IDENTIFICATION OF FACTORS INFLUENCING MEDICAL EXPENSES IN RURAL AREAS OF INDIA

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ABSTRACT

The present study attempts to identify and measure technical efficiency scores on the medical expenses in 28 states of India, using Stochastic Frontier Production Function. The factors that are considered for the present study are package component, doctor/surgeon's fee, diagnostic test fee, bed charges, medicines and other. Results, based on the secondary data collected showed that the mean technical efficiency of total expenses for the hospital at rural areas is 57%, using stochastic frontier production function model. The maximum technical efficiency is 100% and the minimum technical efficiency is 13%. Except Doctor/Surgeon's fee other input factors are at 10% level of significance whereas doctor/surgeon's fee is at 5% level of significance respectively. The potential to increase the efficiency in medical expenditure is 43%.

Keywords: Total expenses, Technical efficiency, Secondary data, Mean efficiency, Stochastic frontier production model, T-ratio, Level of significance.

INTRODUCTION

Healthcare in India features a universal health care system run by the constituent states and territories of India. The Constitution charges every state with "raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties". The National Health Policy was endorsed by the Parliament of India in 1983 and updated in 2002.

Primary health care is provided by city and district hospitals and rural primary health centres (PHCs). These hospitals provide treatment free of cost. Primary care is focused on immunization, prevention of malnutrition, pregnancy, child birth, postnatal care, and treatment of common illnesses. However, the government sector is understaffed and underfinanced; poor services at state-run hospitals force many people to visit private medical practioners. (https://en.wikipedia.org/wiki/Healthcare_in_India)

Rural areas in India have a shortage of medical professionals. 74%of doctors are in urban areas that serve the other 28%of the population. This is a major issue for rural access to health care. The lack of human resources causes citizens to resort to fraudulent or ignorant providers. Doctors tend not to work in rural areas due to insufficient housing, healthcare, education for children, drinking water, electricity, roads and transportation. Additionally, there exists a shortage of infrastructure for health services in rural areas. In fact, urban public hospitals have twice as many beds as rural hospitals, which are lacking in supplies. Studies have indicated that the mortality risks before the age of five are greater for children living in certain rural areas compared to urban communities. Full immunization coverage also varies between rural and urban India, with 39% completely immunized in rural communities and 58% in urban areas across India. Inequalities in healthcare can result from factors such as socioeconomic status and caste, with caste serving as a social determinant of healthcare in India.(https://phdessay.com/government-hospitals-of-india/)

A statistic tells that "India has one government doctor for every 11,528 people and one nurse for every 483 people!" (https://www.indiatoday.in/education-today/featurephilia/story/medical-education-problems-327613-2016-07-06)

METHODOLOGY AND MODELS

Stochastic frontier analysis (SFA) refers to a body of statistical analysis techniques used to estimate production or cost functions in economics, while explicitly accounting for the existence of firm inefficiency. Stochastic Frontier uses standard production methodology hence it is a "Parametric technique". There are different functional forms used in the model functions like the Cobb Douglas form, Quadratic, Normalised Quadratic and Translog function. The following research paper constitutes the Cobb Douglas form, which is;

$$y = a + x_1 + x_2 + x_3 + x_4 + x_5 + x_6$$

On taking log on both sides,

$$\log y = Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$$

where, $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the parameters of the variables and $X_1, X_2, X_3, X_4, X_5, X_6$ are the log values of the variables

DATA AND ANALYSIS

The secondary data is collected from the report "Health in India" released by the National Sample Surveys (NSS) Health in 71st round [NSS Report No. 574: Health in India; page no. A101]. The data is about the average medical expenditure (Rs.) per hospitalisation case in the rural area of India, during the year 2014.(file:///I:/RP-Health/secondary%20data%20health.pdf)

Utilizing the secondary data acquired, the output is fixed to be as the total expenses, and the inputs are package component, doctor/surgeon's fee, diagnostic test fee, bed charges, medicines and other. The summary statistics of the survey variable, MLE estimates, Technical efficiency estimates and summary statistics of technical efficiency estimates are given in the Table1, Table 2, Table 3 and Table 4 respectively. The Potential to increase the efficiency is given in the calculation. The Bar graphs of Parameter r, Coefficient t, Standard error and T-ratio; and for Firm and Efficiency estimates are given in the Graph 1 and Graph 2 respectively.

Table 1: Summary Statistics of the Survey variables:

Variable	Maximum	Minimum	Mean	Median	Mode	Variance	Standard deviation
Package component	15389	115	3720.9	2657	Nil	12825866.4	3581.3
Doctor/Surgeon fee	4199	78	1837.6	1510.5		1627034.0	1275.6
Diagnostic fee	2921	541	1408.1	1266		337581.3	581.0
Bed charges	2825	169	1274.5	1101		697049.1	834.9
Medicines	7086	1911	3846.6	3370		1732438.7	1316.2
Other	3612	303	1173.8	1008.5		514928.1	717.6

Table 2: MLE estimates

Variable	Parameter r	Coefficient t	Standard error	T-ratio
Constant	Beta 0	1.92	0.99	1.95
Package component	Beta 1	0.26	0.87	0.30
Doctor/Surgeon fee	Beta 2	1.64	0.66	2.47
Diagnostic fee	Beta3	0.42	0.91	0.46
Bed charges	Beta4	-0.58	0.79	-0.74
Medicines	Beta5	0.95	0.84	1.14
Other	Beta6	-1.16	1.03	-1.13

Table 3: Technical efficiency estimates

State	Efficiency estimates	State	Efficiency estimates
Andhra Pradesh	0.86	Maharashtra	0.66
Arunachal Pradesh	0.23	Manipur	0.68
Assam	0.53	Mizoram	0.17
Bihar	0.69	Nagaland	0.38
Chhattisgarh	0.85	Odisha	0.88
Delhi	0.13	Punjab	0.35
Gujarat	0.50	Rajasthan	0.86
Haryana	0.56	Sikkim	0.13
Himachal Pradesh	0.37	Tamil Nadu	0.61
Jammu & Kashmir	0.51	Telangana	0.44
Jharkhand	0.60	Tripura	0.46
Karnataka	0.65	Uttar Pradesh	0.92
Kerala	1.00	Uttarakhand	0.31
Madhya Pradesh	0.80	West Bengal	0.71

Table 4: Summary statistics of technical efficiency estimates

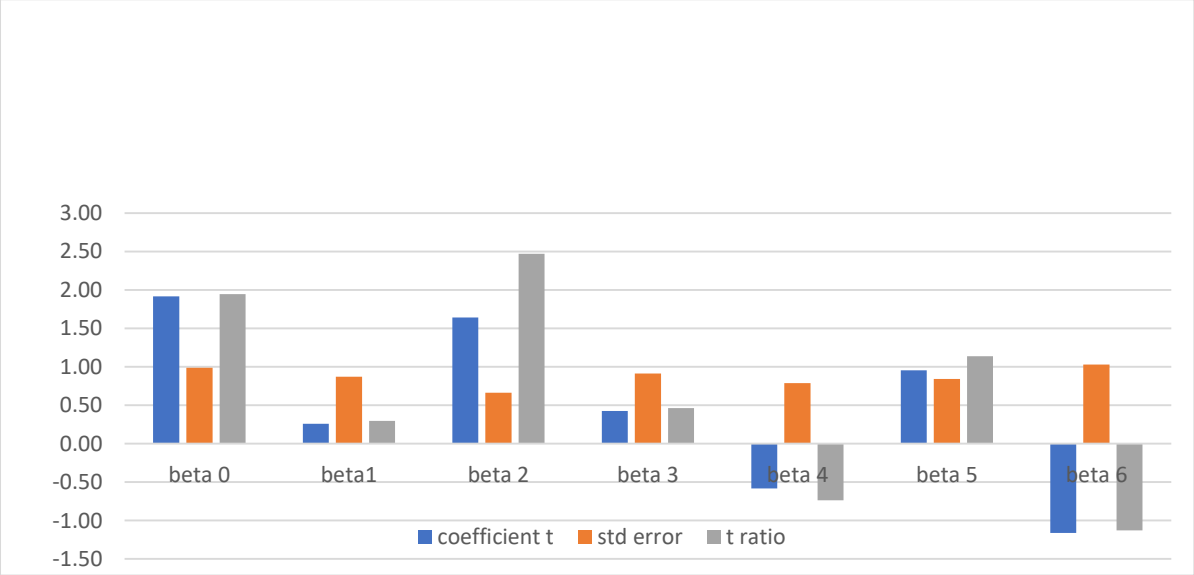
Standard deviation	0.25
Mean	0.57
Median	0.58
Mode	Nil
Maximum	1.00
Minimum	0.13

Calculation:
Potential to increase the efficiency of the medical expenditure is given as,

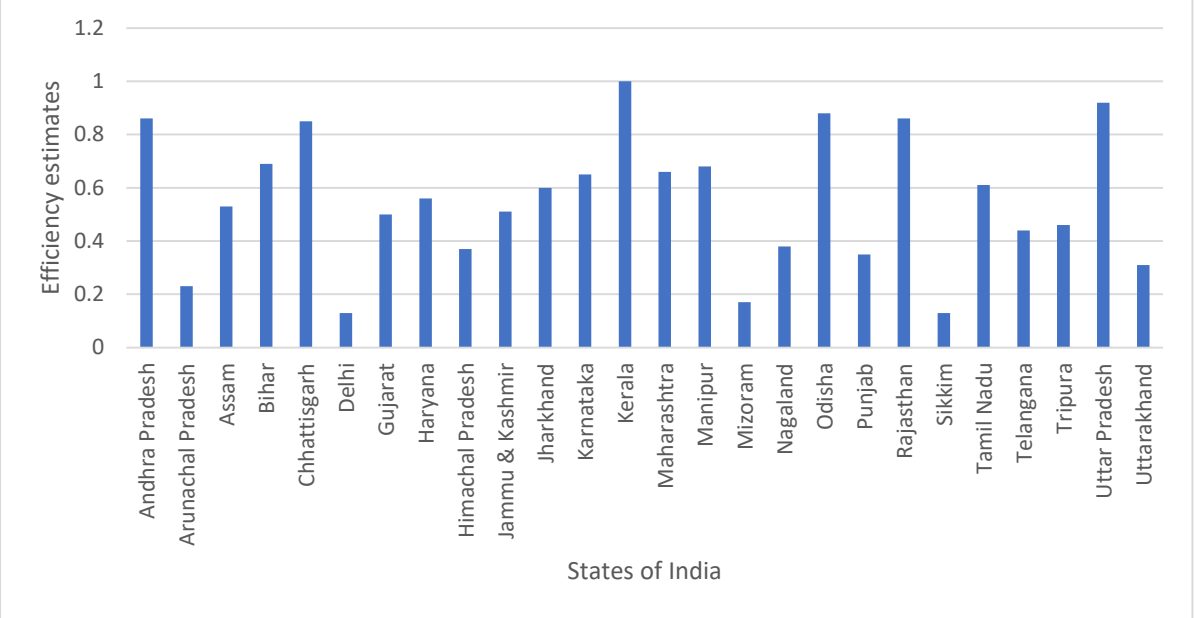
$$\left[1 - \left(\frac{Mean\ Technical\ efficiency\ of\ the\ system}{Maximum\ technical\ estimate}\right)\right] \times 100$$

$$\Rightarrow \left[1 - \left(\frac{0.57}{1.00}\right)\right] \times 100 = 0.43 \times 100 = \mathbf{43\%}$$

Graph 1 : MLE estimates



Graph 2 : Technical efficiency estimates



RESULTS AND DISCUSSION

The results of this study indicated that the performances of the hospitals in rural areas are satisfactory. It is suggested that the effect of various factors, such as the quality of health care and the patients' satisfaction, be considered in the future studies to assess hospitals' performances.

The obtained t-ratio for area package component, doctor/surgeon's fee, diagnostic test fee, bed charges, medicines and other is 0.30, 2.47, 0.46, -0.74, 1.14 and -1.13. The mean efficiency is at 57%.

It is noted that Kerala has the maximum technical efficiency whereas Delhi and Sikkim are at minimum technical efficiency in medical expenditure.

The potential to increase the efficiency in medical expenditure is 43%.

CONCLUSION

The overall performance of the rural hospitals in the year 2014 was satisfactory. However, it is suggested that managers and planners of hospitals implement and design programs based on proper timing and plan measurement in order to use resources effectively and efficiently for the upcoming years.

Thus, the conclusion is that it is good to avoid unhealthy foods to maintain a good health. It is wise to practice some measures followed by our ancestors through which they were able to live a long and healthy life. These all are the measures through which we would be able to have a healthy life and would be able to reduce the usage of hospital.

The results of this paper suggest that different SFA production function definitions have various effects on model findings. This finding is supported by the analysis of mean efficiency distribution along with different hospital characteristics in the rural areas.

The results and interpretations of this study is limited within the framework of data set used. Therefore, the readers should consider the possibility of the results to be biased, before making further comments and statements about these findings.

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