
PHC Thodiyoor	1.00000	Constant
PHC Vallikkavu	1.00000	Constant
PHC Yeroor	0.84446	Decreasing
PHC Perumon	1.00000	Constant
PHC Vallicodu	1.00000	Constant
PHC Malayalapuzha	1.00000	Constant
PHC Pramadam	1.00000	Constant
PHC Kadapra	1.00000	Constant
PHC Nedumpuram	1.00000	Constant
PHC Kuttapuzha	1.00000	Constant
PHC Ranni	1.00000	Constant
PHC Nilakkal	1.00000	Constant
PHC Koipuram	0.95507	Increasing
PHC Kulanada	1.00000	Constant
PHC Mezhuveli	0.82208	Increasing
PHC Omalloor	1.00000	Constant
PHC Thelliyoor	1.00000	Constant
PHC Cherukole	0.98428	Increasing
PHC Erathu	0.91077	Increasing
PHC Koodal	1.00000	Constant
PHC Kokkathodu	1.00000	Constant
PHC Mylapra	0.90565	Increasing

PHC Seethathodu	0.68152	Increasing
PHC Kuttoor	1.00000	Constant
PHC Mannancherry	1.00000	Constant
PHC Cheppad	1.00000	Constant
PHC Muttar	1.00000	Constant
PHC Haripad	1.00000	Constant
PHC Pallipad	1.00000	Constant
PHC Thottappally	0.96316	Increasing
PHC Vallethodu	1.00000	Constant
PHC Panavally	1.00000	Constant
PHC Kavalam	1.00000	Constant
PHC Venmony	0.96201	Increasing
PHC Puliyoor	1.00000	Constant
PHC Mulakuzha	1.00000	Constant
PHC Aroor	1.00000	Constant
PHC Vettakkal	1.00000	Constant
PHC Kandalloor	0.94148	Increasing
PHC Ala	1.00000	Constant
PHC Aryad	1.00000	Constant
PHC Vayalar	0.87110	Increasing
PHC Thakazhi	1.00000	Constant
PHC Karthikapally	1.00000	Constant
PHC Kappa	0.65596	Increasing
PHC Kozhuvanal	0.89962	Increasing
PHC Thalanadu	1.00000	Constant
PHC Thalappalam	0.90060	Increasing
PHC Lalaketty	1.00000	Constant
PHC Peruva	0.85256	Increasing
PHC Kaduthuruthy	0.99076	Increasing
PHC Vazhappally	0.99110	Increasing
PHC Manarcadu	1.00000	Constant
PHC Puthuppally	1.00000	Constant

PHC Nattakom	1.00000	Constant
PHC Kadanadu	1.00000	Constant
PHC Mutholi	1.00000	Constant
PHC Moonilavu	1.00000	Constant
PHC Parathodu	1.00000	Constant
PHC Vellavoor	0.95861	Increasing
PHC Kanakkary	1.00000	Constant
PHC Velloor	1.00000	Constant
PHC Paippad	1.00000	Constant
PHC Poonjar	1.00000	Constant
PHC Mankulam	1.00000	Constant
PHC Chakkupallam	1.00000	Constant
PHC Edavetty	0.90372	Decreasing
PHC Poomala	1.00000	Constant
PHC Poochapra	1.00000	Constant
PHC Senapathy	1.00000	Constant
PHC Alakkode	1.00000	Constant
PHC Vellathooval	1.00000	Constant
PHC Chinnakanal	0.99805	Increasing
PHC Elappara	1.00000	Constant
PHC Kudayathur	1.00000	Constant
PHC Vattavada	1.00000	Constant
PHC Kanchiyar	1.00000	Constant
PHC Konnathady	1.00000	Constant
PHC Peruvanthanam	0.83830	Increasing
PHC Rajakumari	0.87247	Increasing
PHC Kumily	1.00000	Constant
PHC Arakulam	0.85167	Increasing
PHC Cherupa	1.00000	Constant
PHC Koothali	1.00000	Constant
PHC Kalamassery	0.83290	Increasing
PHC Thrikkakara	1.00000	Constant

PHC Edathala	1.00000	Constant
PHC Choornikkara	0.75508	Increasing
PHC Chottanikkara	1.00000	Constant
PHC Kakkanadu	0.68247	Increasing
PHC Eloor	0.84368	Increasing
PHC Elenji	0.67068	Increasing
PHC Nettoor	1.00000	Constant
PHC Binanipuram	0.95503	Increasing
PHC Nedumbassery	0.98359	Increasing
PHC Parakadavu	1.00000	Constant
PHC Maneed	1.00000	Constant
PHC Kanjoor	1.00000	Constant
PHC Chellanam	1.00000	Constant
PHC Chowara	1.00000	Constant
PHC Kodanadu	1.00000	Constant
PHC Keezhmadu	1.00000	Constant
PHC Arakkulam	0.93465	Increasing
PHC Okkal	1.00000	Constant
PHC Elavally	1.00000	Constant
PHC Thrikkur	1.00000	Constant
PHC Padiyur	1.00000	Constant
PHC Punnayur	0.94569	Increasing
PHC Karalam	1.00000	Constant
PHC Puthur	1.00000	Constant
PHC Mundoor	0.85121	Increasing
PHC Veloor	0.79302	Increasing
PHC Elanadu	0.97188	Increasing
PHC Manalur	0.96544	Increasing
PHC Arimbur	0.90608	Increasing
PHC Aloor	1.00000	Constant
PHC Mambara	1.00000	Constant
PHC Kakkad	0.86780	Increasing

PHC Ayyanthole	1.00000	Constant
PHC Kuzhur	1.00000	Constant
PHC Methala	0.92695	Increasing
PHC Arthat	0.96783	Increasing
PHC Adat	1.00000	Constant
PHC Nattika	0.96125	Increasing
PHC Melamuri	1.00000	Constant
PHC Lakkidi	1.00000	Constant
PHC Nagalassery	1.00000	Constant
PHC Kodumbu	1.00000	Constant
PHC Polpully	0.95889	Increasing
PHC Kulukallur	1.00000	Constant
PHC Vilayur	0.79002	Decreasing
PHC Melarcode	1.00000	Constant
PHC Kapoor	0.95062	Increasing
PHC Ayalur	0.98392	Increasing
PHC Muthuthala	0.95170	Increasing
PHC Kannadi	0.98175	Increasing
PHC Thenkara	0.70448	Increasing
PHC Mannoor	0.77485	Increasing
PHC Perur	0.99738	Decreasing
PHC Mundur	1.00000	Constant
PHC Kottayi	1.00000	Constant
PHC Pudur	1.00000	Constant
PHC Ongallur	1.00000	Constant
PHC Mankara	1.00000	Constant
PHC Moothedam	0.95376	Increasing
PHC Kalady	0.99507	Increasing
PHC Kootayi	0.95880	Increasing
PHC Chaliyar	1.00000	Constant
PHC Elamkulam	1.00000	Constant
PHC Cherukavu	1.00000	Constant

PHC Thalakkad	0.87640	Increasing
PHC Moonniyur	0.95798	Increasing
PHC Ponmundam	1.00000	Constant
PHC Porur	1.00000	Constant
PHC Thuvvur	1.00000	Constant
PHC Edayur	0.91754	Increasing
PHC Chokkad	1.00000	Constant
PHC Ponmala	0.93255	Increasing
PHC Vazhayur	0.97264	Increasing
PHC Ozhoor	0.95724	Decreasing
PHC Pothukal	0.98936	Increasing
PHC Vazhakkad	1.00000	Constant
PHC Karulai	0.99251	Increasing
PHC Palapetty	0.93704	Increasing
PHC Cherupa	1.00000	Constant
PHC Mangad	0.82523	Increasing
PHC Kakayam	0.96884	Increasing
PHC Vayalada	1.00000	Constant
PHC Koothali	0.86000	Increasing
PHC Velom	1.00000	Constant
PHC Choolur	0.99557	Increasing
PHC Kakoor	0.88837	Increasing
PHC Thuneri	1.00000	Constant
PHC Thurayur	1.00000	Constant
PHC Peruvayal	1.00000	Constant
PHC Kodiyathoor	1.00000	Constant
PHC Karassery	.69534	Decreasing
PHC Panagad	1.00000	Constant
PHC Atholy	1.00000	Constant
PHC Kattipara	0.95753	Increasing
PHC Moodadi	1.00000	Constant
PHC Chaliyam	1.00000	Constant

PHC Vadakara	1.00000	Constant
PHC Omassery	1.00000	Constant
PHC Chulliode	1.00000	Constant
PHC Varadoor	1.00000	Constant
PHC Kappukunnu	1.00000	Constant
PHC Mooppainad	1.00000	Constant
PHC Valad	1.00000	Constant
PHC Kurukanmoola	1.00000	Constant
PHC Thondernad	1.00000	Constant
PHC Begur	0.96147	Increasing
PHC Sugandhagiry	1.00000	Constant
PHC Pozhuthana	1.00000	Constant
PHC Kottathara	1.00000	Constant
PHC Pakkom	0.94723	Increasing
PHC Chethalayam	1.00000	Constant
PHC Appapara	1.00000	Constant
PHC Poothady	0.90029	Increasing
PHC Noolpuzha	0.94371	Increasing
PHC Vengapally	0.98623	Increasing
PHC Mullankolly	0.65636	Increasing
PHC Edavaka	0.77850	Increasing
PHC Cheeral	1.00000	Constant
PHC Chuzhali	0.78614	Decreasing
PHC Eruvesy	0.91812	Increasing
PHC Kolanchery	0.60977	Increasing
PHC Pampuruthy	0.97127	Increasing
PHC Urathur	1.00000	Constant
PHC Keezhalloor	1.00000	Constant
PHC Ezhome	0.92056	Increasing
PHC Panniyanoor	1.00000	Constant
PHC Puzhathi	1.00000	Constant
PHC Pallikunnu	1.00000	Constant

PHC Kanichar	0.91741	Increasing
PHC Chalil	1.00000	Constant
PHC Chengalayi	1.00000	Constant
PHC Ulikkal	1.00000	Constant
PHC Narath	0.88380	Increasing
PHC Chirakkal	1.00000	Constant
PHC Vengad	0.66978	Increasing
PHC Eranholi	1.00000	Constant
PHC Chokli	0.99271	Increasing
PHC Mokeri	1.00000	Constant
PHC Vellarikundu	1.00000	Constant
PHC Karicheri	1.00000	Constant
PHC Bandadka	0.89536	Increasing
PHC Kalanad	1.00000	Constant
PHC Chengala	1.00000	Constant
PHC Meenja	1.00000	Constant
PHC Arikady	0.87049	Increasing
PHC Madhur	1.00000	Constant
PHC Vaninagar	1.00000	Constant
PHC Mooucode	0.91364	Increasing
PHC Thuruthi	1.00000	Constant
PHC Olat	1.00000	Constant
PHC Ajanur	0.80513	Increasing
PHC Madikai	0.97527	Increasing
PHC Adoor	1.00000	Constant
PHC Perla	1.00000	Constant
PHC Uduma	0.86224	Increasing
PHC Mulleria	1.00000	Constant
PHC Perla	1.00000	Constant
PHC Padne	0.85172	Increasing

Constant Returns to Scale (CRS): CRS strikes when an raise in inputs and outputs is proportionately scaled, resulting in no change in overall efficiency. Increasing Returns to Scale (IRS): IRS occurs when an upsurge in inputs and outputs primes to a more than equivalent intensification in efficiency and the Decreasing Returns to Scale (DRS): DRS occurs when an surge in inputs and outputs primes to a less than equivalent increase in efficiency. It implies that the DMU becomes less efficient as its scale of operation increases.

Thus the constant return to scale PHC's in Kerala is 176 whereas the increasing return to scale and decrease return to scale is 95 and 8 respectively.

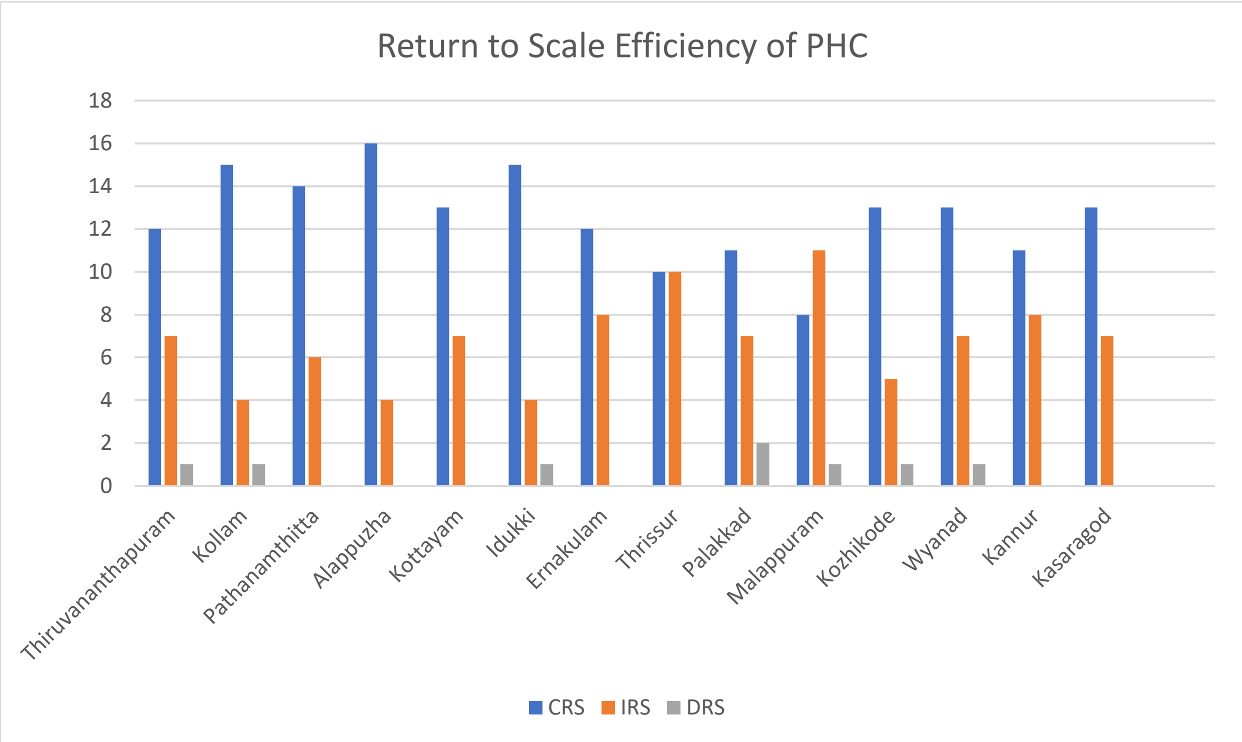


Fig 4.2: Return to Scale efficiency of PHC

Fig 4.3: Slacks in the selected PHC's of Kerala

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	2. PHC Chavara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	2. PHC Achenkovil	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	2. PHC Alappadu	0.54970	0.00000	0.57778	0.00000	0.00000	0.00000	0.00000	0.00000
4	2. PHC Azheekkal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	2. PHC Kallada	0.00000	0.00000	0.39452	0.00000	0.00000	0.00000	119.52868	6.02407
6	2. PHC Elamadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	2. PHC Ezhukone	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	2. PHC Eravipuram	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	2. PHC Kumil	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	2. PHC Kunnathoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	2. PHC Melila	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	2. PHC Mylom	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	2. PHC Neduvathur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	2. PHC Perayam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	2. PHC Perinad	1.85390	0.00000	0.00000	0.00000	0.00000	75.64077	0.00000	0.76383
16	2. PHC Thalavur	0.10664	0.48042	0.00000	0.00000	277.89688	0.00000	0.00000	0.00000
17	2. PHC Thodiyoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	2. PHC Vallikkavu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	2. PHC Yeroor	0.47432	0.63334	0.00000	0.00000	0.00000	120.92159	144.49849	0.00000
20	2. PHC Perumon	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	1. PHC Kowdiar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1. PHC Karamana	0.00000	0.94199	0.02515	0.00000	525.50370	0.00000	0.00000	26.73516
3	1. PHC Ulloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	1. PHC Kizhuvilam	0.00000	0.09446	0.32652	0.00000	0.00000	28.31028	0.00000	15.78800
5	1. PHC Navaikulam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	1. PHC Kalliyoor	0.00000	0.00000	0.05497	0.02749	0.00000	7.80590	0.00000	14.58832
7	1. PHC Vellayani	0.66897	0.00000	0.00000	0.66897	210.25486	16.03673	0.00000	0.00000
8	1. PHC Azhoor	0.00000	0.00000	0.00000	1.68506	0.00000	65.89997	0.00000	0.00000
9	1. PHC Nagaroor	0.00000	0.50291	0.50291	0.00000	69.39977	0.00000	6.53375	0.00000
10	1. PHC Malayadi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	1. PHC Edava	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	1. PHC Vettur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	1. PHC Thonippara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	1. PHC Madavoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	1. PHC Chenkal	0.00000	0.00000	0.96823	0.08361	0.00000	98.63578	7.75618	0.00000
16	1. PHC Karode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	1. PHC Chembooru	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	1. PHC Kollayil	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	1. PHC Kallikadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	1. PHC Veli	0.00000	0.00000	0.57642	0.11306	0.00000	80.85897	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	3. PHC Vallicodu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	3. PHC Malayalapuzha	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	3. PHC Pramadam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	3. PHC Kadapra	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	3. PHC Nedumpuram	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	3. PHC Kuttapuzha	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	3. PHC Ranni	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	3. PHC Nilakkal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	3. PHC Koipuram	0.92615	0.00000	0.02892	0.00000	0.00000	23.12110	212.28225	0.00000
10	3. PHC Kulanada	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	3. PHC Mezhuveli	0.00000	0.73511	0.38721	0.30023	7.25530	71.76548	0.00000	0.00000
12	3. PHC Omalloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	3. PHC Thelliyoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	3. PHC Cherukole	0.00000	0.00000	0.00000	1.43589	0.00000	62.57093	0.00000	53.78297
15	3. PHC Erathu	0.00000	0.00000	0.34090	0.00000	0.00000	0.00000	15.70576	16.82988
16	3. PHC Koodal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	3. PHC Kokkathodu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	3. PHC Mylapra	0.10145	0.00000	0.00000	0.50355	0.00000	54.99502	0.00000	32.10097
19	3. PHC Seethathodu	0.19196	0.00000	0.00000	0.00000	0.00000	0.00000	11.19783	20.56738
20	3. PHC Kuttoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks				Output Slacks			
DMU No.	DMU Name	*no.of beds*	*no.of doctors*	*no.of nurses*	*no.of paramedic staffs*	OPD	IPD	minor surgeries	no.of deliveries
1	4. PHC Mannancherry	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	4. PHC Cheppad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	4. PHC Muttar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	4. PHC Haripad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	4. PHC Pallipad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	4. PHC Thottappally	0.00000	0.48158	0.34431	0.00000	44.36851	0.00000	0.00000	33.89849
7	4. PHC Vallethodu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	4. PHC Panavally	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	4. PHC Kavalam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	4. PHC Venmony	0.00000	0.00000	0.47167	0.03225	0.00000	0.00000	0.00000	7.22262
11	4. PHC Puliyoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	4. PHC Mulakuzha	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	4. PHC Aroor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	4. PHC Vettakkal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	4. PHC Kandalloor	0.00000	0.00000	0.36481	0.00000	0.00000	0.00000	0.00000	0.00000
16	4. PHC Ala	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	4. PHC Aryad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	4. PHC Vayalar	1.44932	0.00000	0.00000	0.00000	0.00000	51.81544	0.00000	0.00000
19	4. PHC Thakazhi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	4. PHC Karthikapally	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks				Output Slacks			
DMU No.	DMU Name	*no.of beds*	*no.of doctors*	*no.of nurses*	*no.of paramedic staffs*	OPD	IPD	minor surgeries	no.of deliveries
1	5. PHC Kappa	0.00000	0.32798	0.09787	0.00000	0.00000	13.33573	59.35897	0.00000
2	5. PHC Kozhuvanal	0.57410	0.16276	0.00000	0.00000	0.00000	37.75321	32.72851	0.00000
3	5. PHC Thalanadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	5. PHC Thalappalam	0.59889	0.00000	0.00000	0.29719	7.43357	0.00000	0.00000	22.65387
5	5. PHC Lalaketty	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	5. PHC Peruva	0.37301	0.00000	0.35226	0.00000	0.00000	0.00000	0.00000	6.20893
7	5. PHC Kaduthuruthy	2.19633	0.00000	0.00000	0.00000	302.99300	0.00000	0.00000	27.91489
8	5. PHC Vazhappally	0.00000	0.15933	0.00000	0.14444	0.00000	0.00000	0.00000	17.05902
9	5. PHC Manarcadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	5. PHC Puthuppally	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	5. PHC Nattakom	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	5. PHC Kadanadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	5. PHC Mutholi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	5. PHC Moonilavu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	5. PHC Parathodu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	5. PHC Vellavoor	0.00000	0.00000	0.77545	0.00000	0.00000	0.00000	0.00000	0.18411
17	5. PHC Kanakkary	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	5. PHC Velloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	5. PHC Paippad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	5. PHC Poonjar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks				Output Slacks			
DMU No.	DMU Name	*no.of beds*	*no.of doctors*	*no.of nurses*	*no.of paramedic staffs*	OPD	IPD	minor surgeries	no.of deliveries
1	6. PHC Mankulam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	6. PHC Chakkupallam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	6. PHC Edavetty	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	151.28047	30.57104
4	6. PHC Poomala	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	6. PHC Poochapra	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	6. PHC Senapathy	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	6. PHC Alakkode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	6. PHC Vellathooval	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	6. PHC Chinnakanal	0.00000	0.00000	0.13253	0.00000	129.43108	0.00000	0.00000	0.00000
10	6. PHC Elappara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	6. PHC Kudayathur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	6. PHC Vattavada	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	6. PHC Kanchiyar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	6. PHC Konnathady	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	6. PHC Peruvanthanam	0.00000	0.00000	0.05590	0.00000	0.00000	0.00000	0.00000	10.45758
16	6. PHC Rajakumari	0.87247	0.00000	0.31784	0.00000	291.56846	0.00000	0.00000	5.54572
17	6. PHC Kumily	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	6. PHC Arakulam	1.04426	0.33511	1.36823	0.00000	0.00000	0.00000	0.00000	11.71682
19	6. PHC Cherupa	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	6. PHC Koothali	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	7. PHC Kalamassery	0.49268	0.00000	0.33139	0.66279	53.02032	0.00000	0.00000	27.04558
2	7. PHC Thrikkakara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	7. PHC Edathala	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	7. PHC Choornikkara	0.39430	0.00000	0.00000	0.00000	0.00000	36.42247	0.00000	8.19184
5	7. PHC Chottanikkara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	7. PHC Kakkanadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	94.89455	25.63900
7	7. PHC Eloor	0.00000	0.00000	0.00000	0.00000	0.00000	61.91638	88.27856	16.88602
8	7. PHC Elenji	0.00000	0.00000	0.00000	0.67068	0.00000	39.62857	7.86165	16.64211
9	7. PHC Nettoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	7. PHC Binanipuram	0.00000	0.00000	0.00000	0.41809	0.00000	132.97115	0.00000	35.23783
11	7. PHC Nedumbassery	0.00000	0.00000	0.00000	0.00000	0.00000	165.68337	50.65124	7.45776
12	7. PHC Parakadavu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	7. PHC Maneed	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	7. PHC Kanjoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	7. PHC Chellanam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	7. PHC Chowara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	7. PHC Kodanadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	7. PHC Keezhmadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	7. PHC Arakkulam	2.25184	0.09491	0.00000	0.00000	0.00000	5.93647	0.00000	0.00000
20	7. PHC Okkal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	8. PHC Elavally	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	8. PHC Thrikkur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	8. PHC Padiyur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	8. PHC Punnayur	0.94569	0.00000	0.00000	0.94569	349.88896	0.00000	25.72924	0.00000
5	8. PHC Karalam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	8. PHC Puthur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	8. PHC Mundoor	0.00000	0.00000	0.00000	0.00000	85.24608	0.00000	84.64947	0.00000
8	8. PHC Veloor	1.58603	0.00000	0.00000	0.00000	55.58613	0.00000	0.00000	9.97541
9	8. PHC Elanadu	0.33327	0.00000	0.75042	0.55473	261.51736	0.00000	0.00000	0.00000
10	8. PHC Manalur	0.26756	0.00000	0.96544	0.26756	146.01414	89.44369	0.00000	0.00000
11	8. PHC Arimbur	0.90608	0.00000	0.00000	0.00000	324.78444	0.00000	46.80233	0.00000
12	8. PHC Aloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	8. PHC Mambara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	8. PHC Kakkad	0.86780	0.00000	0.00000	0.00000	66.45763	25.64068	0.00000	29.04407
15	8. PHC Ayyanthole	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	8. PHC Kuzhur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	8. PHC Methala	2.34667	0.00000	0.00000	0.49277	0.00000	69.20756	0.00000	0.76383
18	8. PHC Arthat	1.93566	0.00000	0.55061	0.00000	745.07974	0.00000	0.00000	12.25793
19	8. PHC Adat	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	8. PHC Nattika	0.18047	0.70099	0.00000	1.66223	0.00000	0.00000	75.72017	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	9. PHC Melamuri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	9. PHC Lakkidi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	9. PHC Nagalassery	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	9. PHC Kodumbu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	9. PHC Polpully	2.50204	0.00000	0.12488	0.00000	0.00000	167.85583	35.90886	0.00000
6	9. PHC Kulukallur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	9. PHC Vilayur	1.19817	0.24524	0.00000	0.00000	0.00000	0.00000	71.56512	12.44774
8	9. PHC Melarcode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	9. PHC Kapoor	0.70161	0.00000	0.71674	0.00000	0.00000	118.42588	48.06049	0.00000
10	9. PHC Ayalur	0.98392	0.00000	0.00000	0.90024	0.00000	0.00000	164.64096	22.25211
11	9. PHC Muthuthala	1.54561	0.00000	0.35779	0.35779	0.00000	6.12466	92.12876	0.00000
12	9. PHC Kannadi	0.86428	0.00000	0.05874	0.05874	568.61108	77.69718	0.00000	0.00000
13	9. PHC Thenkara	2.52470	0.00000	0.00000	0.41125	77.44373	93.66834	0.00000	0.00000
14	9. PHC Mannoor	0.00000	0.49672	0.00000	0.37978	0.00000	49.99126	0.00000	0.00000
15	9. PHC Perur	0.00000	0.84125	0.00000	0.43344	942.65060	0.00000	74.87843	0.00000
16	9. PHC Mundur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	9. PHC Kottayi	4.00000	0.00000	0.00000	0.00000	663.00000	0.00000	129.00000	45.00000
18	9. PHC Pudur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	9. PHC Ongallur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	9. PHC Mankara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	10. PHC Moothedam	0.00000	0.00000	0.31792	0.31792	1114.29480	0.00000	10.79769	9.12139
2	10. PHC Kalady	0.98495	0.99845	0.99170	0.00000	0.00000	0.00000	119.66646	41.37600
3	10. PHC Kootayi	1.91760	0.00000	0.00000	1.91760	511.76404	0.00000	70.73408	7.86891
4	10. PHC Chaliyar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	10. PHC Elamkulam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	10. PHC Cherukavu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	10. PHC Thalakkad	1.75281	0.00000	0.00000	0.87640	326.29213	0.00000	59.20225	20.60674
8	10. PHC Moonniyur	0.00000	0.00000	0.63866	0.63866	554.17647	0.00000	43.17647	26.12605
9	10. PHC Ponmundam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	10. PHC Porur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	10. PHC Thuvvur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	10. PHC Edayur	0.31292	0.00000	0.66626	0.66626	0.00000	32.70077	0.00000	0.00000
13	10. PHC Chokkad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	10. PHC Ponmala	1.74859	0.03884	0.89371	0.00000	0.00000	27.10761	85.16347	0.00000
15	10. PHC Vazhayur	0.00000	0.00000	0.00000	0.00000	0.00000	4.11765	37.17921	10.73324
16	10. PHC Ozhoor	0.00000	0.63816	0.63816	0.31908	427.72368	71.77632	200.97368	0.00000
17	10. PHC Pothukal	0.69782	0.09718	0.89218	0.00000	0.00000	136.43151	12.23425	0.00000
18	10. PHC Vazhakkad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	10. PHC Karulai	2.97753	0.00000	0.00000	0.00000	85.77528	0.00000	62.58801	18.43071
20	10. PHC Palapetty	0.80670	0.04345	0.89359	0.00000	0.00000	65.37002	3.22169	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	11. PHC Cherupa	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	11. PHC Mangad	1.22932	0.00000	0.00000	0.51656	0.00000	0.00000	6.04961	0.00000
3	11. PHC Kakayam	0.34023	0.76637	0.96884	0.00000	0.00000	0.00000	118.93483	0.00000
4	11. PHC Vayalada	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	11. PHC Koothali	0.22551	0.00000	0.63449	0.86000	0.00000	10.82033	0.00000	3.10964
6	11. PHC Velom	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	11. PHC Choolur	0.00000	0.00512	0.00000	1.00069	0.00000	168.55900	79.26731	0.00000
8	11. PHC Kakoor	1.05208	0.00000	0.88837	0.00000	0.00000	140.16893	0.00000	0.00000
9	11. PHC Thuneri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	11. PHC Thurayur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	11. PHC Peruvayal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	11. PHC Kodiyathoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	11. PHC Karassery	0.00000	0.34767	0.34767	0.00000	62.03763	45.87097	48.08602	0.00000
14	11. PHC Panagad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	11. PHC Atholy	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	11. PHC Kattipara	1.98975	0.00000	0.75732	0.00000	0.00000	131.97981	0.00000	0.00000
17	11. PHC Moodadi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	11. PHC Chaliyam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	11. PHC Vadakara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	11. PHC Omassery	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	12. PHC Chulliode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	12. PHC Varadoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	12. PHC Kappukunnu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	12. PHC Mooppainad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	12. PHC Valad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	12. PHC Kurukanmoola	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	12. PHC Thondernad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	12. PHC Begur	0.66299	0.96147	0.54149	0.00000	0.00000	0.00000	10.35752	4.71167
9	12. PHC Sugandhagiry	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	12. PHC Pozhuthana	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	12. PHC Kottathara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	12. PHC Pakkom	0.85809	0.00000	0.00000	0.25632	356.45099	0.00000	0.00000	26.33531
13	12. PHC Chethalayam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	12. PHC Appapara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	12. PHC Poothady	0.12078	0.00000	0.00000	0.00000	259.17041	70.28937	0.00000	0.00000
16	12. PHC Noolpuzha	0.00000	0.00000	0.00000	0.00000	457.27152	123.51987	0.00000	13.15894
17	12. PHC Vengapally	0.00000	0.00000	0.19118	0.79506	343.37331	42.28725	0.00000	0.00000
18	12. PHC Mullankolly	1.26241	0.00000	0.00000	0.00000	43.36914	48.70530	0.00000	0.00000
19	12. PHC Edavaka	1.46159	0.00000	0.00000	0.00000	161.56039	83.37582	0.00000	0.00000
20	12. PHC Cheeral	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	13. PHC Chuzhali	0.00000	0.31446	0.31446	0.00000	0.00000	0.00000	35.18335	23.95450
2	13. PHC Eruvesy	2.16517	0.00000	0.62352	0.00000	0.00000	132.79688	0.00000	6.60820
3	13. PHC Kolanchery	0.60977	0.00000	0.00000	0.00000	0.00000	29.68529	0.00000	16.69721
4	13. PHC Pampuruthy	0.46275	0.46275	1.43402	0.00000	0.00000	0.00000	0.00000	5.98706
5	13. PHC Urathur	0.00000	0.00000	0.00000	0.00000	29.00000	13.00000	0.00000	30.00000
6	13. PHC Keezhalloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	13. PHC Ezhome	2.76167	0.00000	0.00000	0.00000	0.00000	0.00000	35.90532	14.58204
8	13. PHC Panniyanoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	13. PHC Puzhathi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	13. PHC Pallikunnu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	13. PHC Kanichar	1.83481	0.87049	0.00000	1.78790	0.00000	0.00000	0.00000	24.46593
12	13. PHC Chalil	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	13. PHC Chengalayi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	13. PHC Ulikkal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	13. PHC Narath	0.69484	0.00000	0.00000	0.80451	0.00000	0.00000	0.00000	0.00000
16	13. PHC Chirakkal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	13. PHC Vengad	0.00000	0.27025	0.27025	0.00293	0.00000	70.76358	0.00000	0.00000
18	13. PHC Eranholi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	13. PHC Chokli	0.00000	0.99271	0.99271	1.98543	0.00000	74.21090	5.43984	0.00000
20	13. PHC Mokeri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of paramedic staffs	Output Slacks OPD	IPD	minor surgeries	no.of deliveries
1	14. PHC Vellarikundu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	14. PHC Karicheri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	14. PHC Bandadka	2.03964	0.00000	0.11664	0.89536	0.00000	0.00000	0.00000	0.00000
4	14. PHC Kalanad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	14. PHC Chengala	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	14. PHC Meenja	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	14. PHC Arikady	1.54567	0.00000	0.14258	0.00000	0.00000	0.00000	0.00000	0.00000
8	14. PHC Madhur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	14. PHC Vaninagar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	14. PHC Mooucode	1.12416	0.00000	0.00000	0.91364	15.07173	0.00000	0.00000	7.21764
11	14. PHC Thuruthi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	14. PHC Olat	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	14. PHC Ajanur	0.16426	0.00000	0.00000	1.61026	0.00000	49.66353	0.00000	27.05011
14	14. PHC Madikai	1.34961	0.00000	0.00000	0.00000	0.00000	109.45618	0.00000	25.04858
15	14. PHC Adoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	14. PHC Perla	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	14. PHC Uduma	0.32298	0.00000	0.32298	0.00000	0.00000	1.17131	0.00000	35.61082
18	14. PHC Mulleria	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	14. PHC Perla	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	14. PHC Padne	0.00000	0.00000	0.27112	0.00000	0.00000	0.00000	0.00000	25.77301

Out of selected PHC's in Kerala state, 176 PHC's are having zero slack. A slack is nothing but an inefficiency of an organization to perform its functions effectively with the available resources.

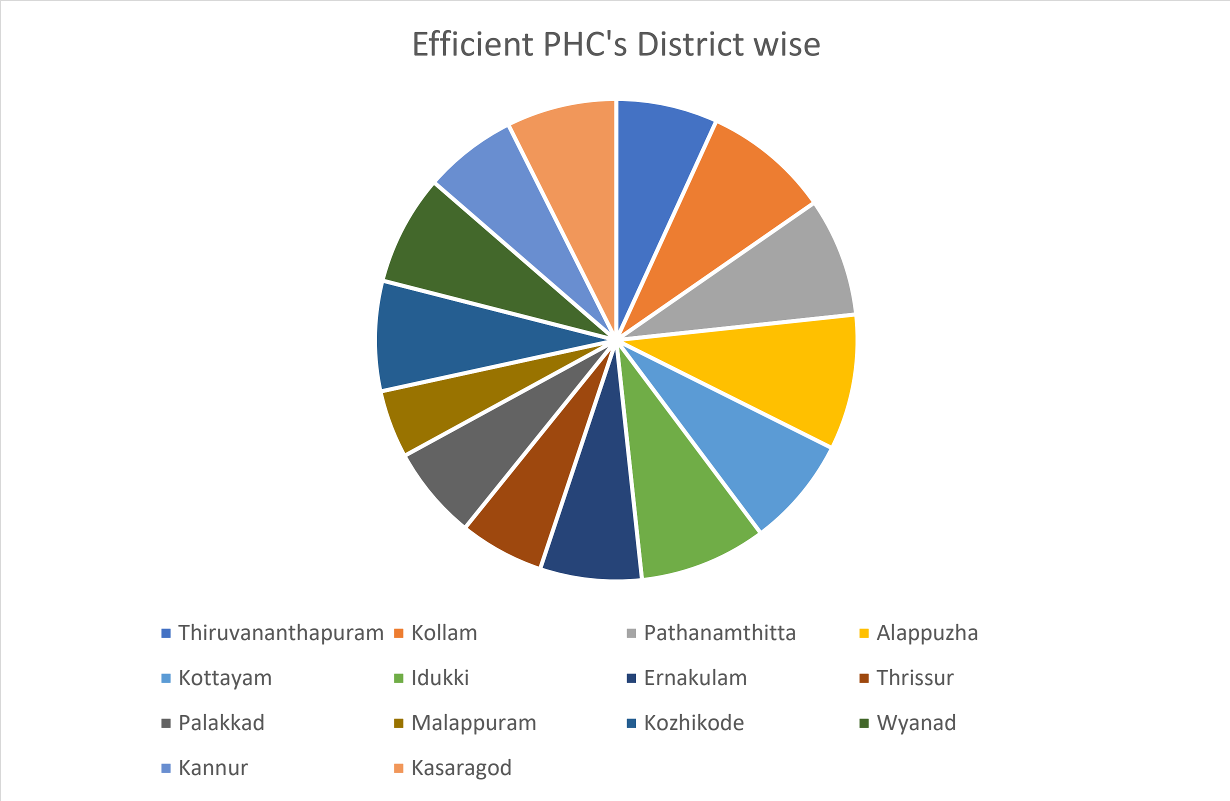


Fig 4.4: Efficiency of PHC's District wise

Table 4.2: District wise efficient PHC's in Kerala

Districts	PHC
Thiruvananthapuram	Kowdiar, Ulloor, Navikulam, Malayadi, Edava, Vettur, Thonippara, Madavoor, Karode, Chembooru, Kollayil, Kallikadu.
Kollam	Chavara, Achenkovil, Azheekkal, Elamadu, Ezhukone, Eravipuram, Kumil, Kunnathoor, Melila, Mylom, Neduvathur, Perayam, Thodiyoor, Vallikkavu, Perumon
Pathanamthitta	Vallicodu, Malayalapuzha, Pramadam, Kadapra, Nedumpuram, Kuttapuzha, Ranni, Nilakkal, Kulanada, Omalloor, Thelliyoor, Koodal, Kottathodu, Kuttor

Alappuzha	Mannancherry, Cheppad, Muttar, Haripad, Pallipad, Vallithodu, Panavally, Kavalam. Puliyoor, Mulakuzha, Aroor, Vettakkal, Ala, Aryad, Thakazhi, Karthikapally
Kottayam	Thalanadu, Lalaketty, Manarcadu, Puthuppally, Nattakom, Kadanadu, Mutholi, Moonilavu, Parathodu, Kanakkary, Velloor, Paippad, Poonjar
Idukki	Mankulam, Chakkupallam, Poomala, Poochapra, Senapathy, Alakkode, Vellathooval, Elappara, Kudayathur, Vattavada, Kanchiyar, Konnathady, Kumily, Cherupa, Koothali
Ernakulam	Thrikkakara, Edathala, Chottanikkara, Nettoor, Parakadavu, Maneed, Kanjoor, Chellanam, Chowara, Kodanadu, Keezhmadu, Okkal
Thrissur	Elavally, Thrikkur, Padiyar, Karalam, Puthur, Aloor, Mambara, Ayyanthole, Kuzhur, Adat
Palakkad	Melamuri, Lakkidi, Nagalassery, Kodumbu, Kulukallur, Melarcode, Mundur, Kottayi, Pudur, Ongallur, Manakara
Malappuram	Chaliyar, Elamkulam, Cherukavu, Ponmundam, Porur, Thuvvur, Chokkad, Vazhakkad
Kozhikode	Cherupa, Vayalada, Velom, Thuneri, Thurayur, Peruvayal, Kodiyathoor, Panagad, Atholy, Moodadi, Chaliyam, Vadakara, Omassery
Wyanad	Chulliode, Varadoor, Kappukunnu, Mooppainad, Valad, Kurukanmoola, Thondarnad, Sugandhagiry, Pozhuthana, Kottathara, Chethalayam, Appapara, Cheeral

Kannur	Urathur, Keezhalloor, Panniyanoor, Puzhathi, Pallikunnu, Chalil, Chengalayi, Ulikkal, Chirakkal, Eranholi, Mokeri
Kasaragod	Vellarikundu, Karicheri, Kalanad, Chengala, Meenja, Madhur, Vaninagar, Thuruthi, Olat, Adoor, Perla, Mulleria, Perla

These are the PHC's that are efficiently working in the state of Kerala. The listed PHC's are having no slacks, and these are working efficiently working with the available inputs.

The highest degree of slack is shown by the number of beds in the PHC then by the Nurses. This implies that the input values of bed capacity and the nurses of the PHC are not sufficient to meet the output values. This can be correlated with the output values of inpatient departments, figure of minor surgeries and sum of deliveries which are not meeting the criteria of efficient scoring.

4.5.2 Efficiency And Slack Of CHC

Table 4.3: Efficiency Score Of CHC

DMU Name	Input Oriented CRS Efficiency	RTS
CHC Palode	1.00000	Constant
CHC Vakkom	0.86516	Increasing
CHC Vellanadu	1.00000	Constant
CHC Vizhinjam	1.00000	Constant
CHC Pulluvilla	1.00000	Constant
CHC Andoorkonam	1.00000	Constant
CHC Aryanad	0.99196	Increasing
CHC Vilappil	1.00000	Constant
CHC Pallickal	1.00000	Constant
CHC Kesavapuram	1.00000	Constant
CHC Anchal	0.89313	Increasing
CHC Kulakkada	1.00000	Constant
CHC Mynagapally	1.00000	Constant
CHC Nedumpana	1.00000	Constant
CHC Oachira	0.61258	Increasing
CHC Nilamel	1.00000	Constant
CHC Chavara	1.00000	Constant
CHC Kulathupuzha	0.88648	Increasing
CHC Mayyanadu	0.62836	Increasing
CHC Sooranadu	0.54191	Increasing
CHC Kallooppara	1.00000	Constant
CHC Kanjeetukara	1.00000	Constant
CHC Thumpamon	1.00000	Constant
CHC Elanthoor	1.00000	Constant
CHC Chathenkery	0.95335	Increasing
CHC Ranni	0.96591	Increasing
CHC Ezhumattoor	1.00000	Constant
CHC Enadimangalam	1.00000	Constant

CHC Vallana	1.00000	Constant
CHC Chittar	1.00000	Constant
CHC Thycattussery	0.71065	Increasing
CHC Champakkulam	1.00000	Constant
CHC Muhamma	0.94005	Decreasing
CHC Thannermukkam	1.00000	Constant
CHC Ambalapuzha	1.00000	Constant
CHC Muthukulam	1.00000	Constant
CHC Veliyanad	0.98941	Increasing
CHC Edathuva	0.98372	Increasing
CHC Pandanadu	0.80202	Increasing
CHC Mannar	0.92727	Increasing
CHC Kumarakam	1.00000	Constant
CHC Ullanadu	1.00000	Constant
CHC Edayazham	1.00000	Constant
CHC Edamaruku	1.00000	Constant
CHC Erumely	0.86228	Increasing
CHC Koodalloor	1.00000	Constant
CHC Paika	1.00000	Constant
CHC Vakathanam	1.00000	Constant
CHC Thalappady	1.00000	Constant
CHC Ayarkunnam	1.00000	Constant
CHC Chithirapuram	0.93447	Increasing
CHC Marayoor	1.00000	Constant
CHC Rajakkadu	1.00000	Constant
CHC Purapuzha	1.00000	Constant
CHC Upputhara	0.99046	Increasing
CHC Vandanmedu	1.00000	Constant
CHC Vandiperiyar	0.97787	Increasing
CHC Chithirapuram	1.00000	Constant
CHC Kanjikuzhy	0.97925	Increasing
CHC Muttom	1.00000	Constant

CHC Moothakunnam	1.00000	Constant
CHC Mulanthuruthy	1.00000	Constant
CHC Malipuram	1.00000	Constant
CHC Vengola	1.00000	Constant
CHC Varapetty	0.96241	Increasing
CHC Pampakuda	1.00000	Constant
CHC Ezhikkara	1.00000	Constant
CHC Kumbalangi	1.00000	Constant
CHC Varapuzha	1.00000	Constant
CHC Kalady	1.00000	Constant
CHC Mala	1.00000	Constant
CHC Kattor	0.93267	Decreasing
CHC Pazhayannur	0.83389	Increasing
CHC Valappad	1.00000	Constant
CHC Thriprayar	1.00000	Constant
CHC Anthikkad	1.00000	Constant
CHC Kadappuram	1.00000	Constant
CHC Ollur	1.00000	Constant
CHC Tholur	1.00000	Constant
CHC Mullassery	1.00000	Constant
CHC Kozhijampara	0.98149	Increasing
CHC Shornur	0.46639	Increasing
CHC Agali	1.00000	Constant
CHC Alenellur	0.91432	Increasing
CHC Chalissery	0.99769	Increasing
CHC Thrithala	0.87562	Increasing
CHC Cherpulasseri	1.00000	Constant
CHC Koduvayur	1.00000	Constant
CHC Kongad	1.00000	Constant
CHC Koppam	1.00000	Constant
CHC Peruvallur	0.87356	Increasing
CHC Urngattiri	1.00000	Constant

CHC Kallikavu	1.00000	Constant
CHC Vettom	1.00000	Constant
CHC Purathur	1.00000	Constant
CHC Vengara	1.00000	Constant
CHC Tanur	0.82639	Increasing
CHC Edappal	1.00000	Constant
CHC Neduva	0.90766	Increasing
CHC Omannur	0.64312	Increasing
CHC Koduvally	1.00000	Constant
CHC Ulliyeri	1.00000	Constant
CHC Orkatteri	1.00000	Constant
CHC Kunnummal	1.00000	Constant
CHC Mukkam	0.59821	Increasing
CHC Cheruvady	1.00000	Constant
CHC Narikkuni	0.84701	Increasing
CHC Meladi	1.00000	Constant
CHC Valayam	1.00000	Constant
CHC Olavanna	0.86832	Increasing
CHC Porunnanure	0.40142	Increasing
CHC Panamaram	0.56199	Increasing
CHC Peria	1.00000	Constant
CHC Meenangady	1.00000	Constant
CHC Thariyode	1.00000	Constant
CHC Pulapally	0.92642	Increasing
CHC Nalloornad	0.78960	Increasing
CHC Ambalavayal	1.00000	Constant
CHC Meppady	1.00000	Constant
CHC Tribal	1.00000	Constant
CHC Karivalloor	1.00000	Constant
CHC Mayyil	0.71589	Increasing
CHC Oduvallithuttu	0.48159	Increasing
CHC Iriveri	0.84781	Increasing

CHC Pappinissery	0.97803	Increasing
CHC Azhicode	1.00000	Constant
CHC Kootumugham	1.00000	Constant
CHC Keezpally	0.94316	Increasing
CHC Mattool	0.59930	Increasing
CHC Cheruvancherry	0.52539	Increasing
CHC Manjeswar	0.77467	Increasing
CHC Cheruvathur	0.48906	Increasing
CHC Periye	1.00000	Constant
CHC Badiadka	0.36407	Increasing
CHC Muliyar	1.00000	Constant
CHC Kumbla	1.00000	Constant
CHC Chattanchal	1.00000	Constant

The constant return to scale CHC's in Kerala is 88 whereas the increasing return to scale and decrease return to scale is 47 and 2 respectively.

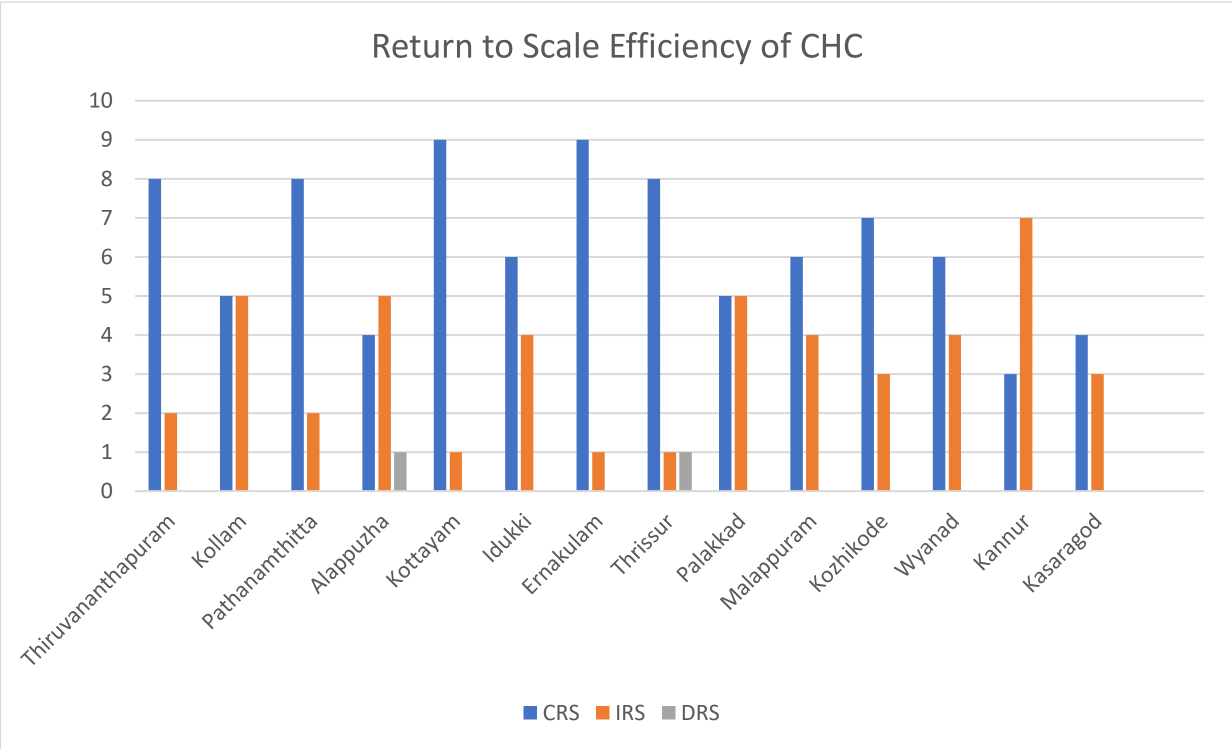


Fig 4.5: Return to Scale Efficiency of CHC

Out of selected CHC's in Kerala state, 88 CHC's are having zero slack. A slack is nothing but an inefficiency of an organization to perform its functions effectively with the available resources.

Fig: 4.6 Slacks in the selected CHC's of Kerala

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	1. CHC Palode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1. CHC Vakkom	0.00000	2.30071	2.01552	2.04256	0.00000	0.28519	68.73401	0.79132	0.00000	0.00000	107.68253	0.00000	1.80160	6.89495
3	1. CHC Vellanadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	1. CHC Vizhinjam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	1. CHC Pulluvilla	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	1. CHC Andoorkonam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	1. CHC Aryanad	0.00000	1.24227	0.00000	0.11031	2.20455	0.53028	11.03134	0.30406	0.00000	87.62280	0.00000	368.60192	26.94713	0.00000
8	1. CHC Vilappil	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	1. CHC Pallickal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	1. CHC Kesavapuram	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	2. CHC Anchal	0.00000	0.23299	3.80550	0.34948	1.12612	0.46598	34.94845	0.00000	0.00000	225.92231	0.00000	394.73594	12.50378	11.48247
12	2. CHC Kulakkada	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	2. CHC Mynagapally	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	2. CHC Nedumpana	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	2. CHC Oachira	0.00000	0.65647	0.02633	0.00000	0.00000	0.42477	0.00000	0.75125	0.00000	39.15080	0.00000	0.00000	10.90196	11.75872
16	2. CHC Nilamel	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	2. CHC Chavara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	2. CHC Kulathupuzha	4.49718	1.32163	0.00000	0.29981	1.36566	0.00000	26.96983	1.31967	0.00000	0.00000	0.00000	6.24283	7.84629	0.00000
19	2. CHC Mayyanadu	0.00000	1.34061	0.00000	0.00920	0.01839	0.54743	63.75601	0.36054	0.00000	109.11941	0.00000	153.63057	12.67457	0.00000
20	2. CHC Sooranadu	0.00000	0.00000	1.08382	0.00000	1.62574	0.00000	0.00000	1.62574	0.00000	5.41912	0.00000	237.01541	12.46398	7.26325

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	3.CHC Kallooppara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	3. CHC Kanjeetukara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	3. CHC Thumpamon	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	3. CHC Elanthoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	3. CHC Chathenkery	4.32656	0.00000	3.06531	1.65011	2.00933	0.05132	41.50943	3.24891	0.00000	299.94440	0.00000	143.15544	0.00000	0.00000
6	3. CHC Ranni	2.31818	0.77273	1.54545	0.57955	1.15909	0.19318	38.63636	0.00000	0.00000	0.00000	1171.54545	250.45455	0.00000	0.00000
7	3. CHC Ezhumattoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	3. CHC Enadimangalam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	3. CHC Vallana	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	3. CHC Chittar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	4. CHC Thycattussery	1.37869	0.10431	0.00000	0.78387	0.54365	0.63793	5.32666	1.03358	0.00000	122.86173	0.00000	0.00000	0.99505	0.00000
12	4. CHC Champakkulam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	4. CHC Muhamma	0.00000	0.85923	0.77840	0.81757	1.06598	0.61082	23.14221	1.81709	0.00000	0.00000	0.00000	0.00000	1.57891	19.87133
14	4. CHC Thannermukkam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	4. CHC Ambalapuzha	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	4. CHC Muthukulam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	4. CHC Veliyanad	1.27209	0.00000	0.84806	0.00000	0.00000	0.14134	16.96123	0.56537	0.00000	0.00000	0.00000	141.40542	16.96123	3.04261
18	4. CHC Edathuva	3.45349	0.70266	1.20498	0.70266	0.00000	0.11063	9.83723	0.31097	0.00000	124.44142	0.00000	86.07570	0.35886	0.00000
19	4. CHC Pandanadu	0.00000	0.00000	0.12266	0.74750	0.41411	0.57871	17.34055	1.03792	0.00000	212.68526	0.00000	0.00000	1.14079	0.00000
20	4.CHC Mannar	3.40000	0.61818	1.23636	1.39091	0.00000	0.15455	30.90909	1.70000	0.00000	0.00000	926.54545	20.45455	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	5. CHC Kumarakam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	5. CHC Ullanadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	5. CHC Edayazham	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	5. CHC Edamaruku	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	5. CHC Erumely	1.83402	0.54545	0.41045	0.36364	1.09091	0.00000	36.36364	1.77137	0.00000	49.80717	0.00000	0.00000	0.00000	2.32444
6	5. CHC Koodalloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	5. CHC paika	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	5. CHC Vakathanam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	5. CHC Thalappady	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	5. CHC Ayarkunnam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	6. CHC Chithirapuram	0.00000	0.16088	0.37539	0.16088	1.20261	0.05363	9.65290	0.26814	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	6. CHC Marayoor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	6. CHC Rajakkadu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	6. CHC Purapuzha	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	6. CHC Upputhara	2.54180	0.87249	0.00000	0.26709	0.31680	0.00000	32.73347	0.00000	0.00000	0.00000	0.00000	0.00000	7.00372	11.98580
16	6. CHC Vandanmedu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	6. CHC Vandiperiyar	5.11564	1.25372	2.25636	0.40139	1.10341	0.00000	68.96293	0.00000	0.00000	47.16897	345.69980	0.00000	10.51218	0.00000
18	6. CHC Chithirapuram	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	6. CHC Kanjikuzhy	1.31271	0.21879	1.05847	0.00000	0.66465	0.08751	0.00000	2.17729	0.00000	60.58544	636.51565	135.80272	0.00000	0.00000
20	6. CHC Muttom	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	7. CHC Moothakunnam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	7. CHC Mulanthuruthy	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	7. CHC Malipuram	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	7. CHC Vengola	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	7. CHC Varapetty	1.92482	0.00000	0.00000	0.96241	0.00000	0.00000	0.00000	1.96924	0.00000	0.00000	0.00000	0.00000	0.00000	11.50450
6	7. CHC Pampakuda	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	7. CHC Ezhikkara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	7. CHC Kumbalangi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	7. CHC Varapuzha	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	7. CHC Kalady	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	8. CHC Mala	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	8. CHC Kattor	0.00000	0.71203	1.10566	0.46885	2.32247	0.75299	31.84071	0.03090	0.00000	0.00000	0.00000	0.00000	19.49068	15.15167
13	8. CHC Pazhayannur	0.00000	0.82643	0.34532	0.00000	1.22456	0.42403	0.00000	0.83005	0.00000	53.35302	0.00000	0.00000	0.00000	21.17975
14	8. CHC Valappad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	8. CHC Thriprayar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	8. CHC Anthikkad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	8. CHC kadappuram	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	8. CHC Ollur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	8. CHC Tholur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	8. CHC Mullassery	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	9. CHC Kozhijampara	2.94447	2.20836	2.20836	0.00000	3.43522	0.00000	144.77000	7.36119	0.00000	177.64997	0.00000	0.27050	0.00000	17.17610
2	9. CHC Shornur	0.00000	0.18625	1.17414	0.48272	0.57356	0.07450	32.63204	1.69717	0.00000	54.29431	0.00000	0.00000	0.00000	9.86765
3	9. CHC Agali	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	9. CHC Alenellur	1.56568	0.60490	1.52338	0.00000	2.06313	0.16048	24.00865	1.92457	0.00000	0.00000	16.82961	0.00000	0.00000	0.00000
5	9. CHC Chalissery	5.45955	0.26763	0.87882	0.00000	2.06394	0.00000	36.90931	1.23541	0.00000	0.00000	386.17925	0.00000	0.00000	0.00000
6	9. CHC Thrithala	0.00000	0.55495	0.00000	0.00000	1.09178	0.79140	27.38240	1.16170	0.00000	80.04436	0.00000	78.08794	0.00000	0.00000
7	9. CHC Cherpulasseri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	9. CHC Koduvayur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	9. CHC Kongad	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	9. CHC Koppam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	10. CHC Peruvallur	0.08017	0.00000	0.55565	0.87356	0.23774	0.87356	0.00000	0.00000	0.00000	0.00000	642.25528	0.00000	0.00000	0.00000
12	10. CHC Urngattiri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	10. CHC Kallikavu	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	10. CHC Vettom	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	10. CHC Purathur	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	10. CHC Vengara	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	10. CHC Tanur	7.67658	1.04624	1.46933	0.27291	0.14121	0.00000	40.71217	0.43972	0.00000	118.88749	0.00000	0.00000	0.00000	0.00000
18	10. CHC Edappal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	10. CHC Neduva	7.21807	2.29077	0.00000	0.25933	0.00000	1.12377	100.70727	7.08841	0.00000	274.37328	748.07662	26.89980	0.00000	0.00000
20	10. CHC Omannur	0.00000	1.01958	0.56044	0.90233	0.21348	0.48387	71.72938	3.48465	0.00000	118.31085	32.35833	0.00000	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	11. CHC Koduvally	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	11. CHC Ulliyeri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	11. CHC Orkatteri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	11. CHC Kunnummal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	11. CHC Mukkam	0.89732	0.00000	0.00000	0.00000	0.29911	0.00000	14.95530	2.09374	0.00000	56.53104	0.00000	154.54646	10.46871	15.85262
6	11. CHC Cheruvady	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	11. CHC Narikkuni	5.70889	0.41589	0.00000	0.29057	1.24018	0.87547	12.76385	0.00000	0.00000	0.00000	0.00000	202.75720	12.72585	7.40532
8	11. CHC Meladi	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	11. CHC Valayam	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	11. CHC Olavanna	15.62970	0.86832	2.60495	2.60495	4.34158	0.00000	234.44554	1.73663	0.00000	0.00000	276.18317	0.00000	4.49802	11.70396
11	12. CHC Porunnanure	2.94929	0.00000	1.24276	0.18527	0.00000	0.22218	12.40305	1.78292	0.00000	79.15268	146.19489	0.00000	0.00000	0.00000
12	12. CHC Panamaram	3.93394	1.11979	2.42831	0.55990	1.30642	0.00000	46.55308	3.37195	0.00000	0.00000	154.51140	58.69646	7.99056	0.00000
13	12. CHC Peria	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	12. CHC Meenangady	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	12. CHC Thariyode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	12. CHC Pulapally	18.88588	0.00000	4.56889	1.09274	2.88236	1.25906	129.06674	6.55644	0.00000	167.23292	751.98599	0.00000	0.00000	7.49062
17	12. CHC Nalloornad	16.15583	0.00000	4.69030	0.14373	1.67562	0.28745	31.11097	5.59997	0.00000	70.76712	764.76271	0.00000	0.00000	3.88060
18	12. CHC Ambalavayal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	12. CHC Meppady	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	12. CHC Tribal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no of beds	no of doctors	no of nurses	no of services	no of paramedicals	no of adm staff	OPD working hours /month	specialized equipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	13. CHC Karivalloor	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	13. CHC Mayyil	0.71996	0.28799	0.43198	0.14399	0.28799	0.00000	7.19963	0.71589	0.00000	14.95339	0.00000	120.78012	0.00000	0.00000
3	13. CHC Oduvallithuttu	0.01515	0.00438	0.00539	0.00236	0.00303	0.00034	0.13463	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.26250
4	13. CHC Iriveri	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.84781	0.00000	0.00000	1123.31051	0.00000	0.00000	25.45117
5	13. CHC Pappinissery	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	208.32125	0.00000	415.15211	0.00000	30.31906
6	13. CHC Azhicode	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	13. CHC Kootumugham	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	13. CHC Keezpally	0.00000	0.00000	0.37168	0.00000	0.37168	0.00000	0.00000	0.94316	0.00000	0.00000	760.44534	0.00000	0.00000	0.00000
9	13. CHC Mattool	0.00000	0.00000	0.21239	0.00000	0.21239	0.00000	0.00000	0.59930	0.00000	0.00000	269.20825	0.00000	0.00000	0.00000
10	13. CHC Cheruvancherry	0.15212	0.00000	0.03651	0.00608	0.03042	0.01217	0.91272	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.60638
11	14. CHC Manjeswar	3.87333	0.77467	0.77467	0.77467	0.77467	0.77467	38.73330	0.00000	0.00000	302.89438	0.00000	370.16877	0.00000	24.01464
12	14. CHC Cheruvathur	0.91699	0.18340	0.00000	0.30566	0.18340	0.42793	12.22657	2.20078	0.00000	142.50065	1694.71838	0.00000	0.00000	17.05606
13	14. CHC Periye	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	14. CHC Badiadka	1.39243	0.00000	0.23268	0.01201	0.22067	0.02402	1.80131	0.31674	0.00000	19.64703	0.00000	0.00000	0.00000	0.00000
15	14. CHC Muliyar	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	14. CHC Kumbla	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	14. CHC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

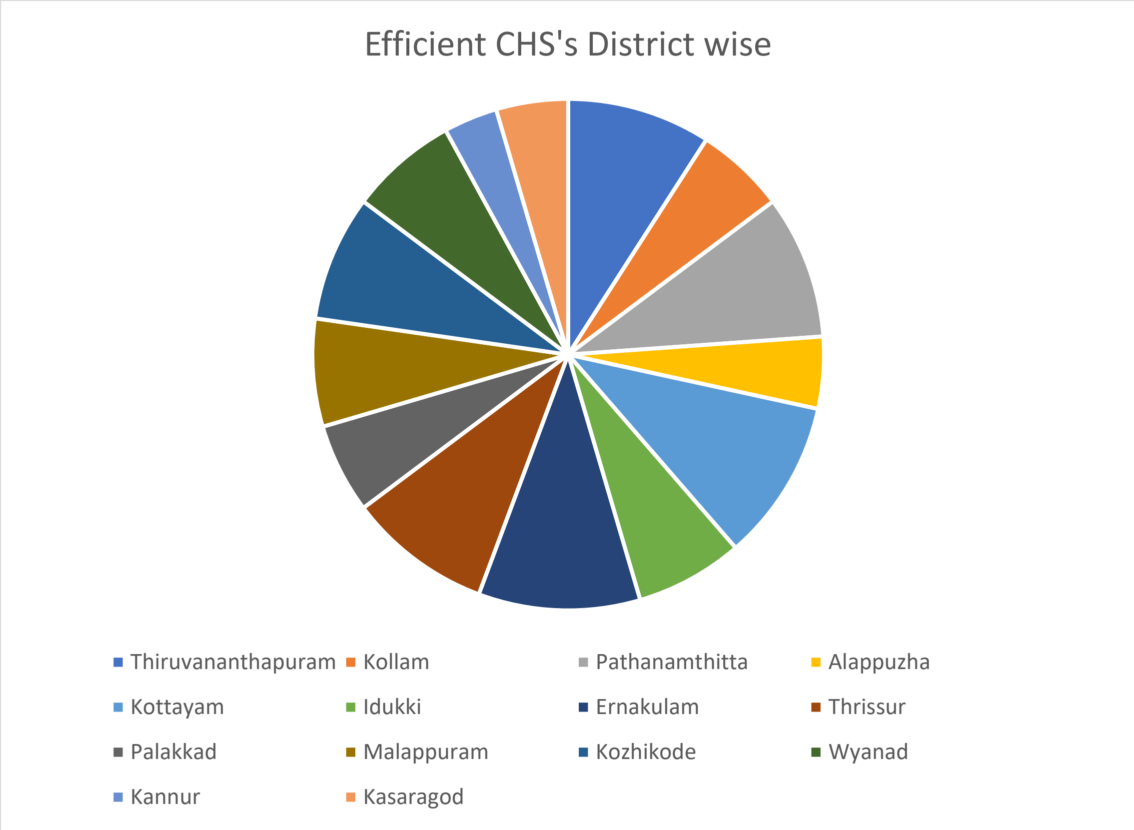


Fig 4.7: Efficiency of CHC's District wise

Table 4.4 District wise efficient CHC's in Kerala

Districts	CHC
Thiruvananthapuram	Palode, Vellanadu, Vizhinjam, Pulluvilla, Andoorkonam, Vilappil, Pallickal, Kesavapuram
Kollam	Kulakkada, Mynagapally, Nedumpana, Nilamel, Chavara,
Pathanamthitta	Kallooppara, Kanjeetukara, Thumpamon, Elanthoor, Ezhumattoor,
Alappuzha	Champakkulam, Thannermukkam, Ambalapuzha, Muthukulam
Kottayam	Kumarakam, Ullanadu, Edayazham, Edamaruku, Koodalloor, Paika, Vakathanam, Thalappady, Ayarkunnam
Idukki	Marayoor, Rajakkadu, Purapuzha, Vandenmedu, Chithirapuram, Muttom

Ernakulam	Moothakunnam, Malanthuruthy, Malipuram, Vengola, Pampakuda, Ezhikkara, Kumbalangi, Varapuzha, Kalady
Thrissur	Mala, Valappad, Thriprayar, Anthikkad, Kadappuram, Ollur, Tholur, Mullassery
Palakkad	Agali, Cherpulasseri, Koduvayur, Kongad, Koppam
Malappuram	Urngathiri, Kallikavu, Vettom, Purathur, Vengara, Edappal
Kozhikode	Koduvally, Ulliyeri, Orkatteri, Kunnummal, Cheruvady, Meladi, Valayam
Wyanad	Peria, Meenangady, Thariyode, Ambalavayal, Meppady, Tribal
Kannur	Karivalloor, Azhikode, Kootumugham
Kasaragod	Periya, Muliyar, Kumbla, Chattanchal

These are the CHC's that are efficiently working in the state of Kerala. The listed CHC's are having no slacks, and these are working efficiently working with the available inputs.

The highest degree of slack is shown by the CHC are the OPD working hours, paramedical staffs and special equipment's used. The number of nurses also contribute to the slack score. The least input slack shown by the CHC is the number of beds. When focusing on output slack's inpatient services like admissions and deliveries are offering more amount of slacks when compared with the out patient services.

4.5.3 Efficiency and Slack Of Sub Centre

Each DMU number corresponds to the name of that sub centre. Reliable sub centre name have been mentioned at the bottom of the table.

Table 4.5: Efficiency Score Of Sub Centre

DMU Name	Input Oriented CRS Efficiency	RTS
4	1.00000	Constant
13	0.92272	Increasing
22	1.00000	Constant
25	0.98471	Increasing
29	1.00000	Constant
43	1.00000	Constant
46	1.00000	Constant
55	0.72695	Increasing
76	0.91078	Increasing
81	0.87354	Increasing
83	0.98904	Increasing
93	1.00000	Constant
100	0.91416	Increasing
107	1.00000	Constant
111	0.98887	Increasing
125	0.73395	Increasing
133	0.84232	Increasing
153	1.00000	Constant
178	1.00000	Constant
185	0.91869	Increasing
199	0.69466	Increasing
203	0.98733	Increasing
234	1.00000	Constant
266	0.82639	Increasing
342	0.95641	Increasing
419	0.97965	Increasing
539	1.00000	Constant
578	1.00000	Constant
618	0.97704	Increasing
635	1.00000	Constant

656	1.00000	Constant
676	0.93590	Increasing
698	1.00000	Constant
708	0.88841	Increasing
711	0.77409	Increasing
723	0.70140	Increasing
749	1.00000	Constant
766	1.00000	Constant
789	1.00000	Constant
791	1.00000	Constant
799	0.64429	Increasing
801	0.84329	Increasing
823	0.74443	Increasing
833	1.00000	Constant
838	0.63869	Increasing
840	0.68591	Increasing
865	1.00000	Constant
877	1.00000	Constant
885	0.62508	Increasing
893	0.67296	Increasing
897	0.96054	Increasing
899	1.00000	Constant
909	0.80750	Increasing
928	0.88056	Increasing
929	0.60697	Increasing
938	0.75408	Increasing
941	0.71100	Increasing
947	1.00000	Constant
948	0.88056	Increasing
952	0.81717	Increasing
961	1.00000	Constant
968	0.79594	Increasing

984	1.00000	Constant
988	0.87486	Increasing
991	0.95630	Increasing
999	0.65848	Increasing
1027	1.00000	Constant
1032	0.87081	Increasing
1056	0.93803	Increasing
1076	0.90455	Decreasing
1083	0.93671	Increasing
1090	0.76109	Increasing
1093	0.79539	Increasing
1099	1.00000	Constant
1126	0.85410	Increasing
1134	0.82315	Increasing
1145	0.84875	Increasing
1164	1.00000	Constant
1175	1.00000	Constant
1190	0.90177	Increasing
1223	1.00000	Constant
1246	0.91660	Increasing
1276	0.92106	Increasing
1287	0.80067	Increasing
1290	1.00000	Constant
1293	0.87058	Increasing
1320	1.00000	Constant
1334	0.90398	Increasing
1348	1.00000	Constant
1357	0.68541	Increasing
1366	0.83730	Increasing
1378	0.93435	Increasing
1383	0.74005	Increasing
1388	1.00000	Constant

1390	0.89399	Increasing
1393	0.96169	Increasing
1437	1.00000	Constant
1465	0.68274	Increasing
1476	0.91294	Increasing
1498	0.57081	Increasing
1499	0.71407	Increasing
1500	1.00000	Constant
1523	0.50349	Increasing
1525	1.00000	Constant
1539	0.91920	Increasing
1545	0.75843	Increasing
1556	0.68259	Increasing
1568	1.00000	Constant
1573	0.77038	Increasing
1577	1.00000	Constant
1589	0.87935	Increasing
1590	0.86646	Increasing
1632	0.71427	Increasing
1653	0.80647	Increasing
1668	0.96875	Increasing
1678	0.90387	Increasing
1688	0.72225	Increasing
1693	1.00000	Constant
1714	1.00000	Constant
1724	0.73387	Increasing
1734	0.80485	Increasing
1754	0.90931	Increasing
1766	0.84331	Increasing
1777	0.88746	Increasing
1789	0.89030	Increasing
1799	1.00000	Constant

1823	1.00000	Constant
1834	0.80877	Increasing
1845	0.74015	Increasing
1866	1.00000	Constant
1875	0.91393	Increasing
1898	0.86130	Increasing
1922	0.89882	Increasing
1928	0.94485	Increasing
1930	0.59362	Increasing
1938	0.72553	Increasing
1944	0.71939	Increasing
1957	0.96306	Increasing
1968	1.00000	Constant
1990	0.98140	Increasing
1998	1.00000	Constant
1999	0.85842	Increasing
2017	1.00000	Constant
2029	0.58321	Increasing
2038	0.96153	Increasing
2045	0.87628	Increasing
2067	0.79603	Increasing
2078	0.74340	Increasing
2093	1.00000	Constant
2099	1.00000	Constant
2110	1.00000	Constant
2145	0.78125	Increasing
2156	0.97273	Increasing
2159	0.82453	Increasing
2163	1.00000	Constant
2169	0.96875	Increasing
2176	0.92771	Increasing
2184	0.80810	Increasing

2190	0.90722	Increasing
2232	1.00000	Constant
2256	0.95889	Increasing
2258	0.81150	Increasing
2276	0.91818	Increasing
2298	0.70374	Increasing
2333	1.00000	Constant
2354	0.66027	Increasing
2367	1.00000	Constant
2398	1.00000	Constant
2407	0.76195	Increasing
2412	0.87812	Increasing
2419	1.00000	Constant
2423	0.91020	Increasing
2434	0.89893	Increasing
2476	1.00000	Constant
2489	1.00000	Constant
2490	0.81434	Increasing
2501	0.77299	Increasing
2534	1.00000	Constant
2556	1.00000	Constant
2567	0.93257	Increasing
2568	0.78510	Increasing
2570	0.71054	Increasing
2572	0.58525	Increasing
2593	0.88967	Increasing
2628	0.78647	Increasing
2635	0.85795	Increasing
2642	0.79150	Increasing
2656	0.81735	Increasing
2662	0.75880	Increasing
2672	1.00000	Constant

2689	1.00000	Constant
2691	1.00000	Constant
2710	0.55514	Increasing
2726	0.89642	Increasing
2738	0.92653	Increasing
2762	0.69986	Increasing
2789	0.74062	Increasing
2792	0.88503	Increasing
2799	0.91375	Increasing
2810	1.00000	Constant
2832	0.66156	Increasing
2845	0.98726	Increasing
2856	0.66201	Increasing
2947	0.66388	Increasing
2983	0.83972	Increasing
2990	1.00000	Constant
3001	1.00000	Constant
3003	0.59048	Increasing
3027	0.83198	Increasing
3048	0.72155	Increasing
3059	0.99334	Increasing
3087	0.71791	Increasing
3098	0.79552	Increasing
3112	1.00000	Constant
3126	1.00000	Constant
3178	0.72760	Increasing
3198	0.58359	Increasing
3199	0.57895	Increasing
3213	1.00000	Constant
3218	0.61199	Increasing
3257	0.91205	Increasing
3276	0.92032	Increasing

3283	1.00000	Constant
3289	1.00000	Constant
3313	1.00000	Constant
3323	0.70133	Increasing
3333	0.89853	Increasing
3356	0.81700	Increasing
3367	1.00000	Constant
3378	1.00000	Constant
3389	0.82693	Increasing
3390	1.00000	Constant
3423	0.86003	Increasing
3445	0.72752	Increasing
3457	0.72142	Increasing
3510	1.00000	Constant
3566	0.77220	Increasing
3673	0.83632	Increasing
3698	1.00000	Constant
3724	0.85286	Increasing
3743	0.78066	Increasing
3764	0.63477	Increasing
3784	0.90731	Increasing
3799	0.74576	Increasing
3822	0.71370	Increasing
3843	0.72609	Increasing
3857	1.00000	Constant
3889	0.61372	Increasing
3924	0.73285	Increasing
3945	0.92746	Increasing
3964	0.92866	Increasing
3977	1.00000	Constant
3982	0.79130	Increasing
3991	1.00000	Constant

4004	1.00000	Constant
4009	0.68749	Increasing
4023	0.87434	Increasing
4045	0.49324	Increasing
4075	0.92689	Increasing
4081	0.78913	Increasing
4098	0.79739	Increasing
4110	0.91235	Increasing
4143	0.84981	Increasing
4154	0.87013	Increasing
4187	0.83932	Increasing
4190	1.00000	Constant
4222	0.73867	Increasing
4234	0.85351	Increasing
4254	0.90235	Increasing
4267	1.00000	Constant
4287	0.73362	Increasing
4292	0.80822	Increasing
4300	0.97529	Increasing
4324	0.88052	Increasing
4345	0.75719	Increasing
4356	0.55265	Increasing
4367	1.00000	Constant
4376	0.78877	Increasing
4387	0.93668	Increasing
4389	1.00000	Constant
4424	0.76461	Increasing
4434	0.90994	Increasing
4445	0.68027	Increasing
4467	1.00000	Constant
4475	0.75017	Increasing
4483	0.53503	Increasing

4489	1.00000	Constant
4491	1.00000	Constant
4512	1.00000	Constant
4520	0.85118	Increasing
4555	0.98192	Increasing
4567	0.66468	Increasing
4576	0.87944	Increasing
4583	0.83312	Increasing
4581	0.71584	Increasing
4588	0.78829	Increasing
4590	1.00000	Constant
4610	0.65379	Increasing
4622	0.83312	Increasing
4632	0.66257	Increasing
4633	0.89322	Increasing
4646	0.65397	Increasing
4656	1.00000	Constant
4673	0.77825	Increasing
4688	0.96849	Increasing
4690	0.60842	Increasing
4699	0.87115	Increasing
4705	0.65021	Increasing
4712	0.96484	Increasing
4723	1.00000	Constant
4729	0.81722	Increasing
4734	0.71314	Increasing
4736	0.67901	Increasing
4744	0.66875	Increasing
4749	1.00000	Constant
4750	0.59518	Increasing
4755	0.83112	Increasing
4781	1.00000	Constant

4799	1.00000	Constant
4803	1.00000	Constant
4820	0.73254	Increasing
4828	0.74945	Increasing
4832	1.00000	Constant
4839	0.75228	Increasing
4841	0.77844	Increasing
4848	0.90046	Increasing
4859	1.00000	Constant
4862	1.00000	Constant
4870	0.55203	Increasing
4881	0.88563	Increasing
4883	0.93827	Increasing
4890	0.86107	Increasing
4910	0.68645	Increasing
4932	1.00000	Constant
4943	0.88570	Increasing
4954	0.82851	Increasing
4958	0.76485	Increasing
4960	0.86744	Increasing
4968	0.89306	Increasing
4980	1.00000	Constant
4989	0.73792	Increasing
4997	1.00000	Constant
5000	0.77537	Increasing
5012	0.83222	Increasing
5046	0.96071	Increasing
5067	1.00000	Constant
5099	0.95516	Increasing
5113	1.00000	Constant
5152	0.78232	Increasing
5171	1.00000	Constant

5184	1.00000	Constant
5189	0.95760	Increasing
5205	0.78188	Increasing
5211	0.80342	Increasing
5245	0.88821	Increasing
5256	1.00000	Constant
5276	0.81246	Increasing
5288	0.88805	Increasing
5298	0.98271	Increasing
5311	1.00000	Constant
5325	1.00000	Constant
5335	1.00000	Constant
5356	1.00000	Constant
5378	1.00000	Constant
5380	1.00000	Constant
5387	0.88423	Increasing
5399	0.72759	Increasing
5410	1.00000	Constant

The constant return to scale Sub centre's in Kerala is 112 whereas the increasing return to scale and decrease return to scale is 250 and 1 respectively.

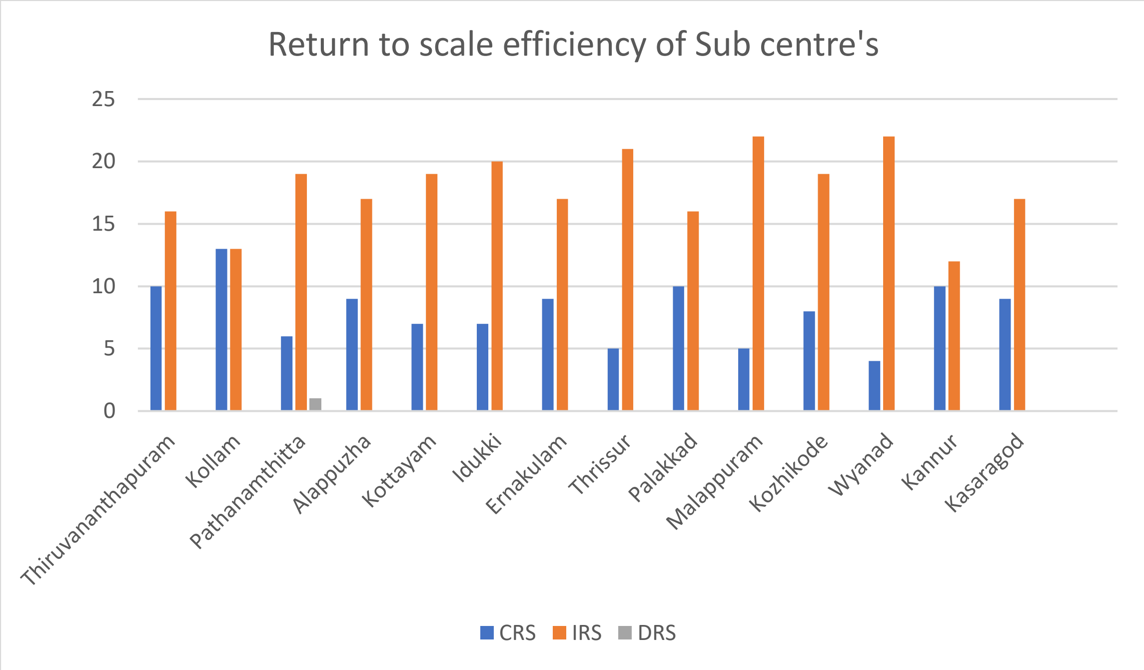


Fig 4.8: Return to Scale Efficiency of Sub Centre

Fig 4.9: Slacks in the selected Sub Centre's of Kerala

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	25	0.00000	0.00000	0.00000	38.61468	104.58716	0.00000	10.49541
5	29	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	43	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	46	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	55	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	76	0.00000	0.00000	0.00000	0.00000	42.26955	0.00000	0.81017
10	81	0.00000	0.00000	0.87354	0.00000	0.00000	0.00000	0.00000
11	83	0.00000	0.00000	0.00000	11.03177	0.00000	189.08573	0.00000
12	93	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	100	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	107	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	111	0.00000	0.00000	0.00000	0.00000	2.65982	0.00000	0.00000
16	125	0.00000	0.00000	0.73395	0.00000	0.00000	0.00000	0.00000
17	133	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.25671
18	153	0.00000	0.00000	0.00000	56.00000	211.00000	0.00000	21.00000
19	178	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	185	0.00000	0.00000	0.00000	8.83940	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	199	0.00000	0.00000	0.69466	0.00000	0.00000	101.82493	2.69026
2	203	0.00000	0.00000	0.00000	0.00000	71.37604	0.00000	0.00000
3	234	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	266	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	342	0.00000	0.00000	0.00000	27.71808	0.00000	0.00000	5.20508
6	419	0.00000	0.00000	0.00000	18.39706	143.44945	0.00000	0.00000
7	539	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	578	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	618	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	635	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	656	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	676	0.00000	0.00000	0.00000	5.50861	100.68776	0.00000	0.00000
13	698	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	708	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	711	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	723	0.00000	0.00000	0.00000	0.00000	19.04508	25.03991	0.00000
17	749	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	766	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	789	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	791	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	799	0.00000	0.00000	0.00000	0.00000	0.00000	11.12977	0.00000
2	801	0.00000	0.00000	0.00000	0.00000	0.00000	110.98386	0.00000
3	823	0.00000	0.00000	0.00000	0.00000	0.00000	88.98709	3.98115
4	833	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	838	0.00000	0.00000	0.00000	0.00000	0.00000	51.89085	0.00000
6	840	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	9.54647
7	865	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	877	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	885	0.00000	0.00000	0.00000	0.00000	0.00000	63.36458	0.00000
10	893	0.00000	0.00000	0.00000	0.00000	0.00000	105.65137	13.24446
11	897	0.00000	0.00000	0.00000	0.00000	0.00000	445.94717	0.00000
12	899	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	909	0.00000	0.00000	0.00000	0.00000	0.00000	50.47593	0.00000
14	928	0.00000	0.00000	0.00000	0.00000	0.00000	240.19608	6.93497
15	929	0.00000	0.00000	0.00000	22.88592	0.00000	0.00000	0.00000
16	938	0.00000	0.00000	0.00000	0.00000	0.00000	20.19817	0.00000
17	941	0.00000	0.00000	0.00000	0.00000	132.20937	0.00000	0.00000
18	947	1.00000	0.00000	2.00000	0.00000	623.26087	0.00000	10.60870
19	948	0.00000	0.00000	0.00000	0.00000	0.00000	222.19608	16.93497
20	952	0.00000	0.00000	0.00000	0.00000	44.26413	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	961	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	968	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	7.88100
3	984	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	988	0.00000	0.00000	0.00000	0.00000	6.99506	0.00000	0.00000
5	991	0.00000	0.95630	0.00000	0.00000	0.00000	0.00000	0.00000
6	999	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	1027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	1032	0.00000	0.00000	0.00000	0.00000	9.66184	0.00000	3.98136
9	1056	0.00000	0.00000	0.00000	16.99807	0.00000	0.00000	0.00000
10	1076	0.00000	0.00000	1.35683	133.20456	0.00000	26.02010	0.00000
11	1083	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	1090	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	1093	0.00000	0.00000	0.00000	0.00000	114.98880	0.00000	0.00000
14	1099	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	1126	0.00000	0.00000	0.00000	0.00000	42.37386	163.00304	0.00000
16	1134	0.00000	0.00000	0.00000	0.00000	35.57621	0.00000	7.40680
17	1145	0.00000	0.00000	0.00000	5.64227	0.00000	0.00000	0.00000
18	1164	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	1175	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	1190	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	no.of nurses	no.of trained health personals	no.of subordinate staffs	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	1223	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1246	0.00000	0.00000	0.00000	27.07116	39.51096	0.00000	0.00000
3	1276	0.00000	0.00000	0.00000	0.00000	0.00000	32.64435	0.00000
4	1287	0.00000	0.00000	0.00000	0.00000	89.97600	0.00000	0.00000
5	1290	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	1293	0.00000	0.00000	0.00000	0.00000	185.20824	0.00000	0.00000
7	1320	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	1334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	1348	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	1357	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	1366	0.00000	0.00000	0.00000	0.00000	0.00000	18.69854	0.00000
12	1378	0.00000	0.00000	0.00000	42.10071	0.00000	0.00000	0.00000
13	1383	0.00000	0.00000	1.48010	0.00000	0.00000	130.75684	0.00000
14	1388	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	1390	0.00000	0.00000	0.00000	0.00000	104.75193	0.00000	0.00000
16	1393	0.00000	0.00000	0.00000	7.41606	172.72023	0.00000	0.00000
17	1437	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	1465	0.00000	0.00000	0.00000	0.00000	99.69518	0.00000	0.00000
19	1476	0.00000	0.00000	0.00000	3.67686	0.00000	330.31168	0.00000
20	1498	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	no.of nurses	no.of trained health personals	no.of subordinate staffs	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	1499	0.00000	0.00000	0.00000	0.00000	0.00000	156.78851	0.00000
2	1500	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	1523	0.00000	0.00000	0.00000	0.00000	0.00000	29.41072	0.00000
4	1525	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	1539	0.00000	0.00000	0.00000	0.00000	0.00000	154.34213	0.00000
6	1545	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	1556	0.00000	0.00000	0.00000	32.16039	0.00000	0.00000	0.96430
8	1568	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	1573	0.00000	0.00000	0.00000	0.00000	0.00000	27.05133	0.00000
10	1577	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	1589	0.00000	0.00000	0.00000	148.94764	0.00000	0.00000	0.28697
12	1590	0.00000	0.00000	0.00000	0.00000	0.00000	82.87131	0.00000
13	1632	0.00000	0.00000	0.00000	0.00000	0.00000	59.83566	0.00000
14	1653	0.00000	0.00000	0.00000	0.00000	0.00000	54.38452	0.00000
15	1668	0.00000	0.00000	0.00000	0.00000	218.85759	204.63291	0.00000
16	1678	0.00000	0.00000	0.00000	45.49726	82.46210	0.00000	0.00000
17	1688	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.93326
18	1693	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	1714	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	1724	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	5.71347

		Input Slacks			Output Slacks			
DMU No.	DMU Name	no.of nurses	no.of trained health personals	no.of subordinate staffs	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	1734	0.00000	0.80485	0.00000	0.00000	0.00000	0.00000	4.82026
2	1754	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	5.87920
3	1766	0.00000	0.00000	0.84331	0.00000	0.00000	0.00000	0.81889
4	1777	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.80513
5	1789	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	4.74973
6	1799	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	1823	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	1834	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	16.19838
9	1845	0.00000	0.00000	0.00000	3.26267	0.00000	16.06045	0.00000
10	1866	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	1875	0.00000	0.00000	0.00000	0.00000	0.00000	216.44814	0.00000
12	1898	0.00000	0.00000	0.00000	0.00000	4.76547	0.00000	20.24487
13	1922	0.00000	0.00000	1.79764	0.00000	0.00000	0.00000	0.00000
14	1928	0.00000	0.00000	0.00000	0.00000	0.00000	42.25831	0.00000
15	1930	0.59362	0.00000	0.89043	18.00622	0.00000	0.00000	0.00000
16	1938	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.91688
17	1944	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.64086
18	1957	0.00000	0.00000	0.00000	0.00000	263.88525	72.61684	0.00000
19	1968	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	1990	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	16.52906

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	1998	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1999	0.00000	0.00000	0.00000	0.00000	113.14478	0.00000	0.00000
3	2017	0.00000	0.00000	0.00000	14.00000	275.00000	388.00000	0.00000
4	2029	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	2038	0.00000	0.00000	0.00000	8.88943	0.00000	232.09497	0.00000
6	2045	0.00000	0.00000	0.00000	0.00000	162.91542	0.00000	0.00000
7	2067	0.00000	0.00000	0.00000	0.00000	0.00000	7.40144	0.00000
8	2078	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	2093	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	2099	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	2110	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	2145	0.00000	0.00000	0.00000	6.87500	10.34375	117.25000	0.00000
13	2156	0.00000	0.00000	0.00000	0.00000	188.38938	0.00000	0.00000
14	2159	0.00000	0.00000	0.00000	0.00000	74.71994	0.00000	0.00000
15	2163	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	2169	0.00000	0.00000	0.00000	35.12500	297.90625	231.75000	0.00000
17	2176	0.00000	0.00000	0.00000	0.00000	0.00000	48.04652	0.00000
18	2184	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.70456
19	2190	0.00000	0.00000	0.00000	1.11536	0.00000	0.00000	5.40649
20	2232	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	2256	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	9.24400
2	2258	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	2276	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	2298	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	2333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	2354	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	2367	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	2398	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	2407	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	2412	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	2419	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	2423	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3.70708
13	2434	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	2476	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	2489	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	2490	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	9.31051
17	2501	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	2534	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	2556	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	2567	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	2568	0.00000	0.00000	0.00000	15.71901	127.10923	0.00000	0.00000
2	2570	0.71054	0.00000	1.42108	0.00000	53.14941	0.00000	0.00000
3	2572	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	2593	0.00000	0.00000	0.00000	22.29264	74.50008	0.00000	0.00000
5	2628	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	2635	0.00000	0.00000	0.00000	0.00000	76.62210	0.00000	0.00000
7	2642	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	2656	0.00000	0.00000	0.00000	0.00000	86.53650	0.00000	0.00000
9	2662	0.00000	0.00000	0.00000	37.68095	0.00000	41.38672	0.00000
10	2672	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	2689	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	2691	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	2710	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	2726	0.00000	0.00000	0.89642	0.00000	0.00000	214.64461	6.41719
15	2738	0.00000	0.00000	0.00000	32.29510	61.35950	0.00000	0.00000
16	2762	0.00000	0.00000	0.00000	0.00000	31.00302	0.00000	9.33800
17	2789	0.00000	0.00000	0.00000	0.00000	0.00000	13.91817	0.00000
18	2792	0.00000	0.00000	0.00000	7.81098	0.00000	0.00000	0.00000
19	2799	0.00000	0.00000	0.00000	18.12904	0.00000	0.00000	0.00000
20	2810	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	2832	0.00000	0.00000	0.00000	0.00000	0.00000	71.63404	0.00000
2	2845	0.00000	0.00000	0.00000	7.24597	0.00000	99.53265	0.00000
3	2856	0.00000	0.00000	0.00000	14.90049	0.00000	274.48907	0.00000
4	2947	0.00000	0.00000	0.00000	106.42697	0.00000	0.00000	3.55780
5	2983	0.00000	0.00000	0.00000	4.06942	0.00000	99.80143	0.00000
6	2990	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	3001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	3003	0.00000	0.00000	0.00000	0.00000	0.00000	45.87496	2.58102
9	3027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	3048	0.00000	0.00000	0.00000	0.00000	18.64040	0.00000	0.00000
11	3059	0.00000	0.00000	0.00000	39.42927	0.00000	273.65106	0.00000
12	3087	0.00000	0.00000	0.00000	0.00000	0.00000	0.44245	0.00000
13	3098	0.00000	0.00000	0.79552	0.00000	0.00000	230.12888	0.00000
14	3112	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	3126	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	3178	0.00000	0.00000	0.00000	0.00000	0.00000	118.80954	0.00000
17	3198	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3.10791
18	3199	0.00000	0.00000	0.00000	0.00000	48.86981	0.00000	0.00000
19	3213	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	3218	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3.98576

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	3257	0.00000	0.00000	0.00000	5.27010	0.00000	287.23396	0.00000
2	3276	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	3283	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	3289	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	3313	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	3323	0.00000	0.00000	0.00000	0.00000	0.00000	61.03503	0.00000
7	3333	0.00000	0.00000	0.00000	0.00000	0.00000	84.62269	0.00000
8	3356	0.00000	0.00000	0.00000	0.00000	0.00000	11.55602	0.00000
9	3367	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	3378	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	3389	0.00000	0.00000	0.00000	0.00000	0.00000	192.11264	0.00000
12	3390	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	3423	0.00000	0.00000	0.00000	0.00000	0.00000	178.83829	0.00000
14	3445	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.67509
15	3457	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	2.66943
16	3510	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	3566	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	8.02258
18	3673	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	3698	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	3724	0.00000	0.00000	0.00000	26.65211	0.00000	140.60306	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	3743	0.00000	0.00000	0.00000	0.00000	151.16447	0.00000	0.00000
2	3764	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	3784	0.90731	0.00000	0.90731	0.00000	243.96026	196.22151	0.00000
4	3799	0.00000	0.00000	0.00000	0.00000	19.43534	0.00000	2.61016
5	3822	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	13.87941
6	3843	0.00000	0.00000	0.00000	0.00000	230.50708	0.00000	0.00000
7	3857	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	3889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	3924	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	10.02866
10	3945	0.00000	0.00000	0.00000	0.00000	24.30993	0.00000	0.00000
11	3964	0.00000	0.00000	0.00000	0.00000	0.00000	12.70898	19.34903
12	3977	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	3982	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	10.18160
14	3991	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	4004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	4009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	4023	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	7.08097
18	4045	0.00000	0.00000	0.00000	0.00000	31.42285	0.00000	4.27676
19	4075	0.00000	0.00000	0.00000	0.00000	0.00000	6.37552	20.68512
20	4081	0.00000	0.00000	1.57826	0.00000	86.77614	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	4098	0.00000	0.00000	0.00000	0.00000	95.60979	0.00000	10.40696
2	4110	0.00000	0.00000	0.00000	0.00000	131.74748	94.37262	0.00000
3	4143	0.00000	0.00000	0.00000	0.00000	140.62783	0.00000	0.00000
4	4154	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.66699
5	4187	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	5.53495
6	4190	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	4222	0.73867	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	4234	0.00000	0.00000	0.00000	0.00000	71.33010	250.64510	0.00000
9	4254	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	4267	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	4287	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	4292	0.00000	0.00000	0.80822	0.00000	0.00000	5.39259	0.00000
13	4300	0.00000	0.00000	0.00000	0.00000	154.23200	143.16356	0.00000
14	4324	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	4345	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3.62399
16	4356	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	4367	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	4376	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	9.63857
19	4387	0.00000	0.00000	0.00000	5.44765	0.00000	0.00000	3.29027
20	4389	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	4424	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	4434	0.00000	0.00000	0.00000	0.00000	0.00000	9.93675	0.00000
3	4445	0.00000	0.00000	0.00000	0.00000	0.00000	21.67630	0.00000
4	4467	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	4475	0.00000	0.00000	0.00000	8.84667	0.00000	0.00000	0.00000
6	4483	0.00000	0.00000	0.00000	0.00000	0.00000	84.16347	1.42491
7	4489	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	4491	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	4512	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	4520	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	10.70826
11	4555	0.00000	0.00000	0.00000	34.94246	0.00000	173.89432	0.00000
12	4567	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	4576	0.00000	0.00000	0.00000	0.00000	0.00000	36.89374	0.00000
14	4583	0.00000	0.00000	0.00000	17.45860	0.00000	242.54268	4.65987
15	4581	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	4588	0.78829	0.00000	0.26468	0.00000	0.00000	286.60214	0.00000
17	4590	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	4610	0.00000	0.00000	0.00000	0.00000	55.64603	60.21956	0.00000
19	4622	0.00000	0.00000	0.00000	6.45860	0.00000	132.54268	14.65987
20	4632	0.00000	0.00000	0.00000	1.60466	0.00000	0.00000	0.00000

		Input Slacks			Output Slacks			
DMU No.	DMU Name	*no.of nurses*	*no.of trained health personals*	*no.of subordinate staffs*	minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	4633	0.00000	0.00000	0.00000	0.00000	100.93680	0.00000	0.00000
2	4646	0.00000	0.00000	0.00000	0.00000	0.00000	0.79427	4.96126
3	4656	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	4673	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	4688	0.00000	0.00000	0.00000	0.00000	0.00000	212.61218	0.00000
6	4690	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	4699	0.00000	0.00000	0.00000	0.00000	0.00000	23.25789	0.00000
8	4705	0.00000	0.00000	0.00000	0.00000	0.00000	126.73662	0.00000
9	4712	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	4723	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	4729	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	4734	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	4736	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	4744	0.00000	0.00000	0.00000	0.00000	17.52604	0.00000	0.00000
15	4749	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	4750	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	4755	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	9.05179
18	4781	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	4799	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	4803	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	4820	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	4828	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	4832	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	4839	0.00000	0.00000	0.00000	0.00000	61.38815	23.56473	0.00000
5	4841	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	4848	0.00000	0.00000	0.00000	0.00000	74.86343	294.90278	10.51157
7	4859	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	4862	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	4870	0.55203	0.00000	1.10405	0.00000	0.00000	0.00000	1.27154
10	4881	0.00000	0.00000	0.00000	16.16457	0.00000	0.00000	0.00000
11	4883	0.00000	0.00000	0.00000	36.97014	0.00000	55.46205	0.00000
12	4890	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.94152
13	4910	0.00000	0.00000	0.68645	0.00000	0.00000	17.58701	0.00000
14	4932	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	4943	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	4.21359
16	4954	0.00000	0.00000	0.00000	0.00000	10.13235	0.00000	0.00000
17	4958	0.00000	0.00000	0.00000	21.06540	0.00000	0.00000	0.00000
18	4960	0.00000	0.00000	0.00000	0.00000	213.68931	44.66591	0.00000
19	4968	0.00000	0.00000	0.00000	0.00000	0.00000	346.30395	0.00000
20	4980	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	4989	0.00000	0.00000	0.00000	0.00000	0.00000	10.38354	0.00000
2	4997	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	5000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	4.69959
4	5012	0.00000	0.00000	0.17445	0.00000	0.00000	211.81987	3.83876
5	5046	0.00000	0.00000	0.00000	0.00000	0.00000	23.12057	0.00000
6	5067	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	5099	0.00000	0.00000	0.00000	0.00000	0.00000	59.19551	6.24843
8	5113	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	5152	0.00000	0.00000	0.00000	0.00000	0.00000	76.56730	0.64238
10	5171	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	5184	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	5189	0.00000	0.00000	0.00000	0.00000	0.00000	41.92586	0.00000
13	5205	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	5211	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	11.07697
15	5245	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	5256	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	5276	0.00000	0.00000	0.00000	0.00000	0.00000	118.31491	2.67344
18	5288	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	13.17364
19	5298	0.00000	0.00000	0.00000	0.72473	0.00000	0.00000	0.00000
20	5311	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of nurses	no.of trained health personals	no.of subordinate staffs	Output Slacks minor procedures/y	antenatal&postnatal care/y	immunization/y	health education/y
1	5325	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	5335	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	5356	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	5378	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	5380	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	5387	0.00000	0.00000	0.00000	31.45154	0.00000	0.00000	3.47953
7	5399	0.00000	0.00000	0.00000	0.00000	0.00000	29.45913	4.09245
8	5410	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

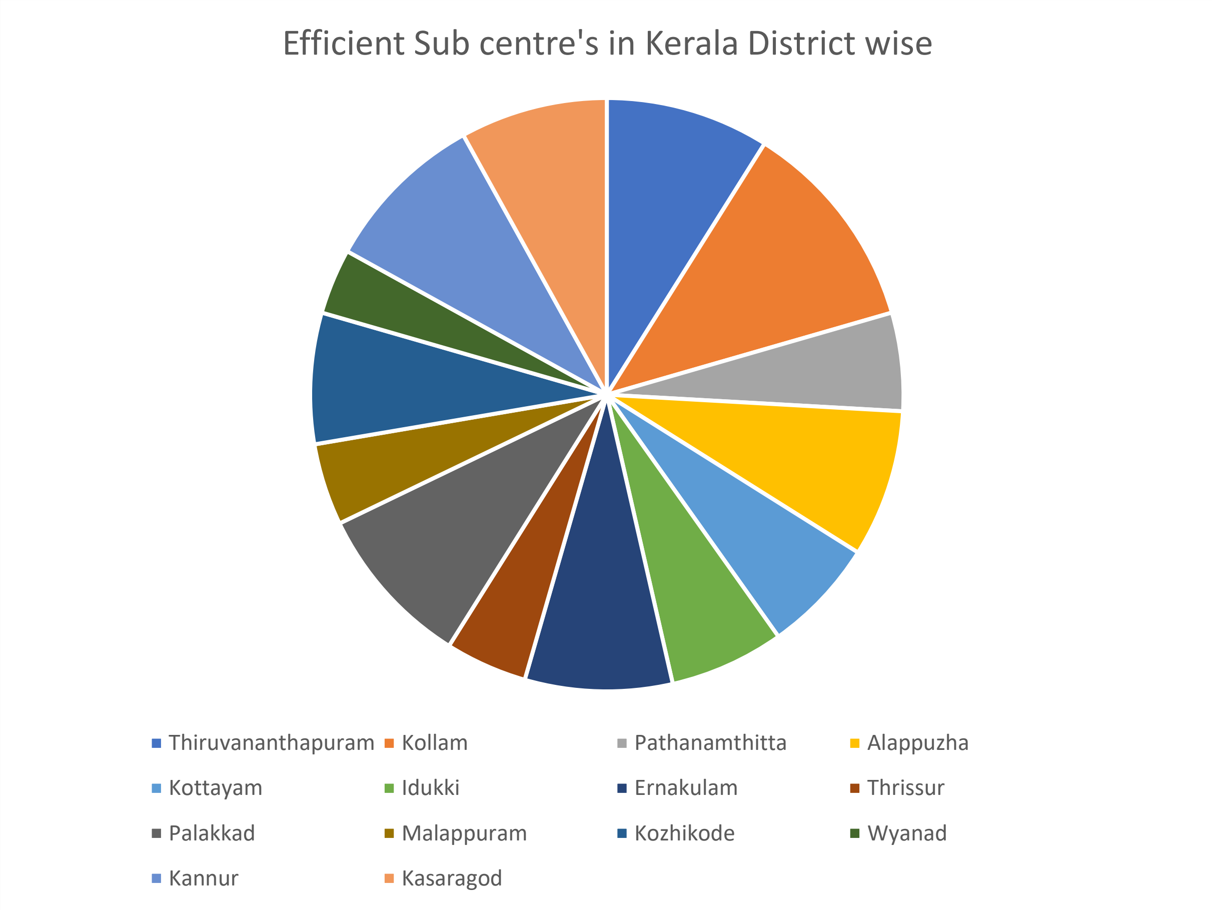


Fig 4.10: Efficiency of Sub Centre's District wise

Table 4.6: District wise efficient Sub Centre's in Kerala

Districts	Sub Centre's
Thiruvananthapuram	Mambally, Maruthummodu, Pappanamcode, Pancode, Erayamcode, Kappamvila, Main centre, Chilambara, Vazhichal, Chani
Kollam	Kovoor, Palathara, Vellappare, Panayam, Bharatheepuram, Vadakkumbhagam, Punnala, Pathazhy, Methukummel, Manjakkala, Kadapuzha, Kilikollor, Maruthady.
Pathanamthitta	Kadapra, Chirayiramb. Main Centre, Vellayil, Mundappally
Alappuzha	Kudapuram, Konattussery, Kanjipadam, Nazarath, Karikuzhy, Vettuveni, Krishnapuram, Venmony East, Madapariyararam

Kottayam	Neendoor, Main Centre, Koruthodu, Amara, Rubber Board, Poovakkulam, Thekkummury.
Idukki	Elamdesam, Peringassery, Kuzhikandam, Kalvary Mount, Murikkattukudy, Kannampady, Melezhuthu.
Ernakulam	Puthenvelikara, Ponjassery, Ponnarimangalam, Adivadu, Mangalathuthazham, Main Centre, Karukappilly, Mannamthuruth, Veliyathunad.
Thrissur	Main Centre, Chirangara, Koonnor, Ollur, Vatanapilly.
Palakkad	Vilayur, Main Centre, Payyalore, Kunissery, Puthucode, Kalapetty, Konnaram, Thadukassery, Sharakovil, Palathara
Malappuram	Chelloor, Koopa, Panangattur, Kallingapparamba, Cholappuram
Kozhikode	Kadalundi, Kayappanachy, Kariyathankavu, Sarkar Paramba, Kollam, Malapuram, Engappuzha, Areekad.
Wyanad	Karimbil, Kolagappara, Chundale, Mannalam.
Kannur	Palayam, Moozhikara, Perumachery, Kaivelikkal, Vadakkumpad, Azhikode, Kunnumkai, Kakkad, Main Centre, Muringodi.
Kasaragod	Main Centre, Panthahady, Prantherkavu, Arikady, Kizhoor, Alampady, Narkilakkad, Padinharekkara, Vorkady.

The district of Kollam in the Kerala state holds maximum number of slack efficient sub centre's followed by the districts like Thiruvananthapuram, Palakkad and Kannur. Ironically there is only one DRS sub centre identified among the sample population. Majority of the main centre sub centre's are slack efficient.

4.6 ANALYSIS OF SECONDARY HEALTH CARE

4.6.1 Efficiency And Slack Of Government Hospitals

Table 4.7: Efficiency Score Of Government Hospitals

DMU Name	Input – Oriented CRS Efficiency	RTS
GH1 TVM	1.00000	Constant
GH2 TVM	1.00000	Constant
DH 1 TVM	1.00000	Constant
DH 2 TVM	1.00000	Constant
THQH 1 TVM	1.00000	Constant
THQH 2 TVM	1.00000	Constant
THQH 3 TVM	1.00000	Constant
TH 1 TVM	0.88581	Increasing
TH 2 TVM	1.00000	Constant
TH 3 TVM	1.00000	Constant
TH 4 TVM	0.93744	Increasing
TH 5 TVM	0.96585	Increasing
DH 1 KLM	0.96424	Increasing
THQH 1 KLM	1.00000	Constant
THQH 2 KLM	1.00000	Constant
THQH 3 KLM	0.53461	Increasing
THQH 4 KLM	0.99906	Decreasing
THQH 5 KLM	1.00000	Constant
TH 1 KLM	1.00000	Constant
TH 2 KLM	1.00000	Constant
TH 3 KLM	0.99800	Decreasing
TH 4 KLM	0.87900	Decreasing
GH 1 PTM	0.92900	Decreasing
GH 2 PTM	1.00000	Constant
DH 1 PTM	0.99170	Decreasing
THQH 1 PTM	1.00000	Constant
THQH 2 PTM	0.99484	Decreasing
THQH 3 PTM	0.89584	Decreasing
THQH 4 PTM	0.95885	Decreasing

GH 1 ALP	0.92032	Decreasing
DH 1 ALP	0.94041	Increasing
DH 2 ALP	1.00000	Constant
THQH 1 ALP	0.93970	Decreasing
THQH 2 ALP	1.00000	Constant
THQH 3 ALP	0.97129	Decreasing
THQH 4 ALP	1.00000	Constant
TH 1 ALP	0.51447	Increasing
TH 2 ALP	0.66993	Increasing
GH 1 KTM	1.00000	Constant
GH 2 KTM	1.00000	Constant
GH 3 KTM	1.00000	Constant
GH 4 KTM	0.99837	Decreasing
THQH 1 KTM	0.99723	Decreasing
THQH 2 KTM	0.99384	Decreasing
THQH 3 KTM	0.99484	Increasing
DH 1 IDK	0.99484	Increasing
DH 2 IDK	1.00000	Constant
THQH 1 IDK	0.89485	Decreasing
THQH 2 IDK	0.99586	Increasing
THQH 3 IDK	0.88698	Increasing
THQH 4 IDK	1.00000	Increasing
GH 1 EKM	1.00000	Constant
GH 2 EKM	1.00000	Constant
DH 1 EKM	1.00000	Constant
THQH 1 EKM	0.96240	Increasing
THQH 2 EKM	0.93747	Increasing
THQH 3 EKM	0.89838	Increasing
THQH 4 EKM	0.88474	Increasing
TH 1 EKM	0.99388	Increasing
TH 2 EKM	0.89433	Decreasing
TH 3 EKM	0.46595	Increasing

TH 4 EKM	0.35497	Increasing
TH 5 EKM	0.56785	Increasing
TH 6 EKM	0.83764	Increasing
GH 1 TSR	1.00000	Constant
GH 2 TSR	0.84907	Decreasing
DH 1 TSR	0.96804	Increasing
THQH 1 TSR	0.92579	Increasing
THQH 2 TSR	1.00000	Constant
THQH 3 TSR	1.00000	Constant
TH 1 TSR	1.00000	Constant
TH 2 TSR	1.00000	Constant
TH 3 TSR	1.00000	Constant
DH 1 PKD	1.00000	Constant
THQH 1 PKD	1.00000	Constant
THQH 2 PKD	0.75477	Decreasing
THQH 3 PKD	0.79793	Decreasing
THQH 4 PKD	0.77684	Decreasing
THQH 5 PKD	0.73336	Increasing
TH 1 PKD	0.92325	Increasing
DH 1 MPM	1.00000	Constant
DH 2 MPM	1.00000	Constant
DH 3 MPM	0.89298	Decreasing
THQH 1 MPM	0.83528	Decreasing
THQH 2 MPM	0.83522	Decreasing
THQH 3 MPM	0.93363	Decreasing
THQH 4 MPM	1.00000	Constant
TH 1 MPM	1.00000	Constant
TH 2 MPM	1.00000	Constant
TH 3 MPM	0.80542	Decreasing
GH 1 KKD	1.00000	Constant
DH 1 KKD	1.00000	Constant
THQH 1 KKD	0.89861	Decreasing

TH 1 KKD	0.57540	Increasing
TH 2 KKD	1.00000	Constant
TH 3 KKD	1.00000	Constant
TH 4 KKD	0.38052	Increasing
TH 5 KKD	0.26124	Increasing
TH 6 KKD	0.46260	Increasing
GH 1 WYD	0.37164	Increasing
DH 1 WYD	0.94775	Decreasing
THQH 1 WYD	0.75586	Decreasing
THQH 2 WYD	0.86734	Decreasing
GH 1 KNR	0.98038	Decreasing
DH 1 KNR	1.00000	Constant
THQH 1 KNR	0.87935	Decreasing
TH 1 KNR	1.00000	Constant
TH 2 KNR	0.89599	Decreasing
TH 3 KNR	0.72202	Increasing
TH 4 KNR	1.00000	Constant
TH 5 KNR	0.66584	Increasing
TH 6 KNR	0.98879	Increasing
TH 7 KNR	0.77240	Increasing
TH 8 KNR	0.74184	Increasing
GH 1 KSD	1.00000	Constant
DH 1 KSD	0.93884	Increasing
THQH 1 KSD	0.98377	Decreasing
THQH 2 KSD	0.88938	Increasing
THQH 3 KSD	0.82928	Increasing
THQH 4 KSD	0.75155	Increasing
TH 1 KSD	0.89726	Increasing

The constant return to scale in Government secondary care hospitals in the state of Kerala is 47 whereas the increase and decrease return to scale is 41 and 33 respectively.

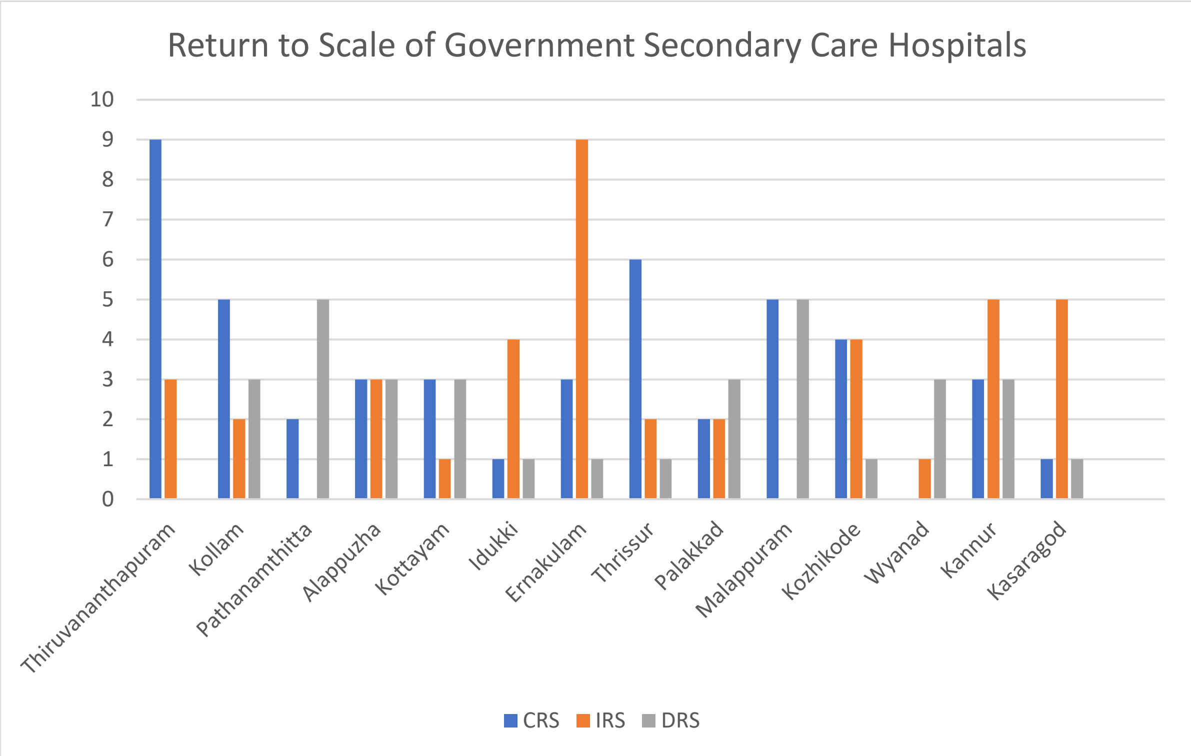


Fig 4.11: Return to Scale Efficiency of Government secondary care hospitals

Fig: 4.12: Slacks In The Government Secondary Care Hospitals Of Kerala

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	GH1 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	GH2 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	DH 1 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	DH 2 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	THQH 1 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	THQH 2 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	THQH 3 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	TH 1 TVM	10.06664	5.78956	5.93256	1.21554	1.69661	16.86781	127.25949	0.00000	0.00000	0.00000	0.00000	0.00000	73.38833	19.63352
9	TH 2 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	TH 3 TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	TH 4 TVM	0.00000	3.48099	1.62989	1.77328	6.05664	3.49541	535.89160	0.00000	0.00000	5374.35529	0.00000	1396.83625	389.63702	0.00000
12	TH 5 TVM	0.56539	6.72076	3.04385	1.30059	16.07419	4.73024	1058.56466	0.00000	0.00000	0.00000	19023.47033	610.89735	727.84368	0.00000
13	DH 1 KLM	0.00000	5.71662	17.70582	1.53107	38.08994	35.74608	2015.63060	34.03653	0.40077	0.00000	0.00000	203.03073	0.00000	68.30389
14	THQH 1 KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	THQH 2 KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	THQH 3 KLM	4.41062	0.69696	1.47979	0.79241	2.99773	3.97148	80.19951	2.48228	0.00000	0.00000	0.00000	188.42210	42.90883	15.32117
17	THQH 4 KLM	5.18107	3.57257	0.00000	0.08891	1.46012	0.55757	353.79796	16.72703	11.49836	0.00000	0.00000	0.00000	0.00000	46.91946
18	THQH 5 KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	TH 1 KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	TH 2 KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks										Output Slacks			
		no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	TH 3 KLM	0.00000	0.00000	12.99382	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	224.48847
2	TH 4 KLM	0.00000	1.11332	0.00000	0.00000	0.00000	3.33843	564.49948	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	23.32422
3	GH 1 PTM	0.00000	0.00000	21.93831	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	42.42422	0.00000
4	GH 2 PTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	DH 1 PTM	60.51335	6.74741	0.00000	0.07433	31.39090	60.46726	982.42550	47.26275	0.00000	0.00000	0.00000	0.00000	0.00000	559.20819
6	THQH 1 PTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	THQH 2 PTM	0.00000	0.00000	11.32892	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	THQH 3 PTM	0.00000	0.00000	10.38822	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	THQH 4 PTM	0.00000	9.39932	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.22847	0.00000
10	GH 1 ALP	8.40114	15.62599	21.79441	0.00000	18.24626	90.60767	1026.41547	42.88421	36.59708	128.27404	0.00000	0.00000	0.00000	0.00000
11	DH 1 ALP	62.37002	6.62952	7.69640	6.31940	12.58044	112.12211	1065.96013	55.51931	55.25525	0.00000	0.00000	0.00000	0.00000	34.03429
12	DH 2 ALP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	THQH 1 ALP	86.89086	21.01899	22.10535	4.73668	41.39187	78.22975	2267.46281	25.89051	40.12139	0.00000	0.00000	0.00000	0.00000	246.62036
14	THQH 2 ALP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	THQH 3 ALP	16.99786	18.22627	24.93341	0.00000	24.21999	23.60300	2256.00085	22.76579	0.00000	0.00000	0.00000	0.00000	0.00000	331.48383
16	THQH 4 ALP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	TH 1 ALP	1.14764	1.88817	4.78301	0.48426	2.08126	0.00000	242.07660	12.99049	0.00000	0.00000	0.00000	0.00000	52.73529	125.96950
18	TH 2 ALP	1.76808	1.45328	2.25862	0.00000	2.26254	0.00000	175.44618	14.07518	0.00000	1.82079	0.00000	0.00000	52.37900	98.12392
19	GH 1 KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	GH 2 KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks										Output Slacks			
		no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	GH 3 KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	GH 4 KTM	22.78876	0.00000	1.99879	8.88765	0.00000	0.00000	0.00000	4.99876	0.00000	0.00000	0.00000	0.00000	67.99877	0.00000
3	THQH 1 KTM	44.34738	5.64706	1.35379	0.00000	2.35518	38.11687	0.00000	18.04567	0.00000	0.00000	0.00000	0.00000	194.40911	0.00000
4	THQH 2 KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	THQH 3 KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	DH 1 IDK	0.00000	3.88978	7.88976	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	DH 2 IDK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	THQH 1 IDK	0.00000	0.00000	3.88976	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	78.99768	0.00000
9	THQH 2 IDK	0.00000	8.66757	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	43.89897	0.00000
10	THQH 3 IDK	0.00000	0.00000	6.88977	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	6.99896
11	THQH 4 IDK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	GH 1 EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	GH 2 EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	DH 1 EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	THQH 1 EKM	61.58439	3.63070	0.00000	7.67263	9.67711	69.44741	0.00000	44.05781	18.50314	0.00000	0.00000	326.94732	0.00000	0.00000
16	THQH 2 EKM	0.00000	6.99787	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	THQH 3 EKM	0.00000	0.00000	7.98876	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	THQH 4 EKM	0.00000	7.99887	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	TH 1 EKM	0.00000	0.00000	6.89887	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	TH 2 EKM	93.78511	2.01129	2.84842	4.67044	0.00000	94.78245	0.00000	57.33563	0.00000	115.09107	97785.14582	0.00000	1.89397	0.00000

DMU No.	DMU Name	Input Slacks										Output Slacks			
		no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	TH 3 EKM	5.29438	0.55112	2.03743	2.60266	2.43855	0.00000	10.13116	0.00000	0.00000	1571.01698	0.00000	0.00000	58.58096	83.05519
2	TH 4 EKM	7.04849	0.60081	1.43846	1.50922	1.33540	1.63542	0.00000	0.00000	0.00000	1043.71844	0.00000	121.83488	0.00000	69.99173
3	TH 5 EKM	17.65104	0.38890	2.55055	0.51774	5.15120	0.00000	55.35335	0.00000	0.00000	1896.61093	0.00000	558.79401	87.71174	326.60824
4	TH 6 EKM	13.45473	2.62075	4.89115	2.79288	8.43625	0.00000	450.75218	0.00000	0.00000	3461.18993	0.00000	1413.89981	71.25276	259.25278
5	GH 1 TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	GH 2 TSR	27.52397	4.26483	0.00000	0.94144	0.00000	29.22239	702.64147	0.00000	33.85784	386.10412	0.00000	6384.08834	0.00000	88.28025
7	DH 1 TSR	0.00000	1.54651	1.15811	0.00000	4.71256	0.98679	164.29804	0.00000	0.00000	14.96806	0.00000	3885.83869	108.30261	0.00000
8	THQH 1 TSR	16.25515	7.25566	9.98935	8.00435	11.85211	0.00000	906.51500	0.00000	0.00000	1867.73322	141277.18538	677.00380	0.00000	60.76379
9	THQH 2 TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	THQH 3 TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	TH 1 TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	TH 2 TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	TH 3 TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	DH 1 PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	THQH 1 PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	THQH 2 PKD	0.00000	8.84687	12.65980	2.76986	17.74121	3.12341	1191.93657	0.00000	0.00000	10677.56245	53392.57357	0.00000	0.00000	9.22973
17	THQH 3 PKD	9.31424	21.76129	18.21842	2.37387	15.59906	0.00000	3061.35843	0.00000	0.00000	15626.54366	10423.48393	0.00000	402.58170	0.00000
18	THQH 4 PKD	0.00000	9.90467	11.51532	0.00000	12.18094	0.19349	1358.02433	0.00000	0.00000	6367.97969	427002.29316	0.00000	291.32012	92.52293
19	THQH 5 PKD	16.19562	1.07091	3.16085	5.52765	0.00000	12.07592	172.55614	0.00000	0.00000	4415.99309	5542.59471	0.00000	212.50464	0.00000
20	TH 1 PKD	4.28139	0.84250	4.12871	3.89398	8.66489	6.31711	0.00000	0.00000	0.00000	2561.22991	15038.70811	0.00000	191.40836	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	DH 1 MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	DH 2 MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	DH 3 MPM	28.37634	6.17188	16.64475	4.22460	20.49291	9.51048	0.00000	0.00000	0.00000	0.00000	837920.97068	5745.40677	0.00000	0.00000
4	THQH 1 MPM	20.90027	1.25461	19.27504	4.02752	2.00360	16.11676	0.00000	0.00000	0.00000	4081.83329	301549.34738	0.00000	894.54381	0.00000
5	THQH 2 MPM	32.15190	2.14263	15.19635	1.58786	5.71591	17.12492	0.00000	0.00000	0.00000	3707.10354	717928.00059	0.00000	145.94375	0.00000
6	THQH 3 MPM	30.12841	25.51074	34.59468	0.00000	35.20028	21.87716	4499.07499	0.00000	0.00000	3924.59131	1903801.04163	0.00000	370.68681	227.14081
7	THQH 4 MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	TH 1 MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	TH 2 MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	TH 3 MPM	4.76172	4.91218	0.05753	1.85866	0.00000	0.00000	596.98467	8.18697	0.00000	1141.91352	607117.52161	0.00000	597.47938	350.59106
11	GH 1 KKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	DH 1 KKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	THQH 1 KKD	30.67244	2.12189	10.13850	0.00000	11.19220	0.00000	508.50976	0.00000	0.00000	5920.23459	1486689.88448	11964.09299	976.44738	0.00000
14	TH 1 KKD	4.46779	1.86158	4.14625	1.11695	5.65243	4.87395	299.54510	0.00000	0.00000	130.25981	0.00000	1820.53429	361.45460	263.07798
15	TH 2 KKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	TH 3 KKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	TH 4 KKD	6.64450	0.00000	0.00000	2.57584	0.40979	5.82492	7.31773	3.42470	0.00000	4807.54609	627165.48752	0.00000	387.61646	163.64473
18	TH 5 KKD	2.57865	0.00000	1.06601	0.91011	0.89326	0.87640	10.53371	0.00000	0.00000	1866.88118	328509.22517	0.00000	262.27538	126.80207
19	TH 6 KKD	21.04980	0.81185	8.66378	4.72709	9.00690	14.32526	0.00000	0.00000	0.00000	6865.38230	588634.44916	0.00000	321.64507	154.52947
20	GH 1 WYD	41.13024	0.00000	14.39911	0.01727	4.35092	26.38526	90.00200	0.00000	0.00000	2492.21751	147655.59144	1803.62075	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	DH 1 WYD	0.00000	20.29485	11.39484	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	273.93884	0.00000
2	THQH 1 WYD	0.00000	29.28293	10.38470	0.00000	19.28842	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	22.39498
3	THQH 2 WYD	0.00000	19.48850	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	127.28833	0.00000	0.00000	0.00000
4	GH 1 KNR	119.88716	21.73175	11.99304	0.00000	12.59205	80.45823	2908.19322	164.05656	48.58521	13654.73152	0.00000	0.00000	2031.20492	871.94630
5	DH 1 KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	THQH 1 KNR	2.60337	3.04339	0.00000	0.00000	2.46836	9.94294	480.27780	7.33076	0.00000	0.00000	23191.04427	0.00000	611.75735	778.12763
7	TH 1 KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	TH 2 KNR	0.47736	1.93983	11.29398	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	142.02093	0.00000	0.00000
9	TH 3 KNR	0.51012	0.00000	0.48741	1.29296	1.41255	1.26139	2.70781	0.00000	0.00000	0.00000	0.00000	211.25410	26.90188	2.72769
10	TH 4 KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	TH 5 KNR	2.77890	0.00000	0.82591	0.00000	3.43182	2.17886	34.59678	0.00000	0.00000	1262.68400	16596.77142	0.00000	27.19747	0.00000
12	TH 6 KNR	0.00000	0.00000	27.38922	0.00000	0.00000	0.00000	0.00000	11.20298	0.00000	0.00000	0.00000	122.29373	0.00000	0.00000
13	TH 7 KNR	20.34250	3.33674	0.00000	0.15722	2.92840	0.00000	483.74150	21.25117	11.31480	0.00000	0.00000	0.00000	868.26294	482.40145
14	TH 8 KNR	6.43189	0.16895	12.96865	0.00000	15.55539	4.13063	0.00000	9.36431	14.95337	4854.83264	0.00000	2247.19376	1200.88607	615.20803
15	GH 1 KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	DH 1 KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	THQH 1 KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	THQH 2 KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	THQH 3 KSD	0.00000	0.00000	25.29383	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3627.22837	0.00000	0.00000	0.00000
2	THQH 4 KSD	0.00000	72.28372	0.00000	0.00000	0.00000	0.00000	0.00000	1.50311	0.00000	0.00000	3977.57764	0.00000	0.00000	311.78882
3	TH 1 KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	2291.29938	0.00000	0.00000	0.00000

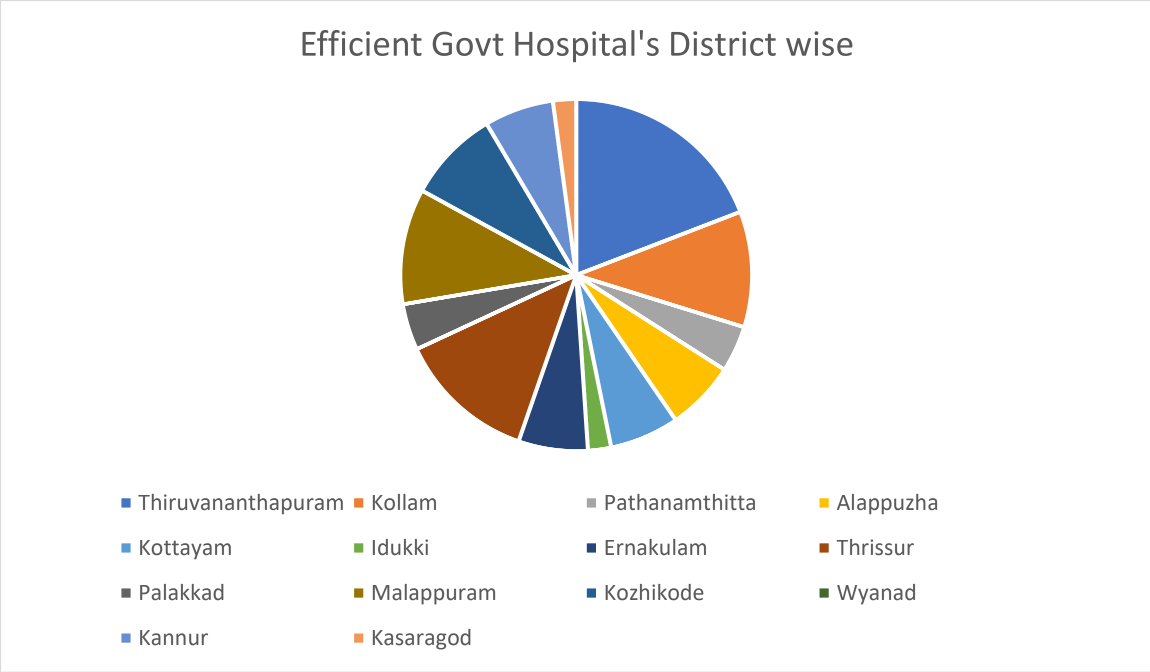


Fig: 4.13: Efficiency of Government hospital's District wise

The majority of the slack efficient government hospitals are present in the capital city of Kerala, that is the Thiruvanathapuram with 9 hospitals, followed by the Thrissur district with 6. The Malappuram and the Kollam districts bag the third place with 5 efficient hospitals followed by the Kozhikode district with 4 efficient hospitals. The next position is shared by the districts of Alappuzha, Kottayam, Ernakulam and Kannur with 3 zero slack hospitals. The Pathanamthitta and the Palakkad districts are having 2 efficient hospitals whereas Kasaragod is having only 1. The district of Wyanad is not even having a single slack efficient hospital in its district.

4.6.2 Efficiency and Slack Of Private Hospitals

Table 4.8: Efficiency Score Of Private Hospitals

DMU Name	Input – Oriented CRS Efficiency	RTS
A.J H TVM	1.00000	Constant
ANATHAPURI H TVM	1.00000	Constant
COSMOPOLITIAN H TVM	1.00000	Constant
KIMS TVM	1.00000	Constant
JUBILEE MEMORIAL H TVM	1.00000	Constant
LORDS H TVM	1.00000	Constant
NIMS TVM	1.00000	Constant
S.P FORT TVM	1.00000	Constant
S.U.T TVM	1.00000	Constant
SANTHWANA TVM	1.00000	Constant
P.R.S TVM	1.00000	Constant
GITANJALI TVM	1.00000	Constant
ASHTAMUDI KLM	1.00000	Constant
UPASANA KLM	0.74932	Increasing
N.S KLM	0.86149	Decreasing
NAIR'S KLM	0.62975	Increasing
BISHOP BENZIGER KLM	1.00000	Constant
MEDIRTINA KLM	1.00000	Constant
SANKAR'S KLM	1.00000	Constant
HOLLYCROSS KLM	1.00000	Constant
CHRISTIAN MISSION PTM	1.00000	Constant
PAYYANIL PTM	0.92214	Decreasing
MUTHOOT PTM	0.98091	Decreasing
DEEPA ALP	0.98808	Increasing
HUDA TRUST ALP	1.00000	Constant
JOSCO ALP	0.96499	Increasing
MEDICAL TRUST ALP	1.00000	Constant

K.V.M ALP	1.00000	Constant
S.N MEMO ALP	0.88576	Increasing
MAHA JUBILEE MEM ALP	0.84741	Increasing
M.G.D.M KTM	1.00000	Constant
SH MED CENTRE KTM	1.00000	Constant
CARITAS KTM	1.00000	Constant
CHERUPUSHPAM KTM	1.00000	Constant
BHARAT KTM	0.96182	Decreasing
MATHA KTM	1.00000	Constant
ST THOMAS KTM	1.00000	Constant
ST MARYS KTM	1.00000	Constant
KIMS KTM	1.00000	Constant
ARCHANA IDK	1.00000	Constant
CHAZHIKKATU IDK	1.00000	Constant
MEDICAL TRUST IDK	0.96813	Increasing
MORNING STAR MED MISSION IDK	1.00000	Constant
ST JOHN IDK	1.00000	Constant
ASTER EKM	1.00000	Constant
RAJAGIRI EKM	1.00000	Constant
KAROTHUKUZHUI EKM	1.00000	Constant
CITY EKM	1.00000	Constant
COCHIN PORT EKM	1.00000	Constant
EMC EKM	0.74211	Increasing
LAKESHORE EKM	1.00000	Constant
LISSIE EKM	1.00000	Constant
LF EKM	1.00000	Constant
LOURDE EKM	1.00000	Constant
GOUTHAM EKM	1.00000	Constant
MEDICAL TRUST EKM	1.00000	Constant
IG Co-OP EKM	1.00000	Constant
M.A.J EKM	1.00000	Constant
VIJAYA EKM	0.87630	Decreasing

ASWINI TSR	0.89474	Decreasing
ANZAR TSR	1.00000	Constant
IRIJALAKUDA Co-OP TSR	0.96103	Decreasing
S.H TSR	0.68923	Decreasing
KURUNA TSR	1.00000	Constant
OUR TSR	0.99864	Decreasing
MOTHER TSR	0.84630	Decreasing
CRESENT PKD	1.00000	Constant
THANGAM PKD	1.00000	Constant
MOTHER CARE PKD	1.00000	Constant
RG Co-OP PKD	1.00000	Constant
WELCARE PKD	1.00000	Constant
SAI PKD	1.00000	Constant
LAKSHMI PKD	1.00000	Constant
PMSA Co-OP MPM	1.00000	Constant
KURINNIKATTIL MPM	1.00000	Constant
M.K.H MPM	1.00000	Constant
AL SHIFA MPM	0.89884	Decreasing
MERCY MPM	1.00000	Constant
DAYA MPM	0.95369	Decreasing
WALTZ MPM	1.00000	Constant
TIRUR Co OP MPM	1.00000	Constant
NIMS MPM	1.00000	Constant
MOULANA MPM	1.00000	Constant
MIMS CLT	1.00000	Constant
BMH CLT	0.87670	Decreasing
FATHIMA CLT	0.79671	Increasing
IQRAA CLT	1.00000	Constant
NIRMALA CLT	1.00000	Constant
PVS CLT	1.00000	Constant
STAR CLT	0.86600	Increasing
MEITRA CLT	1.00000	Constant

NATIONAL CLT	0.88817	Decreasing
CALICUT Co-OP CLT	1.00000	Constant
VINAYAKA WYD	1.00000	Constant
ST JOSEPH WYD	1.00000	Constant
FATHIMA MATHA WYD	0.88853	Decreasing
GOOD SHEPERD WYD	0.82613	Decreasing
ST ANN'S WYD	1.00000	Constant
IQRAA WYD	1.00000	Constant
LEO WYD	0.90142	Decreasing
ANAAMAYA KNR	0.88476	Decreasing
LIFELINE KNR	1.00000	Constant
FATHIMA KNR	0.93981	Decreasing
DHANALAKSHMI KNR	1.00000	Constant
KOYIL KNR	0.92748	Decreasing
AKG Co OP KNR	1.00000	Constant
ASHIRVAD KNR	0.64447	Increasing
MADHAVARAO KNR	1.00000	Constant
KIMST KNR	1.00000	Constant
ARAMANA KSD	1.00000	Constant
CAREWELL KSD	1.00000	Constant
SUNRISE KSD	1.00000	Constant
MALIK DEENAR KSD	1.00000	Constant
MANZOOR KSD	1.00000	Constant
KSD Co OP	1.00000	Constant
KRISHNA KSD	1.00000	Constant
SIMS KSD	0.98385	Increasing
MALLYA KSD	0.68231	Increasing
KIMS KSD	1.00000	Constant

The entire constant return to scale of private secondary care hospitals in Kerala is 86, the increased return to scale is 13 and the decrease to return to scale is 20.

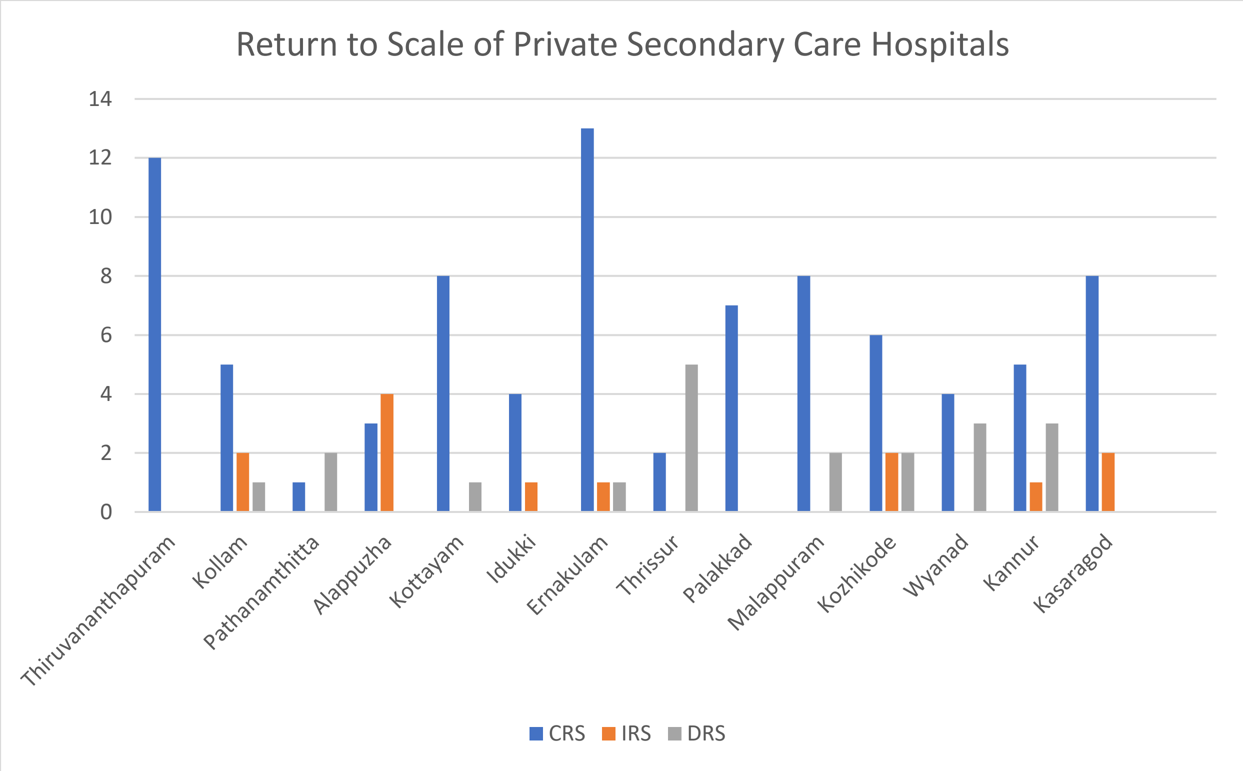


Fig 4.14: Return To Scale Efficiency Of Private Secondary Care Hospitals

Fig 4.15: Slacks In the Private Secondary Care Hospitals Of Kerala

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	A.J H TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	ANATHAPURI H TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	COSMOPOLITIAN H TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	KIMS TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	JUBILEE MEMORIAL H TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	LORDS H TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	NIMS TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	S.P FORT TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	S.U.T TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	SANTHWANA TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	P.R.S TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	GITANJALI TVM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	ASHTAMUDI KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	UPASANA KLM	92.19046	0.00000	26.87634	0.00000	235.13144	30.36188	2647.09541	8.67134	30.29935	4141.66588	1283.39951	0.00000	145.16103	0.00000
15	N.S KLM	0.00000	11.57514	82.45335	0.00000	500.08038	15.17744	0.00000	0.00000	0.00000	3429.03360	0.00000	5751.10474	0.00000	358.61945
16	NAIR'S KLM	20.08273	0.00000	7.40238	0.00000	89.80621	1.63540	624.65802	2.09168	0.00000	3230.23177	1266.50805	0.00000	319.99702	0.00000
17	BISHOP BENZIGER KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	MEDIRTINA KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	SANKAR'S KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	HOLLYCROSS KLM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	Output Slacks OPD	IPD	major surg	no.of deliveries
1	CHRISTIAN MISSION PTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	PAYYANIL PTM	29.41185	17.50494	0.00000	0.00000	16.86686	23.93971	2245.49269	22.06656	0.00000	393.79865	0.00000	1409.40734	7.15595	0.00000
3	MUTHOOT PTM	15.09092	23.88388	2.87026	4.90217	0.00000	0.00000	1525.31540	63.21720	126.39365	784.02056	1463.75717	2049.90980	0.00000	0.00000
4	DEEPA ALP	1.24156	7.51077	3.50289	4.61028	5.38296	0.00000	1498.05574	4.87413	0.00000	0.00000	29.25972	0.00000	127.81788	0.00000
5	HUDA TRUST ALP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	JOSCO ALP	24.24705	28.23262	0.00000	0.00000	0.00000	0.00000	2517.11526	10.35468	0.00000	1031.05319	1198.21758	0.00000	267.74009	0.00000
7	MEDICAL TRUST ALP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	K.V.M ALP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	S.N MEMO ALP	61.47171	40.42606	59.27503	0.00000	44.67771	71.78195	1874.26709	11.05428	0.00000	2253.37215	0.00000	100.68354	128.96835	198.12973
10	MAHA JUBILEE MEM ALP	0.00000	5.38466	0.00000	2.50527	0.00000	5.87762	547.10268	33.83668	298.48834	171.31440	0.00000	0.00000	210.66769	0.00000
11	M.G.D.M KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	SH MED CENTRE KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	CARITAS KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	CHERUPUSHPAM KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	BHARAT KTM	20.92874	1.20691	0.00000	7.57627	0.00000	11.92928	0.00000	3.37378	0.00000	435.03481	0.00000	0.00000	249.04536	0.00000
16	MATHA KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	ST THOMAS KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	ST MARYS KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	KIMS KTM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	ARCHANA IDK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	Output Slacks OPD	IPD	major surg	no.of deliveries
1	CHAZHIKKATU IDK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	MEDICAL TRUST IDK	5.54154	10.38543	0.00000	3.33532	1.02164	7.63205	131.61479	0.00000	0.00000	0.00000	908.44116	0.00000	33.47882	0.00000
3	MORNING STAR MED MISSION IDK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	ST JOHN IDK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	ASTER EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	RAJAGIRI EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	KAROTHUKUZHUI EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	CITY EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	COCHIN PORT EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	EMC EKM	0.00000	2.59409	15.42006	1.89795	17.61354	4.43950	95.88280	17.63324	0.00000	217.52917	24075.48421	1182.77595	0.00000	283.61379
11	LAKESHORE EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	LISSIE EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	LF EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	LOURDE EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	GOUTHAM EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	MEDICAL TRUST EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	IGCoOP EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	M.A.J EKM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	VIJAYA EKM	9.64167	16.38037	20.24487	4.29173	57.23211	0.00000	1156.63011	0.00000	0.00000	10423.66362	6452.69543	759.44038	0.00000	234.20828
20	ASWINI TSR	72.08385	0.00000	0.00000	4.01129	111.95345	0.00000	349.07060	0.00000	0.00000	2995.51611	14317.63314	0.00000	0.00000	149.98157

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	Output Slacks OPD	IPD	major surg	no.of deliveries
1	ANZAR TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	IRIJALAKUDA CoOP TSR	0.00000	9.30893	7.28202	3.49030	39.59025	4.44697	1264.63393	0.00000	0.00000	5825.48489	25859.12895	3823.93849	9.07216	0.00000
3	S.H TSR	0.00000	7.18988	16.63876	0.00000	0.00000	19.32357	329.83381	0.00000	60.16434	3025.23956	0.00000	0.00000	0.00000	77.47461
4	KURUNA TSR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	OUR TSR	0.00000	44.17716	32.17870	0.00000	157.38260	11.75760	4408.63763	0.00000	0.00000	6089.20268	990.80816	0.00000	0.00000	148.10738
6	MOTHER TSR	6.81258	17.07223	0.00000	0.00000	27.95797	5.43519	1240.36963	25.80625	80.43164	4871.95545	0.00000	510.62379	75.42116	54.46838
7	CRESENT PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	THANGAM PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	MOTHER CARE PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	RG CoOP PKS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	WELCARE PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	SAI PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	LAKSHMI PKD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	PMSA CoOP MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	KURINNIKATTIL MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	M.K.H MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	AL SHIFA MPM	50.72908	35.60596	62.40489	0.00000	145.83857	0.00000	5379.37573	94.24318	165.67568	1755.64502	0.00000	1602.14075	1359.36330	0.00000
18	MERCY MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	DAYA MPM	14.79078	1.25780	8.25066	3.02791	0.00000	39.57825	56.56129	27.86586	190.73719	1218.38777	572.66265	0.00000	76.84160	0.00000
20	WALTZ MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	TIRUR CoOP MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	NIMS MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	MOULANA MPM	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	MIMS CLT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	BMH CLT	32.02447	8.44584	32.15039	0.00000	99.09609	104.06574	0.00000	0.00000	321.43280	0.00000	43349.16427	0.00000	0.00000	174.47451
6	FATHIMA CLT	4.36657	14.21188	18.57554	0.00000	13.33626	31.87653	0.00000	61.30389	32.68785	0.00000	0.00000	989.51114	245.05478	0.00000
7	IQRAA CLT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	NIRMALA CLT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	PVS CLT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	STAR CLT	28.43240	5.29995	0.00000	0.00000	39.95476	0.00000	1145.84981	57.58184	133.54097	3039.57232	0.00000	7132.92876	0.00000	56.79987
11	MEITRA CLT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	NATIONAL CLT	58.99781	0.00000	30.99765	0.00000	89.27129	0.00000	825.74442	0.00000	53.76006	5412.60262	9251.97881	0.00000	0.00000	74.01508
13	CALICUT CoOP CLT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	VINAYAKA WYD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	ST JOSEPH WYD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	FATHIMA MATHA WYD	24.39819	11.21850	15.94791	0.00000	4.70877	32.70298	533.76114	16.78901	41.30979	0.00000	0.00000	7669.09766	0.00000	0.00000
17	GOOD SHEPERD WYD	13.77617	3.29399	8.03295	0.00000	8.41188	12.88063	329.39891	0.00000	41.30646	0.00000	0.00000	565.87362	0.00000	82.34219
18	ST ANN'S WYD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	IQRAA WYD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	LEO WYD	42.07122	6.18783	3.74742	0.00000	7.00864	0.00000	548.52242	0.00000	30.60892	0.00000	2832.36949	0.00000	0.00000	110.94747

		Input Slacks										Output Slacks			
DMU No.	DMU Name	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	ANAAMAYA KNR	2.91095	11.19529	9.05246	0.00000	0.19039	0.00000	1119.52882	5.23236	0.00000	0.00000	0.00000	0.00000	89.22561	419.83716
2	LIFE LINE KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	FATHIMA KNR	6.23110	6.20614	0.21976	0.00000	0.00000	56.17082	620.61358	0.00000	0.00000	316.19482	0.00000	3334.80351	151.47796	466.47145
4	DHANALAKSHMI KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	KOYIL KNR	15.08104	0.00000	7.04169	12.93162	21.83734	57.46307	0.00000	59.03028	98.19566	0.00000	0.00000	1446.63191	179.64798	0.00000
6	AKG CoOP KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	ASHIRVAD KNR	10.50253	1.77498	0.00000	1.66436	8.48202	0.00000	177.49782	31.63109	32.22338	464.72121	0.00000	0.00000	129.90928	52.73100
8	MADHAVARAO KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	KIMST KNR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	ARAMANA KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	CAREWELL KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	SUNRISE KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	MALIK DEENAR KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	MANZOOR KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	KSD Co OP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	KRISHNA KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	SIMS KSD	14.28461	1.57331	7.10498	0.76263	21.56830	0.00000	0.00000	0.00000	0.00000	823.13943	0.00000	0.00000	0.00000	0.00000
18	MALLYA KSD	8.52892	1.37636	3.79966	2.97653	6.63453	0.00000	137.63621	15.45851	0.00000	436.34535	61.17435	2022.04778	0.00000	0.00000
19	KIMS KSD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

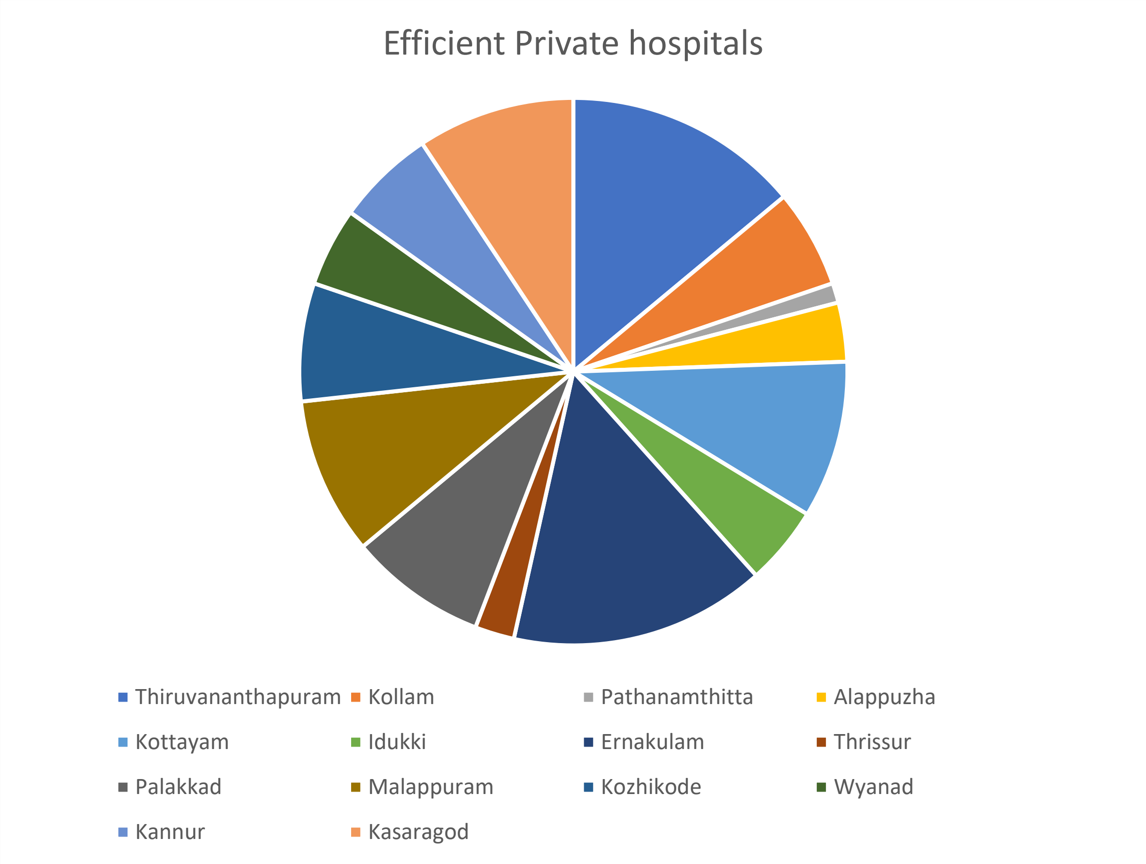


Fig 4.16: Efficiency of Private hospital's District wise

Table 4.9: Hospitals according to NABH classification

Hospitals according to NABH classification				
Districts	Less than 100	101 – 300	301 – 500	501 and above
Thiruvananthapuram	Santhwana, Gitanjali	AJH, Jubilee Memorial, Lords, SP Fort, SUT, PRS	Ananthapuri, Cosmopolitian, NIMS	KIMS
Kollam	Astamudi	Medirtina	Sankar's	Bishop Benziger, Holly Cross
Pathanamthitta		Christian Mission		
Alappuzha		Huda Trust, KVM		Medical Trust

Kottayam	Caritas, KIMS	Cherupushpam, Matha, St Marys	MGDM, SH Medical Centre, St Thomas	
Idukki	Archana	Chazhikkatu, Morning Star Medical Mission	St John’s	
Ernakulam	City, Cochin Port	Karothukuzhi, Goutham, MAJ	Rajagiri, IG co operative	ASTER, Lakeshore, Lissie, LF, Lourde, Medical Trust
Thrissur		Ansar	Karuna	
Palakkad	Sai, Lakshmi	Cresent, Thangam, Mother care, Welcare	RG co operative	
Malappuram	Kurinnikattil	PMSA co operative, MKH, Mercy, Waltz, Tirur Co operative, NIMS	Moulana	
Kozhikode		Meitra, Calicut co operative	Iqraa, Nirmala, PVS	MIMS
Wyanad	Vinayaka, St Joseph, St Ann’s	Iqraa		
Kannur	Life Line, Madhavarao		Dhanalakshmi, AKG co operative	KIMST

Kasaragod	Carewell, Sunrise, Manzoor	Aramana, Malik Deenar, Krishna, KIMS	Kasaragod Co operative	

The most slack efficient private hospital in Kerala is from the district of Ernakulam with 13 hospitals followed by Thiruvananthapuram district with 12. Kasaragod, Malappuram and Kottayam districts shares the third rank with 8 efficient hospitals each. Palakkad and Kozhikode districts stands in the line behind them with 7 and 6 efficient hospitals respectively. Kollam and Kannur districts are having 5 efficient hospitals each whereas Idukki and Wyanad have 4. The last three ranks are held by Alappuzha, Thrissur and Pathanamthitta districts with efficient hospitals as 3, 2 and 1 respectively.

Table 4.10: Comparison based on NABH bed classification among private and government hospitals.

Districts	Less than 100		101 – 300		301 – 500		501 & above		Total
	Govt	Pvt	Govt	Pvt	Govt	Pvt	Govt	Pvt	
TRIVANDRUM	6	2	3	6	2	3	1	1	24
KOLLAM	4	1	5	3	0	2	1	2	18
PATHANAMTHITTA	1	0	5	3	1	0	0	0	10
ALAPPUZHA	2	2	5	4	2	0	0	1	16
KOTTAYAM	1	2	4	4	2	3	0	0	16
IDUKKI	3	1	3	3	0	1	0	0	11
ERNAKULAM	5	2	7	5	0	2	1	6	28

THRISSUR	2	0	7	6	0	1	0	0	16
PALAKKAD	2	2	4	4	0	1	1	0	14
MALAPPURAM	4	1	6	7	0	2	0	0	20
KOZHIKODE	4	0	4	5	0	4	1	1	19
WYANAD	1	3	2	4	1	0	0	0	11
KANNUR	6	3	3	3	0	2	2	1	20
KASARAGOD	5	5	1	4	1	1	0	0	17
TOTAL	**46**	**24**	**59**	**61**	**9**	**21**	**7**	**13**	**240**

Table 4.11: Efficiency Comparison based on NABH bed classification among private and government hospitals.

Districts	Less than 100		101 – 300		301 – 500		501 & above		Total
	Govt	Pvt	Govt	Pvt	Govt	Pvt	Govt	Pvt	
TRIVANDRUM	3/6	2/2	3/3	6/6	2/2	3/3	1/1	1/1	21/24
KOLLAM	1/4	1/1	4/5	1/3	0	1/2	0/1	2/2	10/18
PATHANAMTHITTA	0/1	0	2/5	1/3	0/1	0	0	0	3/10
ALAPPUZHA	0/2	0/2	3/5	2/4	0/2	0	0	1/1	6/16
KOTTAYAM	0/1	2/2	1/4	3/4	2/2	3/3	0	0	11/16
IDUKKI	1/3	1/1	1/3	2/3	0	1/1	0	0	6/11

ERNAKULAM	0/5	2/2	2/7	3/5	0	2/2	1/1	6/6	16/28
THRISSUR	2/2	0	4/7	1/6	0	1/1	0	0	8/16
PALAKKAD	0/2	2/2	1/4	4/4	0	1/1	1/1	0	9/14
MALAPPURAM	3/4	1/1	2/6	6/7	0	1/2	0	0	13/20
KOZHIKODE	0/4	0	3/4	2/5	0	3/4	1/1	1/1	10/19
WYANAD	0/1	3/3	0/2	1/4	0/1	0	0	0	4/11
KANNUR	1/6	2/3	1/3	0/3	0	2/2	1/2	1/1	8/20
KASARAGOD	0/5	3/5	1/1	4/4	0/1	1/1	0	0	9/17
TOTAL	**11/46**	**19/24**	**28/59**	**36/61**	**4/9**	**19/21**	**5/7**	**12/13**	**133/240**

Identified slacks:

Most of the slacks that identified were number of beds, number of doctors and number of nurses. The availability of medical and nursing working force in the hospitals are evident in government and private hospitals.

4.7 ANALYSIS OF TERTIARY HEALTHCARE

4.7.1 Efficiency and Slack Of Government Medical College Hospitals

Table 4.12: Efficiency Score Of Government Medical College Hospitals

DMU Name	Input oriented CRS Efficiency	RTS
1	1.00000	Constant
2	0.39867	Increasing
3	0.61003	Increasing
4	1.00000	Constant
5	1.00000	Constant
6	0.38562	Increasing
7	0.47145	Increasing
8	0.68872	Increasing
9	0.78710	Increasing
10	0.47149	Increasing
11	1.00000	Constant
12	0.46640	Increasing
13	0.48373	Increasing
14	0.15159	Increasing

The constant return to scale Government Medical College hospitals in Kerala is 4 whereas the increasing return to scale is 10. There is no decrease return to scale hospitals in this category.

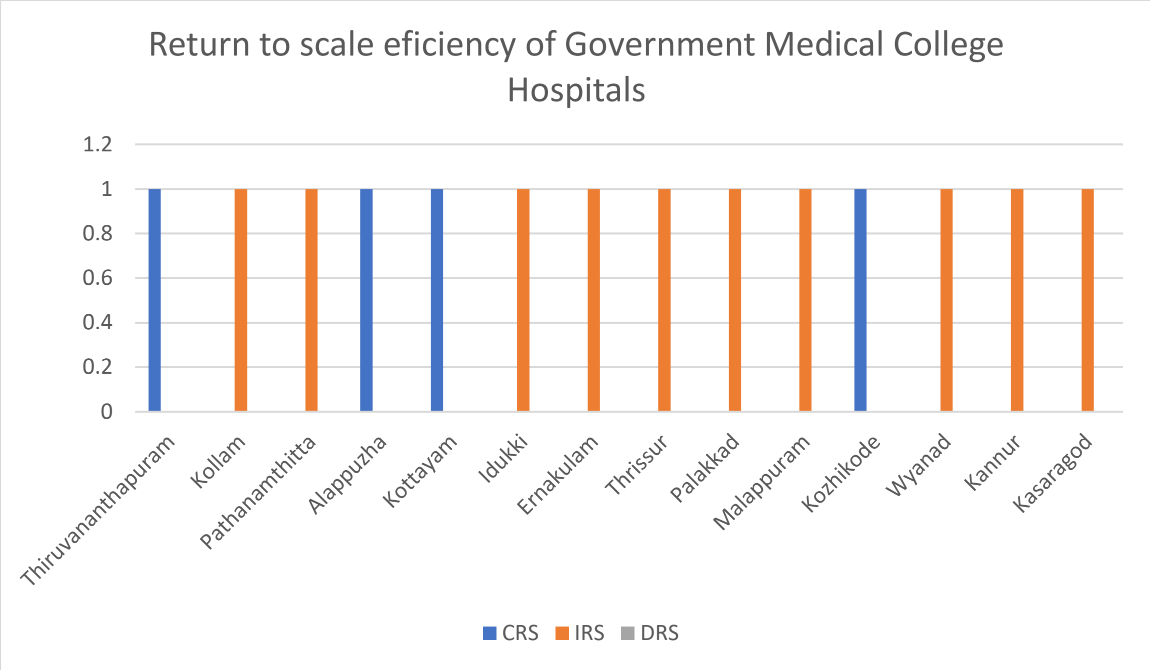


Fig 4.17: Return To Scale Efficiency Of Government Medical College Hospitals

		Input Slacks										Output Slacks			
DMU No.	DMU Name	Govt Medical College	no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	diagnositic services	OPD	IPD	major surg	no.of deliveries
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	2	0.00000	14.18334	0.00000	12.61492	1.14848	0.00000	4.50790	565.17551	14.89492	0.00000	151011.89464	5300.54081	0.00000	0.00000
3	3	0.00000	39.01353	0.00000	9.37279	12.01290	19.44792	31.94070	1278.70904	54.54378	1644.79007	286044.69749	7410.58988	0.00000	0.00000
4	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	6	0.00000	55.65668	10.55190	20.72553	8.61903	5.21833	4.53151	0.00000	26.86005	1263.55772	188774.65638	1413.77109	0.00000	0.00000
7	7	0.00000	54.82831	58.01577	53.36122	8.69534	26.92946	26.83285	3346.42197	55.20078	0.00000	360715.14856	14241.20147	0.00000	0.00000
8	8	0.00000	52.02811	29.34641	28.39285	10.39383	33.13577	1.31975	4360.19496	6.76605	0.00000	804630.50686	62429.19219	0.00000	180.51742
9	9	0.00000	164.41068	32.73035	33.71908	17.96118	19.20894	0.00000	0.00000	75.64070	4500.34874	506363.05331	20085.09571	0.00000	0.00000
10	10	0.00000	53.02716	57.01762	50.83763	7.38948	0.00000	25.59837	3362.29183	0.00000	0.00000	35035.48375	12243.36472	0.00000	0.00000
11	11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	12	0.00000	103.59387	37.56048	45.17026	9.43892	33.00190	23.39095	1939.83440	57.71679	0.00000	233978.53180	8642.89115	0.00000	0.00000
13	13	0.00000	69.11226	23.00786	44.03032	16.12935	14.39671	11.71246	0.00000	49.22114	880.90698	399896.22443	6979.71999	0.00000	0.00000
14	14	0.00000	23.45662	7.71912	9.28856	2.01897	2.39009	1.08985	458.02486	0.00000	182.75257	12843.69255	0.00000	61.87583	18.29486

Fig 4.18: Slacks In the Government Medical College Hospitals Of Kerala

The slacks in government medical college hospitals are the nurses, the number of beds and number of administrative staffs.

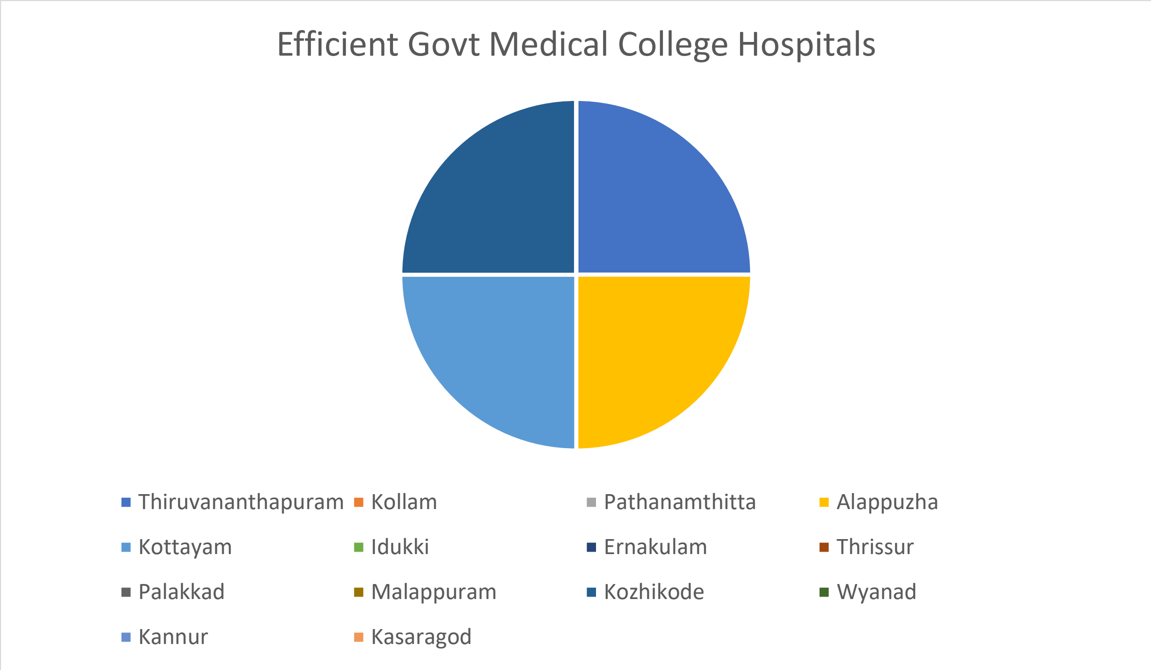


Fig 4.19: Efficiency of Government Medical College hospital's District wise

These are the Government Medical College hospitals that are efficiently working in the state of Kerala. The listed hospitals are having no slacks, and these are working efficiently working with the available inputs.

Out of 14 state owned medical college hospitals only 4 are efficiently working. Others are having slacks in it. The majority of the slacks are seen among doctors and nurses. The available number of doctors and nurses are not sufficient to meet the requirements of the hospitals which is reflected by the output slacks. Moreover the government hospitals are burdened by the increase number of inpatients beyond its limit. For example, a hospital with 550 bed strength is admitting more than 1,000 patients per day, which ultimately stretch the working pattern of the medical and nursing staffs, that may lead to inefficiency.

The Government Medical College hospitals like Trivandrum MCH, Kozhikode MCH, Kottayam MCH, Alappuzha MCH can be taken as a bench marking hospital.

4.7.2 Efficiency and Slack Of Private Medical College Hospitals

Table 4.13: Efficiency Score Of Private Medical College Hospitals

DMU Name	Input – Oriented CRS Efficiency	RTS
Dr Somevel M CSI MC,Karakonam	0.94657	Decreasing
Sree Gokulam MC, Venjaramoodu	0.86755	Decreasing
Sree Uthradom Thirunnal Academy of Med Science, Vencode	0.98678	Increasing
Azeezia MC, Meeyannoor	0.84765	Decreasing
Travancore MC, Mayyanad	0.95911	Increasing
Mount Zion MC hospital, Ezhamkulam	0.96866	Decreasing
Pushpagiri Institude of Med Science & RC, Thiruvalla	1.00000	Constant
Al Azhar MC & super speciality hospital, Thodupuzha	0.96785	Increasing
Amrita School of Medicine	0.84067	Decreasing
MOSC MC, Kolenchery	0.91224	Decreasing
Sree Narayana institute of Med Science, Kunnukara	0.96885	Decreasing
Amala Institute of Med Science	1.00000	Constant
Jubilee Mission MC & Research Inst.	1.00000	Constant
P. K Das Institute of Med Science, Ottapalam	0.86775	Decreasing
Karuna MC	0.78856	Decreasing
MES Academy of Med Science, Palachode	0.74657	Decreasing
KMCT MC, Manassery	0.86752	Increasing

MMC, Modakkallur	0.83554	Decreasing
DM WIMS MC & hospital, Muppainad	0.87667	Decreasing
Kannur MC, Anjarakandy	0.78345	Increasing

The constant return to scale private medical college hospitals are only 3 out of 20. The increase return to scale is 5 and the majority of the hospitals are in decrease to return to scale, that is 12 out of 20.

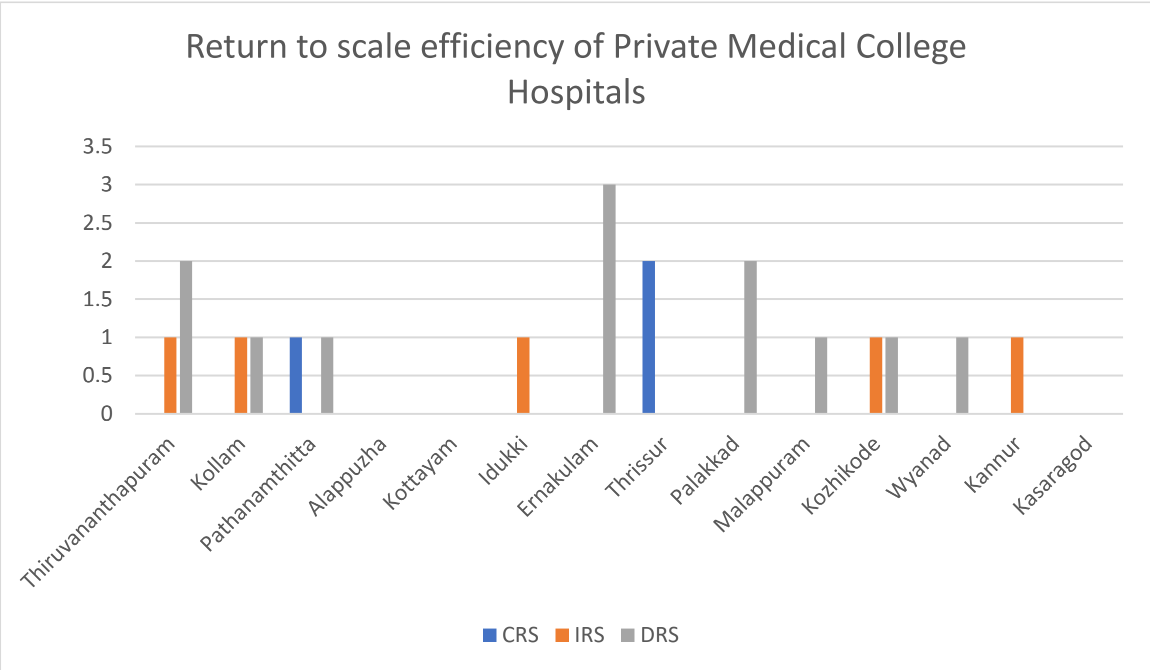


Fig 4.20: Return To Scale Efficiency Of Private Medical College Hospitals

DMU No.	DMU Name	Input Slacks no.of beds	no.of doctors	no.of nurses	no.of services offered	no.of paramedicals	no.of administrative staff	OPD working hours per month	specialized euipments used	tele med cons/month	diagnositic services	Output Slacks OPD	IPD	major surg	no.of deliveries
1	1. Dr Somevel M CSI MC,Karakonam	40.15234	90.93872	124.58574	0.00000	22.19383	0.00000	5364.58375	0.00000	34.20939	243.88654	0.00000	3544.96656	0.00000	244.76332
2	2. Sree Gokulam MC, Venjaramoodu	12.38839	335.38375	458.99442	0.00000	24.33534	0.00000	0.00000	0.00000	0.00000	0.00000	3663.36545	4545.46788	256.43858	0.00000
3	3. Sree Uthradom Thirunnal Academy of Med Science, Vencode	0.00000	355.49383	384.59480	0.00000	24.44343	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	4675.85674	0.00000	545.50925
4	1. Azeezia MC, Meeyannoor	38.49382	0.00000	78.39408	0.00000	35.34546	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3535.75445	52.94784	0.00000
5	2. Travancore MC, Mayyanad	154.79220	58.31832	113.89835	0.00000	103.04476	15.31403	5771.18058	0.00000	0.00000	0.00000	16613.38646	0.00000	2068.44371	684.90603
6	1. Mount Zion MC hospital, Ezhamkulam	283.39398	344.49328	228.48583	0.00000	64.48666	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	4667.46848	355.49680	0.00000
7	2. Pushpagiri Institude of Med Science & RC, Thiruvalla	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	1. Al Azhar MC & super speciality hospital, Thodupuzha	12.29939	12.28378	74.48493	0.00000	43.33434	44.24282	0.00000	0.00000	0.00000	0.00000	0.00000	3565.49684	0.00000	454.49385
9	1. Amrita School of Medicine	0.00000	66.22376	133.19038	0.00000	85.14728	0.00000	4007.88380	0.00000	17.01705	2239.24293	0.00000	5441.61067	1157.56516	697.20549
10	2. MOSC MC, Kolenchery	42.15800	92.08783	132.39304	0.00000	19.55710	0.00000	5562.35963	0.00000	39.35513	0.00000	0.00000	7311.19800	1442.22803	244.29351
11	3. Sree Narayana institute of Med Science, Kunnukara	0.00000	32.28484	44.39584	0.00000	35.33225	11.29224	0.00000	0.00000	0.00000	0.00000	0.00000	5755.69484	0.00000	445.38548
12	1. Amala Institute of Med Science	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	2. Jubilee Mission MC & Research Inst.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	55.40580	0.00000
14	1. P. K Das Institute of Med Science, Ottapalam	45.89967	89.55757	112.38943	0.00000	19.38485	13.59480	3456.44938	0.00000	0.00000	0.00000	0.00000	1345.99876	0.00000	0.00000
15	2. Karuna MC	78.45887	221.88643	302.38874	0.00000	23.57485	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	1. MES Academy of Med Science, Palachode	45.89665	57.99564	89.49059	0.00000	33.27334	11.49988	234.38555	0.00000	0.00000	0.00000	0.00000	2655.89890	0.00000	43.95865
17	1. KMCT MC, Manassery	112.88464	212.88643	310.39848	0.00000	22.39854	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3299.77654	0.00000	554.45544
18	2. MMC, Modakkallur	77.07876	98.99087	112.04399	0.00000	12.39857	22.39488	4938.49950	0.00000	0.00000	0.00000	3456.88786	1235.88656	0.00000	0.00000
19	1. DM WIMS MC & hospital, Muppainad	45.88763	67.98767	78.49054	0.00000	20.94885	0.00000	1211.29948	0.00000	0.00000	0.00000	445.59586	0.00000	55.39580	0.00000
20	Kannur MC, Anjarakandy	68.99674	112.99867	210.78394	0.00000	39.39882	0.00000	0.00000	0.00000	0.00000	0.00000	122.39490	3544.38850	0.00000	45.59686

Fig 4.21: Slacks In the Private Medical College Hospitals Of Kerala

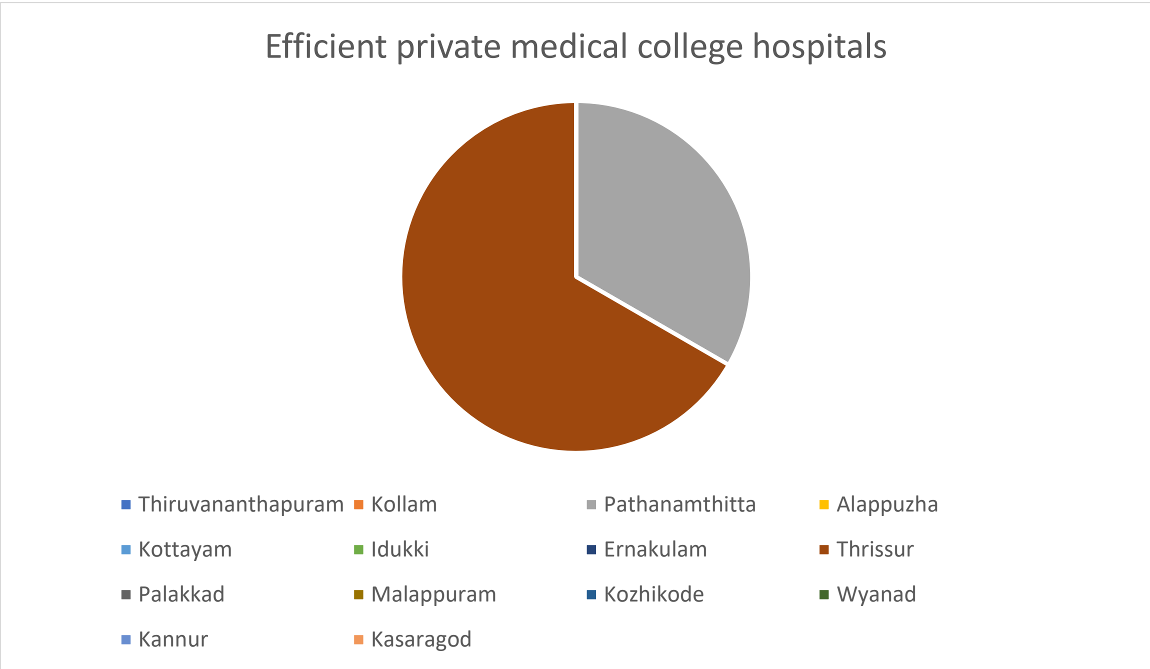


Fig 4.22: Efficiency of Private Medical College hospital’s District wise

These are the Private Medical College hospitals that are efficiently working in the state of Kerala. The listed 3 hospitals are having no slacks, and these are working efficiently working with the available inputs.

Despite of having zero slack in the special equipment's used and tele consultation, majority of the private medical college hospitals are working in efficiently. The decrease return to scale indicates that even the inputs are increased there will be decrease in the output. In this scenario that condition is enlightened. Majority of the slacks likes in the input and output of private medical college hospitals.

4.8 BENCK MARKING MODELS

Benchmarking is a continuous analysis of strategies, functions, processes, products or services, performances, etc. compared within or between best-in-class organisations by obtaining information through an appropriate data collection method, with the intention of assessing an organization's current standards and, as a result, carrying out self-improvement by implementing changes to scale or exceed those standards. Benchmarking can be done within or between best-in-class organisations. Obtaining information through appropriate data collection method (Anand & Kodali, 2008). The process of benchmarking has evolved from a "continuous and systematic process of evaluation of the products, services" to a "continuous process of identification, learning, and implementation of best practises in order to obtain competitive advantages, whether internal, external, or generic." Previously, benchmarking was described as "continuous and systematic process of evaluation of the products, services." The model that the business decides to use should be simple and straightforward, with an emphasis on logical planning and organisation, as well as the establishment of a protocol for behaviour and results. The models of the benchmarking process have been developed with the intention of elaborating on the procedures that need to be followed in the course of benchmarking.

The primary objective of benchmarking is to devise novel methodologies or enhance existing procedures in order to align with the elevated standard. The endeavour in question is not characterised by a singular instance of exertion. On the contrary, it constitutes an integral facet of the perpetual enhancement of operational procedures, which the most esteemed establishments ardently embrace in order to maintain their competitive edge.

Bhutta and Huq (1999) assert that the process of benchmarking can encompass a varying number of processes, with certain businesses employing as many as 33 steps, while others opting for a more concise approach of only four steps. In addition to the pioneering ten-step benchmarking process introduced by Xerox (Camp, 1989), other researchers have proposed alternative methodologies. Filer et al. (1988) presented a seven-step process, Spendolini (1992) outlined a five-step process, and Eyrich (1991) described IBM's five phase/14-step process. Furthermore, Alcoa developed a six-step benchmarking approach, while AT&T proposed a 12-step benchmarking process (Bemowski, 1991). Additionally, various academicians have put forth their own models, which have been subsequently modified and adapted to suit different benchmarking scenarios. One instance of a recommended benchmarking procedure is outlined by Boxwell (1994). This technique, as employed by Nath and Mrinalini (1995), was utilized specifically for benchmarking R&D Organisations. Sole and Bist (1995) made modifications to Spendolini's five-step method by including an additional phase. They placed emphasis on the notion that benchmarking presupposes a continuous improvement objective for all firms employing the process. Consequently, they assured that their model adhered to a circular framework. In their study, Anderson and Moen (1999) discovered a total of 60 distinct models that had been produced and put out by several scholars, researchers, consultants, and specialists in the area. This extensive collection of existing models served as a valuable resource for Anderson and Moen as they embarked on the creation of their own novel model, known as the benchmarking wheel. In this thesis, it is not feasible to encompass all the existing models.

However, an effort will be made to primarily focus on the models that are relevant to the healthcare business.

The classification of benchmarking has been delineated into two discernible categories, namely technical benchmarking and competitive benchmarking.

The practise of technical benchmarking is undertaken by design personnel with the objective of assessing the capabilities of various products or services, particularly in relation to those offered by prominent competitors. In the context of evaluating the properties of an organization's products or services, designers employ a rating scale ranging from one to four, with four representing the highest rank. This scale serves as a tool for designers to assess and assign relative values to the various attributes associated with the organization's offerings. By utilizing this scale, designers are able to discern the perceived quality and desirability of said properties, thereby facilitating a comprehensive evaluation process. In the event that empirical evidence cannot be procured, it is plausible to surmise that the endeavours undertaken in the realm of design may prove to be inadequate, thereby rendering the resultant products or services incapable of attaining a competitive edge.

Competitive benchmarking is a strategic evaluation technique that assesses the relative performance of an organisation in comparison to its primary competitors. This method primarily focuses on scrutinising the organization's products or services, specifically examining the attributes, functions, or values that are deemed crucial. By conducting a comprehensive analysis, competitive benchmarking enables organisations to gauge their standing in relation to the leading competition, thereby identifying areas of strength and areas that require improvement. Inquiring about the relative ranking of your organization's products or services vis-à-vis the prominent competitors, it is of interest to ascertain the customers' perception on a quantifiable scale ranging from one to four, with four denoting the highest level of satisfaction. In the event that empirical data cannot be procured, it is imperative to acknowledge that marketing endeavours may be prone to misdirection and design endeavours may be susceptible to misguidedness.

4.8.1 Healthcare Benchmarking

Healthcare benchmarking is a critical process in the realm of healthcare management that holds significant relevance and importance. This scholarly inquiry aims to elucidate the essence of healthcare benchmarking and its consequential significance. At its core, healthcare benchmarking can be defined as a systematic and strategic approach employed to evaluate and compare the performance of healthcare organisations or entities against established standards, best practises, or industry peers. It serves as a valuable tool for

In essence, benchmarking in the realm of healthcare entails the act of juxtaposing the performance of a given organisation or clinician against that of their counterparts.

The primary objective of implementing benchmarking practises within registries is to enhance the overall quality, efficiency, and patient experience. The meticulous examination and equitable evaluation of various entities or processes are indispensable facets of efficacious endeavours aimed at enhancing quality. In the realm of registries, benchmarks hold immense value for both individual sites and clinicians alike.

The utilisation of benchmarks within the context of a registry enables participants to gain valuable insights into their relative performance vis-à-vis their peers, thereby facilitating a comprehensive understanding of the underlying factors contributing to such disparities. By employing benchmarks as a comparative yardstick, registry participants can discern the nuances and intricacies that delineate their standing in relation to others, thereby unravelling the rationale behind observed variations. Benchmarks play a pivotal role in providing organisations with a comprehensive understanding of their position within the expansive healthcare landscape. The individuals in question will not only possess a comprehensive comprehension of their relative positioning within a given group, be it the lower echelons, the middle stratum, or the uppermost tier, but will also possess a profound understanding of the underlying factors contributing to their placement.

The utilisation of benchmarking within the healthcare industry enables hospitals, practises, individual clinicians, and other healthcare organisations to effectively monitor and evaluate their own performance in relation to their de-identified peers, as deemed appropriate in the given context. The utilisation of benchmarks can be extended to encompass a wide array of metrics pertaining to patient characteristics, volume, processes, outcomes, and various other categories that hold significant relevance within the context of healthcare research and analysis.

Benchmarking is an indispensable instrument employed by leaders within care facilities to assess and evaluate the performance of a given provider in relation to comparable organisations within the same domain. The term "specifically" pertains to the meticulous examination of a facility's operational efficacy, wherein the acquired data is juxtaposed against a universally accepted benchmark, such as the standards established by the Centres for Medicare and Medicaid Services (CMS) and other pertinent regulatory bodies.

The practise of benchmarking is predicated upon the veracity and efficacy of data, enabling leaders to discern areas warranting enhancement, formulate astute decisions, mitigate risk, and conceive novel courses of action.

<u>The four different types of benchmarking</u>

<u>Internal benchmarking</u>: Within the same integrated delivery network (IDN), internal benchmarking is primarily used to maintain quality standards across several facilities. Administrators of hospitals and care facilities should monitor how well separate departments are performing so that patients can obtain the same level of treatment everywhere. Patient

satisfaction ratings, readmission rates after 30 days, and the frequency of hospital-acquired diseases are some of the most popular internal performance indicators facility leaders monitor.

External benchmarking : This practice, also known as competitive benchmarking, requires the hospital to evaluate and contrast its performance to that of another similar organization. A hospital can compare its performance metrics to those of similar-sized or -serving-patient-population hospitals in its local area. Hospital executives may learn from other facilities and enhance their processes using this technique. Accessing performance information on facilities that are comparable to your own is the most efficient approach to comprehending the competitive landscape. Based on hospital size, demographics of the general population, or CBSA region, data can be analyzed.

For instance, our Hospital View product provides detailed facility profiles on more than 9,000 active hospitals across the U.S., giving users a behind-the-scenes look at how each hospital performs in terms of several indicators.

Functional benchmarking: External bench marking’s analysis and comparison steps are expanded upon in functional benchmarking. This strategy instructs hospital executives to contrast their company with others in related industries that may use a comparable statistic or procedure. Comparing functions, for instance, may be very helpful in fields like IT. Care facilities are required to exercise greater vigilance than businesses outside the healthcare sector since healthcare providers deal with sensitive data. Healthcare IT directors can put the best plans in place to lessen instances of hacking and data leakage by studying the data security practises of organisations in other industries.

Generic benchmarking: Similar to functional benchmarking, this strategy calls on hospital management to think outside the box as they examine how other businesses are operating and adopt the tactics that make them successful. For instance, a hospital could find that the admission and processing of patients are comparable to how guests check into hotels. Comparing these two procedures may appear confusing at first, yet both revolve around moving a person from one location to another. There might not always be a direct connection, though. That's alright. Generic benchmarking ultimately serves as a catalyst for change inside an organisation by introducing fresh perspectives.

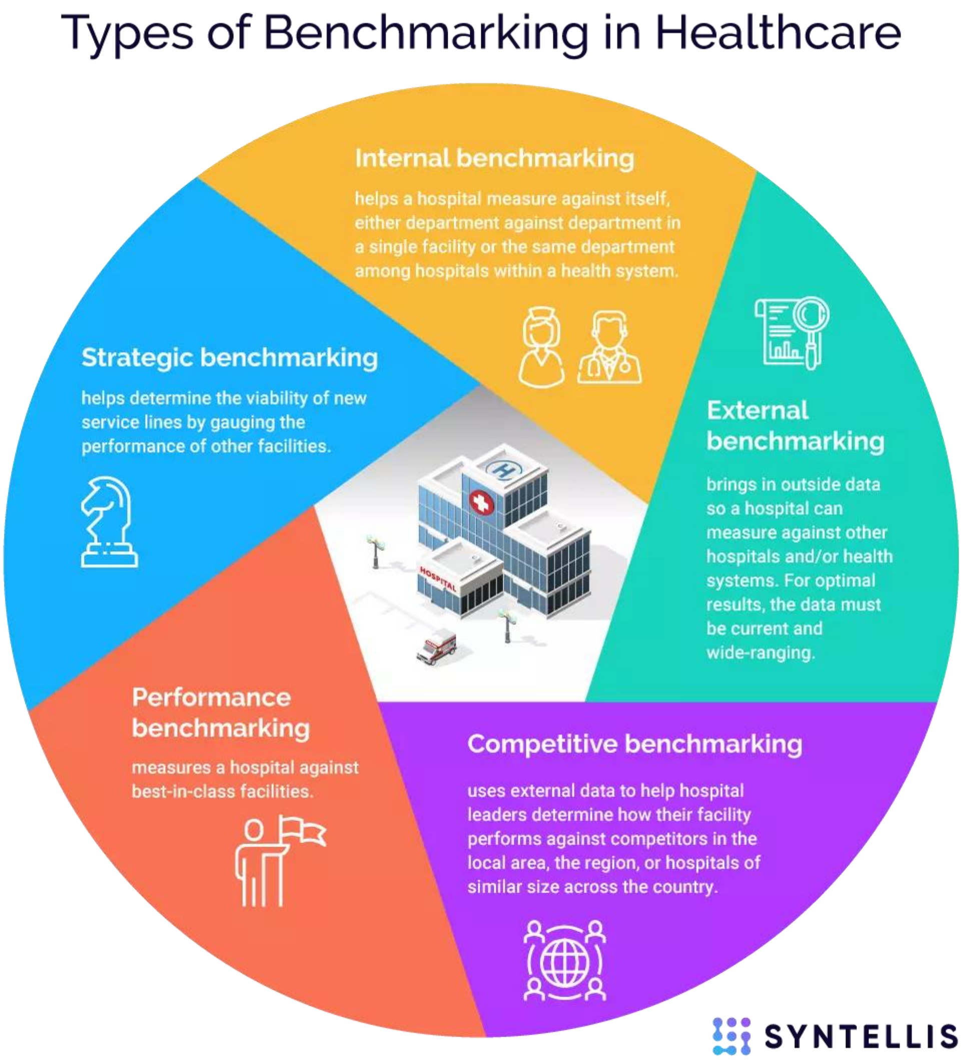


Fig 4.23: Types Of Bench Marking In Healthcare

4.9 KEY PERFORMANCE MATRIX/INDICATORS

Key performance indicators, or KPIs, are observable and quantifiable metrics that are used to measure advancement towards a certain goal or aim. KPIs support data-driven decision-making, performance optimisation, and the identification of organisational strengths and shortcomings.

4.9.1 Importance of key performance indicators

- The primary emphasis of key performance indicators (KPIs) lies in the evaluation of a business's overall performance. The absence of Key Performance Indicators (KPIs) poses a significant challenge for leaders within an organisation, as it hinders their ability to effectively assess performance and subsequently implement operational modifications to rectify any identified issues.
- The maintenance of employee concentration on business initiatives and tasks that are pivotal to the achievement of organisational success would present a formidable challenge in the absence of specifically designated Key Performance Indicators (KPIs) that serve to fortify the significance and worth of said activities.
- In conjunction with accentuating business triumphs or predicaments predicated on assessments of present and past accomplishments, Key Performance Indicators (KPIs) possess the capability to indicate forthcoming consequences, thereby furnishing executives with timely alerts regarding potential business predicaments or preemptive counsel on prospects to optimise return on investment. Equipped with such pertinent information, organisational leaders are empowered to adopt a proactive approach in managing their business operations, thereby potentially securing a distinct edge over their competitors in the market landscape.

4.9.2 Types of key performance indicators

The following are the four most common types of KPIs:

Lagging indicators: KPIs denoting the quantifiable metrics employed to assess the outcomes of business undertakings, such as the growth in quarterly profits and revenues, are commonly acknowledged as lagging KPIs due to their retrospective nature, as they primarily monitor events that have transpired in the past.

Leading indicators: In contrast, it is noteworthy to highlight that prominent key performance indicators (KPIs) are indicative of imminent business advancements. A prime illustration of such KPIs can be observed in the form of sales bookings, which serve as precursors to the generation of revenue in subsequent quarters.

Quantitative indicators: Quantifiable metrics, such as revenue or website traffic, can be assessed through numerical measurements. These metrics possess the advantageous quality of being readily assessable and comparable over extended periods, rendering them a popular choice for monitoring advancements towards predetermined numerical objectives. Quantitative indicators, as a methodological approach, offer a reliable means of obtaining precise and data-driven insights into the performance of a given company or organisation.

Qualitative indicators: The qualitative indicators, being of a more abstract nature, possess a certain degree of subjectivity and are susceptible to varying interpretations. These indicators encompass aspects such as the user's experiential perception of a product or their interaction with a website. When dealing with qualitative indicators, the task of identifying pertinent key performance indicators (KPIs) can prove to be a formidable challenge. The selection of suitable KPIs is contingent upon an organization's capacity to effectively measure said indicators.

4.9.3 Developing key performance indicators.

Establish strategic goals: Before creating KPIs for the organisation, ascertain its strategic goals. Describe the anticipated results that will aid in achieving those corporate objectives. For instance, the organisation must describe the specific outcomes it is aiming for before developing the KPIs

Recognize alternate performance measures: Make an effort to identify alternative performance measurements that may be used to get the desired results. For instance, the business should inquire about possible extra criteria for assessing progress.

Select the best suited KPIs: Select the KPIs that will help you achieve each targeted result. These metrics should be utilized after being identified since they show progress towards the target objective.

Define and record the KPIs: Define and document the selected KPIs, including their method of computation, data sources, frequency of collection, and any necessary benchmarks or objectives.

Examples of commonly used KPIs:

1) Example of Sales KPIs:

- Monthly sales growth
- Monthly customers per sales rep
- Quarterly sales bookings
- Number of engaged leads in sales funnel
- Average conversion time

2) Example of Marketing KPIs:

- Monthly website traffic

- Page likes and comments
- Social media engagement rates
- Number of new monthly leads
- Click-through rate percentage

3) Example of Human Resources KPIs:

- Monthly overtime hours
- Quarterly training costs
- Cost per new hire
- Employee productivity
- Monthly absenteeism rate

4) Example of Customer Service KPIs:

- Customer satisfaction score
- Customer retention rate
- Monthly support ticket submissions
- Average resolution time
- Cost per resolution

<u>Examples of KPI's used in healthcare.</u>

- Average Hospital Stay: Evaluate the amount of time patients are staying.
- Bed Occupancy Rate: Monitor the availability of hospital beds.
- Medical Equipment Utilization: Track the utilization of your equipment.
- Patient Drug Cost Per Stay: Improve cost management of medications.
- Treatment Costs: Calculate how much a patient costs to your facility.

- Operating Cash Flow: Monitor the financial health of your facility.
- Net Profit Margin: Ensure your facility remains profitable.
- Patient Room Turnover Rate: Balance the turnover with speed and quality
- Patient Follow-up Rate: Measure the care for your patients over time.
- Hospital Readmission Rates: Track how many patients are coming back.
- Patient Wait Time: Monitor waiting times to increase patient satisfaction.
- Patient Satisfaction: Analyze patient satisfaction in detail.
- Claims Denial Rate: Ensure medical costs are covered.
- Treatment Error Rate: Make sure you provide the right treatment.
- Patient Mortality Rate: Prevent patient mortality under your care.
- Staff-to-Patient Ratio: Ensure you have enough staff to care for patients.
- Cancelled/missed appointments: Keep track of patients' appointments.
- Patient Safety: Prevent incidents happening in your facility.
- ER Wait Time: Identify rush hours in your emergency room.
- Costs by Payer: Understand the type of health insurance of your patients.

Table 4.14 The KPI Matrix

Lagging Indicators	**Leading Indicators**
Medical Equipment Utilization	Net Profit Margin
Operating Cash Flow	Patient Satisfaction
Patient Wait Time	Patient Mortality Rate
Cancelled/missed appointments	Staff-to-Patient Ratio
ER Wait Time	Patient Safety
Quantitative Indicators	**Qualitative Indicators**
Bed Occupancy Rate	Average Hospital Stay
Hospital Readmission Rates	Patient Room Turnover Rate
Costs by Payer	Patient Follow-up Rate
Claims Denial Rate	Treatment Error Rate
Treatment Costs	Patient Drug Cost Per Stay

CHAPTER 5

FINDINGS, RECOMMENDATIONS AND CONCLUSION

CHAPTER 5

FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 FINDINGS OF THE STUDY

This chapter serves as a comprehensive synthesis of the research outcomes, recommendations, and conclusions derived from the current investigation entitled "A Slack-Based Data Envelopment Analysis Modelling for Scrutinising the Efficiency of Private and Public Healthcare Settings in Kerala." The research study encompasses an examination of the efficacy of primary health centres, sub-centres, and public hospitals through the utilisation of data envelopment analysis. The subsequent sections of the study comprise the presentation of research findings, followed by a comprehensive conclusion and recommendation. These findings shed light on crucial facets and offer valuable insights pertaining to the four distinct research objectives.

The objective of this study is to identify and analyse the factors that contribute to inefficiency in the inputs of Primary Health Centres (PHCs), sub-centres, and hospitals, with a specific focus on identifying any slack present in these inputs. By examining the various components that make up the inputs of these healthcare facilities, we aim to shed light on potential areas of improvement that can enhance the overall efficiency of the healthcare system. Through a comprehensive analysis of the existing literature and empirical data, this research seeks to provide valuable insights into the identification and mitigation of slack in the inputs of PHCs, sub-centres, and hospitals, ultimately contributing to the optimisation of healthcare delivery.

Another objective of this study is to develop a comprehensive benchmarking model for Primary Health Centres (PHCs), sub-centres, and hospitals, specifically focusing on their operational functioning. By establishing a benchmarking framework, this research aims to provide a standardised and systematic approach to evaluate and compare the performance of these healthcare facilities. The proposed model will enable healthcare administrators and policymakers to identify areas of improvement, enhance efficiency, and optimise resource allocation within the healthcare system. Through the utilisation of benchmarking techniques, this study seeks to contribute to the advancement of healthcare management practises and ultimately improve the overall quality of healthcare industry.

In order to establish a key performance matrix for the field of Healthcare Administration, it is imperative to undertake a comprehensive analysis of the various factors that contribute to the effective management and delivery of healthcare services. This research endeavour aims to identify and evaluate the key performance indicators (KPIs) that are most relevant and impactful in assessing the performance and success of healthcare administration practices. To begin, a thorough review of the exist. The assessment of slack values within hospitals offers valuable insights for hospital management, enabling them to strategically adjust their inputs, expand their capacity, and eliminate surplus resources to achieve target values and optimise resource utilisation.

5.1.1 Summary of Findings from Objectives of the Study

Table 5.1: Compiled Findings Of Study

Objectives	Sub centre	PHC	CHC	Private hospital	Govt hospital	Private MCH	Govt MCH
1.To analyze the efficiency of the primary health centre, sub-centre and public hospitals using data	112 efficient	176 efficient	88 efficient	86 efficient	47 efficient	3 efficient	4 efficient

envelopment analysis.							
2. To find slack in inputs of PHC's, sub-centre and hospitals that contribute toward inefficiency.	No of subordinate staffs	No of beds, nurses & paramedic's	OPD working hours, equipment's, paramedics & nurses	Nurses, doctors, number of beds	Nurses, doctors, number of beds	Nurses, doctors, paramedical staffs, number of beds	Nurses, number of beds and paramedical staffs
3. To create Benchmarking model for PHC's, sub-centre and hospitals for operational working.	112 sub centres can be bench marked	176 PHC'S can be bench marked	88 CHC'S can be bench marked	86 private hospitals can be bench marked	46 government hospitals can be bench marked	3 private medical college hospitals can be bench marked	4 government medical college hospitals can be bench marked
4. To create a key performing matrix for Healthcare Administration.	Waiting time.	Patient safety	Patient follow up rate.	Claims denial rate, hospital readmission rate, net profit margin	Bed occupancy rate, average hospital stays.	Treatment cost, medical equipment utilization.	Staff to patient ratio, treatment error rate.

In the state of Kerala, there exists a total of 229 Community Health Centres (CHCs), 924 Primary Health Centres (PHCs), and 5414 sub-centres. Based on a confidence level of 95% and a margin of error of 5%, the recommended sample sizes are 144, 272, and 359, respectively. Among the chosen 144 individuals with a CHC designation, it has been seen that 88 of them are now operating in an effective manner. Among the total of 272 Primary Health Centres

(PHCs) assessed, 176 have been found to be functioning effectively. Similarly, out of the 359 sub-centres that were chosen for evaluation, 112 have been identified as operating efficiently. Out of 121 government hospital 47 are efficiently working whereas when compared to the private hospitals, out of selected 119 samples, 86 are efficiently working. Out of 14 government run medical college hospitals in Kerala, only 4 are efficiently working and out of 20 private medical college hospitals in the state, sadly 3 are effectively working.

5.1.2 Problem Of Estimating And Analyzing The Efficiency Of Hospitals

There exists a limited number of conceptual frameworks that can be employed to assess the efficacy of diverse business entities, such as hospitals and banks. Among these frameworks, the technique of data envelopment analysis (DEA) has garnered significant attention from researchers across Europe, America, and notably Korea, as a means to evaluate the efficiency of their respective business units. However, it is worth noting that in the Indian context, only a handful of studies and practical applications have been undertaken in this domain in the past. Consequently, the present research endeavour aims to shed light on various conceptual underpinnings pertaining to the evaluation of efficiency in this context.

In the event that a medical facility undergoes expansion, it is observed that each input is proportionally augmented to a comparable degree. In the realm of inquiry, it is conceivable that there exist three plausible scenarios:

- The observed phenomenon of output increasing in proportion to the expansion of inputs suggests the presence of consistent returns to scale.
- The output(s) of the system exhibits a greater increase than the corresponding increase in inputs, suggesting the presence of increasing returns to scale.

- The observed phenomenon of the output(s) incrementing not precisely in proportion to the increment in inputs implies the presence of diminishing returns to scale.

In accordance with prevailing principles, it can be posited that a hospital, as an entity, exhibits a discernible pattern of return to scale, which may manifest as consistent, expanding, or diminishing, contingent upon the presence of economies or diseconomies of scale. The phenomenon of constant return to scale occurs within a specific context characterised by the presence of economies of scale and the precise discernibility of inputs within the healthcare framework. The phenomenon of increasing return to scale, as elucidated by Washio (2013), manifests as a discernible augmentation in the allocation of resources within hospitals, specifically pertaining to the expansion of healthcare inputs and the specialisation of the healthcare workforce. This expansion is observed to occur in tandem with the progressive enlargement of the scale or size of the hospital. The phenomenon of diminishing returns to scale may manifest itself in instances where large-scale hospitals encounter challenges in maintaining effective communication channels between top-level executives and the healthcare workforce within various divisions and wards, consequently resulting in a decline in administrative efficiency. The phenomenon of diminishing returns to scale can also manifest as a consequence of excessive utilisation of capacities and skills.

Table 5 .2 Return To Scale Findings Of All Hospitals

Hospitals	**Constant Return to Scale**	**Increasing Return to Scale**	**Decreasing Return to scale**
Sub centre	112	250	1

PHC	176	95	8
CHC	88	47	2
Govt Hospitals	47	41	33
Private Hospitals	86	13	20
Govt MCH	4	10	0
Private MCH	3	5	12

The present study investigated the assessment of productivity levels across various healthcare settings within the state of Kerala. Employing the Data Envelopment Analysis (DEA) methodology, it was revealed that a discernible amount of inefficiency exists within the operational framework of both hospitals and other healthcare facilities. Based on the evaluations conducted in the context of this research, it has been determined that a majority of primary health centres (PHCs), specifically 63%, community health centres (CHCs), specifically 64.2%, and sub-centres, specifically 30.9%, exhibit a commendable level of efficiency. Upon careful examination of the available data pertaining to the operational efficiency of functioning hospitals, it is evident that government hospitals exhibit a modest efficiency rate of merely 38.8%. The comparative efficiency of private hospitals about government-run hospitals has been a subject of scholarly inquiry. The observed efficiency of the subject under investigation is quantified at 72.2%. The efficacy levels exhibited by government and privately operated medical college hospitals are lamentably subpar. According to the available data, it has been observed that the efficiency score of government medical college hospitals stands at 28.6%, whereas private medical college hospitals exhibit a comparatively lower efficiency score of 15%. It is evident that a significant number of medical hospitals currently exhibit suboptimal levels of operational efficiency, thereby necessitating concerted efforts to enhance productivity within these healthcare institutions.

The investigation was carried out across three distinct tiers. The categorization of hospitals in India was based on the prevailing healthcare delivery system, encompassing primary healthcare, secondary healthcare, and tertiary healthcare. The primary healthcare system encompasses various levels of care, namely Primary Health Centres (PHCs), Community Health Centres (CHCs), and sub-centres. Among the various entities under consideration, it is noteworthy that the CHC exhibits a significantly higher level of efficiency, as evidenced by its impressive 64.2% performance metric. The realm of secondary healthcare encompasses a range of medical facilities, namely taluk hospitals, district hospitals, general hospitals, and private hospitals. Among the various healthcare institutions under consideration, it is noteworthy that private hospitals exhibit a significantly higher level of efficiency, as indicated by a commendable score of 72.2%. The tertiary healthcare system encompasses medical college hospitals, which are integral components of the healthcare infrastructure. The present investigation involved the inclusion of both government-operated and privately-operated medical college hospitals for the purpose of the study. None of the players exhibited a commendable performance, as evidenced by their inability to achieve a noteworthy score. The findings of this study indicate that the government-run medical college hospital achieved a significantly higher rank of 28.6% compared to the private medical college hospitals.

5.1.3 Increasing Health coverage.

The imperative for the government of the nation lies in formulating a comprehensive policy framework aimed at augmenting health coverage and expanding the network thereof, so as to encompass the entirety of the populace. The extant body of research suggests that private hospitals exhibit a superior level of operational efficiency in comparison to their government counterparts. The present state of government hospitals is characterised by a suboptimal level of performance. The imperative is for the government to formulate a comprehensive policy aimed at incorporating the efficiency scales utilized by private hospitals into their own operations. The imperative for the government to establish prepaid and pooled healthcare financing mechanisms arises from the necessity to mitigate the prevailing over-reliance on out-of-pocket expenditure. The introduction and implementation of prepayment systems undoubtedly have the potential to reduce financial barriers to accessing medical services, thereby contributing to the enhancement of hospital efficiency. The present study represents a pioneering effort in comprehensively examining the healthcare delivery system of the state of Kerala, with a specific focus on elucidating the determinants of hospital framework productivity. This study further posits that substantial improvements in healthcare can be achieved without additional expenditure, highlighting that certain factors contributing to efficiency gains encompass the overall health status of the population. The potential to effectively cater to a substantial population remains feasible through the utilisation of operational analytics by hospitals.

The scarcity of resources allocated to healthcare has been widely acknowledged as a pressing concern. The public healthcare sector in India is currently grappling with significant financial constraints, thereby impeding its ability to effectively address the healthcare needs of the population. Moreover, a notable dearth of healthcare professionals across various tiers further exacerbates the challenges faced by the sector. In the present scenario, it is imperative to emphasise the optimal utilisation of pre-existing resources in order to bolster the delivery of healthcare services within the country. The assessment of the efficacy of healthcare facilities can assist managers in ensuring the optimal utilisation of available resources.

The utilisation of data envelopment analysis (DEA) has emerged as a prominent and effective method for evaluating the operational efficiency of fundamental entities within diverse domains of the healthcare sector. Numerous investigations have been conducted to assess the efficacy of medical hospitals and the overall healthcare system through the utilisation of Data Envelopment Analysis (DEA) in diverse contexts. Operational efficiency refers to the organisational ability to deliver output to clients in a cost-effective manner, without compromising on quality, while simultaneously maximising profitability. In the realm of healthcare, the provision of optimal healthcare services to patients while simultaneously optimising operational costs is a critical consideration for hospitals and medical institutions.

5.1.4 Competitive And Internal Benchmarking

The health care industry has the potential to enhance its operational efficiency by implementing a benchmarking scheme, wherein it compares its services with those of the leading entities within the same field. The primary objective of implementing benchmarking in the realm of medicinal services is to enhance overall operational efficiency, elevate the quality of care provided, gain a deeper understanding of healthcare dynamics, and ultimately enhance patient satisfaction. The methodology encompasses the adoption of optimal practises and evidence-based practises, followed by the identification of potential areas for improvement. The empirical evidence elucidates that private hospitals operating within the secondary healthcare sector exhibit a notable degree of efficiency. Conversely, primary healthcare services characterised by a high level of efficiency are predominantly observed in the form of Primary Health Centres (PHCs) and Community Health Centres (CHCs). However, achieving near-perfect efficiency in the healthcare sector is a formidable task, yet imperative for hospitals to uphold a minimum benchmark. Data envelopment analysis (DEA) is a widely recognised technique that holds promise for achieving operational excellence and facilitating benchmarking in various domains. By employing DEA, organisations can effectively evaluate the relative efficiency and performance of decision-making units (DMUs) within their operational framework. This methodological approach allows for the identification of best practises and the establishment of benchmarks, enabling organisations to enhance their operational efficiency and strive for excellence in their respective industries. Consequently, DEA serves as a valuable tool for organisations seeking to optimise their operations and achieve competitive advantage through performance evaluation and benchmarking.Upon the implementation of Data Envelopment Analysis (DEA), organisations will gain insights into their returns to scale and current operational efficiency. The concept of Slack value entails the provision of appropriate inputs that are necessary to attain a predetermined target value.

The practise of competitive benchmarking differs from that of interior benchmarking. The aforementioned phenomenon occurs when a hospital or healthcare system conducts an analysis of its internal operations, scrutinising each area and evaluating its adherence to established standards and objectives. In the context of enhancing hand hygiene and purification protocols to mitigate contaminations within a medical facility, the implementation of internal benchmarking emerges as a viable approach. This methodology entails an evaluation of existing practises within each department, followed by the establishment of objectives aimed at achieving optimal hand cleanliness consistency throughout the entirety of the hospital. Competitive benchmarking is a strategic practise wherein a hospital undertakes a comprehensive evaluation of another hospital association's procedures or services, with the aim of comparing and contrasting its own objectives or outcomes against those of the counterpart.

The utilisation of Data Envelopment Analysis (DEA) presents a promising approach for the purpose of benchmarking the two crucial aspects of execution within tertiary hospitals, namely productivity and quality. Given the multidimensional nature of quality, it is imperative to address the decision-making process regarding the selection of an appropriate composite quality measure in future research endeavours. Incorporating the element of quality into DEA models has the potential to yield a more favourable assessment of hospital resource utilisation in the foreseeable future.

5.1.5 Hospital Size And Efficiency

In this particular investigation, the healthcare establishments within the region of Kerala have been categorised based on the prevailing healthcare delivery system in the nation of India. The examination and analysis of each tier in isolation have been conducted to assess its efficacy. The first tier encompasses the primary healthcare system, which consists of primary health centres (PHCs), community health centres (CHCs), and sub-centres. The primary healthcare centres (PHCs) and community healthcare centres (CHCs) have demonstrated commendable performance, with a notable 63% and 64.2% respectively. Whereas the sub centres are only efficient up to 31%. The efficacious functioning of the grassroot health system in Kerala is a noteworthy aspect deserving scholarly attention. The second tier of the healthcare system encompasses the secondary level of care, comprising various healthcare facilities such as taluk hospitals, general government hospitals, district hospitals, and private hospitals. In the context of the tier two healthcare system, it is noteworthy to observe that private hospitals exhibit a significantly higher level of efficiency when compared to their government counterparts, surpassing them by an impressive margin of 72.2%. The proposition can be posited that the robustness of private healthcare institutions in the state of Kerala contributes significantly to the overall efficacy of the healthcare system in the region. The final tier within the healthcare system is the tertiary care system, encompassing both government and private medical college hospitals. In the state of Kerala, these establishments exhibit the lowest efficiency scores, with a respective rate of 28.6% and 15%.

It is hereby elucidated that the efficacy of a hospital is not contingent upon the quantity of available beds or the physical dimensions of the facility. The focus of this study lies solely on the optimisation of resource allocation and the maximisation of productivity in relation to inputs and outputs.

5.2 CONCLUSION OF STUDY

An integrated approach to healthcare quality and efficiency is critical for the well-being of any population, and Kerala, a state in India known for its relatively advanced healthcare system, has been working on various strategies to achieve this goal. Here are some key aspects of the integrated approach to quality and efficiency in healthcare in Kerala:

Universal Healthcare Coverage: Kerala has a long history of investing in public healthcare. The state has made significant strides in achieving near-universal healthcare coverage, ensuring that a vast majority of its population has access to healthcare services. This is a fundamental step in ensuring quality healthcare for all.

Primary Healthcare: The state has a well-developed primary healthcare system, with a network of Primary Health Centres (PHCs) and Community Health Centres (CHCs). These centres serve as the first point of contact for patients and are equipped to provide basic healthcare services, health promotion, and disease prevention.

E-health Initiatives: Kerala has embraced e-health initiatives to improve efficiency in healthcare delivery. Electronic health records, telemedicine, and other digital tools help streamline patient care, reduce paperwork, and improve access to medical information.

Quality Assurance Programs: The state has implemented quality assurance programs in healthcare institutions. Regular audits, training of healthcare professionals, and the adoption of best practices contribute to maintaining high standards of care.

Health Insurance: Kerala has been a pioneer in implementing health insurance schemes to provide financial protection to its residents. These schemes not only improve access to healthcare but also enhance the overall quality of care by ensuring that healthcare facilities are financially sustainable.

Community Participation: Kerala places a strong emphasis on community participation in healthcare. Local self-governance bodies, such as panchayats, play a role in planning and monitoring healthcare services. This community involvement helps ensure that healthcare services are tailored to the specific needs of the population.

Health Education and Awareness: Promoting health literacy and awareness is another vital aspect of Kerala's healthcare strategy. Educated patients are more likely to seek preventive care and make informed decisions about their health, contributing to overall efficiency and quality.

Public-Private Partnerships: Kerala has explored partnerships with the private sector to improve healthcare infrastructure and service delivery. This collaboration can help bridge gaps in healthcare access and bring in innovations and technology.

Disease Surveillance and Response: The state has implemented robust disease surveillance systems to detect and respond to health threats promptly. This proactive approach helps control outbreaks and ensures efficient healthcare delivery during emergencies.

Research and Innovation: Kerala encourages research and innovation in healthcare. By fostering an environment that promotes medical research and the development of new healthcare technologies, the state can continually improve the quality and efficiency of its healthcare system.

Kerala's integrated approach to healthcare quality and efficiency involves a combination of universal coverage, primary healthcare, technology adoption, community involvement, and a focus on preventive care. These strategies, along with a commitment to continuous improvement, have contributed to Kerala's reputation for having a relatively high standard of healthcare within India. However, like any healthcare system, challenges persist, including resource constraints and the need for ongoing adaptation to evolving healthcare needs and technologies.

5.2.1 Inefficiency And Slack Monitoring

The concept of slack value pertains to the inclusion of a value within an inequality constraint in order to transform it into an equality constraint. The present study examines the organisational structure of the healthcare system, specifically focusing on the decentralised set-up and the role of small zone level authorities in overseeing and assessing the performance of various healthcare associations. The primary objective is to investigate the extent to which these authorities effectively monitor and analyse the operational inefficiencies within each hospital. The efficacy of resource allocation relies heavily on the active involvement of governmental entities, as they play a pivotal role in ensuring the optimal utilisation of available resources. In order to address the issue of insufficient input from hospitals, it is imperative to establish execution-based pointers to effectively screen the slack. This will enable us to devise appropriate strategies and plans to mitigate any potential shortcomings in the system. The utilisation of data envelopment analysis (DEA) as a methodological approach holds promise in the realm of healthcare management, specifically in the context of measuring inefficiency within hospital settings. By employing DEA, it becomes possible to discern the extent of inefficiency present in hospitals and identify areas where input slack exists. This, in turn, furnishes valuable insights to hospital management, enabling them to focus their efforts on the specific areas that require attention and improvement. This study has also identified numerous deficiencies within the infrastructure utilisation of various hospitals, which could potentially be transferred to other locations in the event of an excess. Furthermore, in the context of large organisations, it is imperative for management to prioritise efficiency. The conducted inquiry furnishes pertinent data with the aim of yielding improved conditions and rational outcomes. The Ministry of Health and Family Welfare (MoHFW) aims to enhance the efficiency of asset allocation by establishing a systematic approach to determine the composition of assets based on healthcare and socioeconomic indicators. These indicators encompass factors such as population density, poverty levels, and bed occupancy ratios. The formulation of the equation can be strategically devised through a comprehensive analysis of the data obtained from the more proficient healthcare facilities. It is imperative that the Ministry of Health and Family Welfare (MoHFW) takes the lead in conducting a benchmarking study of this nature, which is typically undertaken to assess the efficacy of healthcare service providers.

5.3 RECOMMENDATIONS

5.3.1 Data Envelopment Analysis For Productive Administration

The presence of information within the context of hospital administration holds immense significance. There exist a multitude of methodologies by which information may be harnessed to achieve operational efficiency. As previously elucidated, medical institutions perpetually grapple with the quandary of determining the optimal allocation of personnel within a given temporal interval. The presence of excessive personnel within an organisation can lead to a notable escalation in labour expenses. In the event that a situation arises where there is a deficiency in the number of staff members available, it is highly probable that the level of satisfaction experienced by patients will be significantly impacted. This, in turn, has the potential to give rise to dire consequences of a potentially fatal nature. Data Envelopment Analysis (DEA) is a widely recognised method that holds significant potential for application within organisations to address the issue of proper staffing. By employing DEA, organisations can effectively evaluate the efficiency and productivity of their staffing practises, thereby enabling them to identify and rectify any deficiencies in their staffing allocation. DEA, as a non-parametric technique, offers a unique advantage in that it does not require any specific functional form assumptions. Instead, it utilises linear programming to assess the relative efficiency of multiple decision-making units, such as departments or individuals, by comparing their input and output levels. This allows organisations to comprehensively evaluate The utilisation of information in the analysis of staff distribution has the potential to significantly enhance operational productivity. The collection and documentation of patient volume data enables the appropriate allocation of medical personnel within a hospital setting, based on corresponding metrics. The aforementioned information can also be effectively employed for the purpose of staffing the operating room (OR) nursing personnel. Alternatively, medical practitioners may employ the aforementioned data to evaluate the temporal arrival patterns of nursing personnel in relation to their assigned duties. The utilisation of information can also be employed to track patient waiting durations and consultation durations, such as the quantification of the time that physicians allocate to meeting patients and providing them with medical guidance.

Upon analysis of the data, it becomes evident that patients are spending a significant amount of time in a seated position. In light of this finding, it is recommended to consider implementing specific measures such as increasing the number of staff members available to assist the doctor, enhancing the existing appointment scheduling system by identifying and addressing any exceptions, and potentially extending the hours of operation for face-to-face consultations. These strategies aim to optimise patient flow and improve overall efficiency within the healthcare setting. In order to mitigate protracted discourse durations, experts have the capacity to employ innovative solutions, such as solution scheduling, the utilisation of Electronic Health

Records (EHR), and electronic prescription composition tools, among others. The provision of various forms of aid aimed at optimising the process of designing effectively and efficiently utilizing the valuable time of nurses and doctors has garnered considerable attention.

5.3.2 Make Independent Small Units In Big Hospitals

The findings of the research indicate that the Medical College hospitals exhibit a notable degree of inefficiency. The efficiency score of these hospitals fails to reach a minimum threshold of 30%. The potential cause for this issue could be attributed to the challenges associated with managing the administrative aspects of a larger healthcare facility. According to prevailing recommendations, it is suggested that hospitals with substantial physical dimensions consider implementing a system of subdivision into smaller subgroups or subunits, thereby facilitating more efficient administration and management. The implementation of this approach has the potential to facilitate streamlined management of the designated unit, thereby potentially augmenting the operational efficacy of the broader healthcare facility.

5.3.3 Benck Marking Of Private Hospitals.

The present analysis reveals a significant disparity in the efficiency scores between government hospitals and private hospitals. The comparative analysis reveals that government hospitals exhibit an efficiency score of merely 38.8%, whereas private hospitals demonstrate a significantly higher efficiency score of 72.2%. The private healthcare sector has demonstrated a commendable ability to maximise the utilisation of inputs, thereby elevating its operational efficiencies to a heightened degree. The potential beneficiaries of these efficiency scores extend to the patients as well.

5.3.4 Use Of Electronic Health Records

The implementation of Electronic Medical Records (EMR) has been observed to enhance the interconnections between healthcare professionals and their respective patients. The utilisation and documentation of patient data, while incurring initial administrative costs, holds the potential to yield long-term benefits for policy makers in effectively harnessing this data and strategically planning hospital activities. In addition, medical institutions perpetually grapple with the quandary of determining the optimal allocation of personnel within a given temporal framework. In the event that an organisation experiences a surplus of personnel, it will inevitably lead to an escalation in labour expenses. In the event of a situation characterised by a deficiency in personnel, it is imperative to acknowledge that patient satisfaction may be adversely impacted, potentially leading to grave consequences. Data Envelopment Analysis (DEA) is a widely recognised methodology that holds significant potential for addressing the issue of proper staffing within organisations. By employing DEA, organisations can effectively evaluate and optimise their staffing levels in order to achieve enhanced operational efficiency and productivity. DEA, as a non-parametric technique, offers a unique advantage in its ability to measure the relative efficiency of decision-making units (DMUs) within a given organisation. In the context of staffing, DMUs can be considered as various departments, teams, or even individual employees. By comparing the inputs utilized by these DMUs to the outputs they generate, DEA enables organisations The availability of prescription medications and various systems through online platforms has become increasingly prevalent in recent years. The advent of the internet has revolutionised the way individuals access and obtain necessary medications and utilise various systems for their healthcare needs. This digital transformation has provided users with convenient and accessible options for acquiring prescriptions and utilizing a wide range of healthcare systems. The online The utilisation of electronic healthcare records has been found to enhance communication with patients through the utilisation of electronic messages and personal health records. This enhanced correspondence has been shown to more effectively engage patients in the management of their own care. In the event that an electronic healthcare record system is diligently maintained, it has the potential to greatly facilitate hospitals in efficiently evaluating their operational efficiency through the utilisation of the Data Envelopment Analysis (DEA) methodology. The utilisation of electronic healthcare records (EHRs) has been empirically demonstrated to enhance operational efficiencies within the healthcare domain. This is primarily achieved by reducing the temporal demands associated with physician encounters, facilitating enhanced accessibility to comprehensive patient data, streamlining medication management processes, optimising the scheduling of patient appointments, and enabling remote access to patients' medical charts.

5.3.5 Contract Authority Specialists To Expand Case Volume

In order to ensure optimal patient care and treatment outcomes, hospitals must exercise careful consideration when selecting specialists and doctors who possess expertise and recognition in specific medical domains. Private hospitals are currently equipped with a contingent of physicians who cater to the needs of patients on a demand-driven basis. This operational model is anticipated to foster an expansion in patient volume, thereby leading to substantial financial gains for these healthcare institutions. A renowned and esteemed professional in the field of healthcare attracts a substantial influx of patients seeking their expertise and specialised services.

5.3.6 Private Public Partnership

A Public-Private Partnership (PPP) in the context of a hospital involves collaboration between the public sector (typically government or a government agency) and the private sector (usually a private company or consortium of companies) to design, build, finance, operate, and/or maintain healthcare facilities or provide healthcare services. PPPs in hospitals are implemented for various reasons, including improving healthcare infrastructure, expanding access to healthcare services, and leveraging private sector expertise and resources. Here are some key aspects and benefits of PPPs in hospitals:

- Infrastructure Development: PPPs can be used to finance and develop new hospital facilities or upgrade existing ones. Private sector partners often bring investment capital and expertise in construction and facility management.
- Service Provision: In some PPP models, the private sector may be responsible for delivering healthcare services within a public hospital facility. This can include clinical services, diagnostics, and even non-clinical services like catering and maintenance.
- Efficiency: Private sector involvement can introduce efficiencies in hospital management, leading to cost savings. Private companies often have experience in optimizing operations, which can result in improved service delivery and reduced wait times.
- Innovation: Private sector partners may introduce innovative technologies and management practices to improve the quality of care and patient outcomes.
- Risk Sharing: Risks associated with project financing and operations can be shared between the public and private sectors, reducing the burden on the government while ensuring accountability.
- Timely Delivery: PPPs can expedite the construction and expansion of healthcare facilities, helping address the growing demand for healthcare services more quickly than traditional government-led projects.
- Quality Control: PPP contracts typically include performance standards and quality control measures to ensure that the healthcare services provided meet predefined standards.
- Financial Sustainability: PPPs can provide a sustainable financial model for healthcare infrastructure and services by attracting private sector investment.

- Job Creation: PPP projects can generate employment opportunities both during the construction phase and in ongoing hospital operations.
- Access to Capital: Governments may lack the necessary funds to invest in healthcare infrastructure, and PPPs can help bridge this funding gap by accessing private capital.

  challenges and criticisms
- Risk Allocation: Determining the appropriate allocation of risks between public and private sectors can be complex and may lead to disputes.
- Costs: PPP projects can be expensive to set up, with legal, financial, and administrative costs.
- Accountability: Balancing the need for private sector efficiency with public sector accountability can be challenging.
- Long-Term Commitment: PPP contracts often have long durations, and the government must carefully consider whether the terms align with its healthcare policy goals.
- Quality Concerns: The private sector's primary focus on profitability can sometimes lead to concerns about compromising the quality of healthcare services.
- Public Perception: Some individuals and groups may be opposed to the involvement of profit-driven entities in healthcare, viewing it as a potential threat to equitable access and quality.

Overall, the success of a PPP in a hospital setting depends on careful planning, transparent contracts, effective risk management, and a clear understanding of the specific goals and requirements of the healthcare system. Each PPP arrangement should be tailored to the unique circumstances and priorities of the region or country where it is implemented.

5.3.7 Healthcare Operations Management

The imperative nature of healthcare operations management cannot be overstated, particularly in light of the dynamic and ever-evolving healthcare landscape. As the healthcare sector grapples with significant transformations, it becomes increasingly crucial for healthcare administrations to prioritise the effective functioning of their operations. The field of operations management plays a pivotal role in facilitating the effective functioning of medical hospitals and healthcare frameworks. By employing various strategies and techniques, operations management enables these organisations to gain a comprehensive understanding of their work processes and subsequently enhance productivity levels. Moreover, it aids in the reduction of waiting lines and the minimization of process durations, thereby optimising the overall patient experience. Co The escalating costs associated with the delivery of healthcare services can be attributed to the inadequate implementation of operational strategies. However, it is imperative to acknowledge that with such an increase in cost, there is a discernible impact on the nature of care provided. The formulation and implementation of a comprehensive hospital activities board plan holds significant potential in facilitating the effective management of both waste and substandard quality of care within healthcare settings. Cost control is a paramount area of concentration within the realm of medical hospital administration. The contemporary healthcare system is predicated upon technological advancements and emergency-oriented interventions, a paradigm that frequently entails exorbitant costs and burdens patients with substantial financial obligations. The impact of cost control measures extends to the provision of healthcare services, affecting both the quantity and quality of care delivered to patients. The coordination between the medical staff and patients is an essential responsibility that hospital boards must undertake. The denial of treatment is an untenable proposition, as it runs counter to ethical considerations and the principles of medical care. Furthermore, the notion of unbridled growth in this context is unrealistic, as it fails to account for the limitations imposed by resource availability and logistical constraints. Thus, the optimal course of action lies in the judicious allocation and utilisation of hospital resources, thereby ensuring their efficient deployment to effectively address the prevailing circumstances.

5.3.8 Healthcare Informatics

Healthcare informatics, also known as healthcare informatics or healthcare informatics, refers to the systematic gathering and analysis of data within the realm of health services, specifically pertaining to patient medical visit information. The aforementioned field encompasses a multidisciplinary approach that leverages patient information development as a means to enhance healthcare services, primarily by fostering heightened productivity through the implementation of cost-reduction strategies, thereby facilitating greater accessibility to said services. The aforementioned endeavours encompassed the integration of disciplines such as information science, software engineering, sociology, cognitive science, management science, and various other fields. Patient informatics, as defined by the United States National Library of Medicine (NLM), encompasses an interdisciplinary field of study that focuses on the analysis and exploration of the framework, enhancement, allocation, and utilisation of information technology-based advancements within the realm of healthcare organisations. This field encompasses the management, administration, and strategic planning of IT systems within healthcare settings, with the ultimate goal of improving patient care

5.4 LIMITATIONS

In the final sections of this discourse, it is imperative to duly acknowledge certain limitations inherent in the present study. First and foremost, the application of structural quality measures can be employed in subsequent investigations. Structural quality pertains to a constituent aspect within the entirety of the healthcare process, encompassing all elements falling under the overarching category of structure. This encompasses material resources, manpower resources, as well as supplementary resources such as parking facilities, and organisational structure. The investigation of the relationship between structural quality and patient satisfaction necessitates a comprehensive examination, particularly with regards to the potential moderating role of efficiency. By incorporating efficiency as a moderator, the existing grounded concept pertaining to the association between efficiency and satisfaction can be further fortified. Furthermore, it is important to note that the present study did not undertake an analysis of monetary methodology and allocative productivity. Further investigations may delve into the intricate connections that exist between basic quality and monetary effectiveness. Furthermore, it is worth noting that the scope of this study could have been expanded to include additional states. By incorporating a comparative analysis among different states, a more comprehensive understanding of the subject matter could have been achieved.

5.5 SCOPE OF STUDY

This study presents an examination of the methodology for assessing the effectiveness of healthcare facilities within the state of Kerala. Additionally, it proposes a model that can be utilized to establish a correlation between the efficiency of these hospitals and primary care centres. The present study possesses the potential for expansion to encompass additional states within its scope. The proposed methodology possesses the potential to serve as a valuable tool for hospital authorities seeking to establish a benchmark for efficiency within their respective domains.

The present methodology employed, namely Data Envelopment Analysis (DEA), is being utilized to discern hospitals based on their efficiency, thereby enhancing their overall management. The evaluation and scrutiny of these establishments have historically posed a significant challenge. The monitoring of these institutions can be facilitated by the administration through a decentralised setup, wherein area-level healthcare specialists play a crucial role. The role of the government is fundamental in ensuring the optimal utilisation of hospital infrastructure. The proposed task necessitates the establishment of execution-based pointers to scrutinise these accolades through the utilisation of data envelopment analysis. The current recommended procedure facilitates the identification of healthcare agencies that exhibit a moderate level of inefficiency in medical hospital settings. The proposed methodology delineated in this research holds potential for utilisation by the Department of Health and Family Welfare in order to establish benchmarks for the purpose of monitoring and evaluating the performance of both public and private hospitals. Drawing upon the empirical evidence, it is recommended that a series of measures be implemented to enhance the efficacy of resource utilisation within hospital settings. The utilisation of the Data Envelopment Analysis (DEA) methodology presents a valuable approach for evaluating and comparing hospital performance subsequent to the implementation of an Electronic Medical Record (EMR) system. By employing DEA, researchers and healthcare administrators can assess the efficiency and productivity of hospitals, thereby enabling a comprehensive analysis of the impact of EMR system adoption on healthcare delivery. DEA, as a non-parametric technique, offers a robust framework for evaluating the relative performance of multiple decision-making units, such as hospitals, by considering multiple inputs and outputs simultaneously. In the context of assessing hospital performance post-EMR implementation, DEA allows for.

5.6 IMPLICATIONS IN POLICY MAKING AND SOCIETIAL

This extensive investigation represents a pioneering effort, as no similar studies have been previously undertaken within the Indian healthcare system, which evaluates the comprehensive healthcare delivery framework in a state. In this investigation, the researcher demonstrated a focused interest in evaluating the efficacy of sub-centres, primary health centres, community health centres, taluk and district hospitals, as well as private hospitals and both private and government medical colleges within the state of Kerala. Furthermore, the researcher incorporated over 10 inputs and 5 outputs to evaluate the efficiency of the decision-making units. This step facilitated an evaluation of the system's core functionality.

Through a comprehensive analysis of the various steps involved, this study has articulated significant observations for policymakers, grounded in evidence and proof, highlighting a critical flaw within the existing healthcare delivery system. Furthermore, the study proposes potential remedies to address this issue. It is imperative that the policymakers at both the state and central ministry levels actively engage with the findings and recommendations of this study. Their concerted efforts are essential for the effective implementation of these insights, aimed at enhancing the efficiency of India's healthcare infrastructure.

The researcher has chosen a topic of significant importance that occupies a leading position within the realm of study. The examination of the efficiency within the health care sector reflects a commitment to societal well-being as a primary concern of the researcher. This study, when adopted by policymakers, has the potential to significantly transform the healthcare delivery system in India, resulting in substantial positive effects on society.

CHAPTER 6

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