Analysis of health resource allocation efficiency of township hospitals in China

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Abstract. This paper aims to analyze the distribution of health resources in township hospitals in China from 2015 to 2018, and to provide Suggestions for improving the utilization efficiency of health resources in township hospitals by selecting 29 provinces/autonomous regions/municipalities directly under the Central Government (except Beijing and Shanghai) as the research objects. DEA-BCC model and DEA-Malmquist index model were used to analyze the utilization efficiency of health resources allocation in China's township health centers. Results are: In 2018 in the country, 29 provinces, cities and towns and townships, the comprehensive technical efficiency, pure technical efficiency and scale efficiency of mean value of the allocation of health resources is respectively 0.585, 0.751, 0.802, including Tianjin, Jiangsu, Zhejiang, Qinghai, Ningxia and other regions with theirs comprehensive efficiency be 1, DEA, being relatively effective, the comprehensive efficiency of other 24 regions are less than 1, being weak DEA efficient or relatively invalid; From 2015 to 2018, the average total factor productivity index of township health centers in nationwide was 0.979, with an average decrease of 2.1%, the change index of technical efficiency decreased by 1.3%, and the technological progress index decreased by 0.9%. It comes to a conclusion the level of overall resource allocation efficiency of township health centers in China is low with an unbalanced overall resource allocation, and the total factor productivity as a whole shows a downward trend. It is necessary to rationally plan the distribution of health resources in township hospitals, to increase technical input, improve the overall level of medical services, and balance the differences among regions, update the management concept of township health center managers, promote smart medical treatment and fine management, strengthen financial support and policy preference, promote the technological progress of township hospitals, and improve the efficiency of health resources use.

1. Introduction
Health resources refer to the sum of the elements used to carry out various health service activities, including human resources, material resources, financial resources, etc [1]. The outline of the "Healthy China 2030" plan calls for promoting equal access to basic public services, gradually narrowing the differences in basic health services and health levels among regions, achieving universal health coverage, and promoting social equity, with emphasis on the community level. Township hospitals, as an important part of the three-level rural health service network, undertake the important work of residents' medical treatment, epidemic prevention and health care, and are also an important link to
solve the "difficult and expensive medical treatment" of rural residents [2]. Through literature analysis, it is found that township health centers still have problems such as low efficiency of hospitals, serious brain drain and failure to attract patients [3]. Rational allocation of health resources of township hospitals and effective play of the role of "gatekeeper" at the grass-roots level have a strong supporting role for the long-term and sustainable development of township hospitals. In this paper, the data of the national township health centers from 2015 to 2018 were selected, and the static and dynamic analysis of the health resource allocation of township health centers was carried out through DEA-BCC model and Malmquist index model, so as to provide the basis for the rational allocation and effective utilization of health resources.

2. Sources and methods

2.1. Index selection

Through the study of relevant literature and expert consultation [3-9], 3 input indexes including the number of institutions, the number of beds, and the number of health technicians in township hospitals, as well as 3 output indexes including the number of patients, the utilization rate of hospital beds, and the average length of stay were finally confirmed.

2.2. Data sources

Input-output data of health resources of township health centers are from China's Statistical Yearbook of Health and Family Planning (2016-2017) and China's Statistical Yearbook of Health (2018-2019). Due to the lack of relevant data of township hospitals in Beijing and Shanghai in China Health Statistics Yearbook, 29 provinces/autonomous regions/municipalities directly under the Central Government except Beijing and Shanghai were selected as the research objects to analyze the utilization efficiency of health resource allocation in township hospitals during 2015-2018.

2.3. Research methods

Data envelopment analysis (DEA) is a method to measure the relative effectiveness of decision making units based on the input and output indicators of decision making units [8]. Among them, DEA has three main models: CCR model analyzes the overall efficiency of the decision unit in the same period based on the constant return to scale; BCC model analyzes the comprehensive efficiency, pure technical efficiency and scale efficiency of decision making unit under the circumstance of variable scale reward. The Malmquist index model is mainly used to analyze the dynamic (multi-year) total factor productivity and technical level of decision making units [10-11]. The DEA-BCC model and Malmquist index model were used to analyze and evaluate the health resource allocation efficiency of township hospitals in China from 2015 to 2018 under the condition of fixed health resource investment and variable scale reward. The specific indicators are shown in Table 1.

| Measure results   | The specific situation of each index of DEA                                      |
|-------------------|--------------------------------------------------------------------------------|
| DEA efficient     | The comprehensive technical efficiency, pure technical efficiency and scale    |
|                   | technical efficiency are all 1                                               |
| Weak DEA efficient| The comprehensive technical efficiency is less than 1, pure technical efficiency|
|                   | or scale technical efficiency is less than 1                                    |
| Non-DEA efficient | The comprehensive technical efficiency, pure technical efficiency and scale    |
|                   | technical efficiency are all less than 1                                      |
3. Results and analysis

3.1. Basic information of the input and output of health resources in township hospitals nationwide

In 2018, there were 36,461 township hospitals with a total of 1,333,909 beds, 1,181,000 health technicians, and 1,115,958,000 clinics. However, the utilization rate of hospital beds was low, only 59.6%, with an average length of stay of 6.4 days. On the whole, the utilization rate of hospital beds, the number of institutions and the number of beds in the central and western regions are higher than those in the eastern regions, but the number of health technicians and the number of medical practitioners in the eastern regions is higher than that in the central and western regions. According to the basic resources of township health centers in various provinces and cities, the number of patients in township health centers in Henan province ranks the first in China, reaching 108,333,667. The utilization rate of hospital beds in township hospitals in Hubei province was the highest, reaching 76.5. Sichuan has the largest number of township hospitals with 4,433 institutions, 131,474 beds and 93,589 health workers. This indicates that Sichuan province invests more health resources in township health centers, but the medical service users in the township health centers in Henan province are more popular, and the utilization of hospital bed resources in the township health centers in Hubei Province is more reasonable. In 2018, the input-output indexes of health resources in all regions (except Beijing and Shanghai) and township hospitals in all regions are as follows (see Table 2 and 3).

| Region          | Output indicators | Input indicators |
|-----------------|-------------------|------------------|
|                 | Number of patients (per person) | Bed utilization rate (%) | Average length of stay (day) | Number of institutions (units) | Number of beds (pieces) | Number of health technicians (persons) |
| The eastern region | 447191913         | 55               | 6.8                         | 9342                          | 391916               | 413122                          |
| The central region | 324934655         | 62.1             | 6.4                         | 11404                         | 481388               | 373367                          |
| The western region | 343831105         | 60.9             | 6.2                         | 15715                         | 460605               | 394636                          |

Note: The eastern region includes Beijing, Tianjin, Liaoning, Hebei, Shanghai, Shandong, Zhejiang, Jiangsu, Fujian, Guangdong and Hainan. The central region includes Heilongjiang, Jilin, Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan. The western region includes Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang. The data of township hospitals in Beijing and Shanghai were missing, so the eastern region lacked Beijing and Shanghai.

Table 3. The input-output of health resources of township hospitals in 2018.

| Region | Output indicators | Input indicators |
|--------|-------------------|------------------|
|        | Number of patients (per person) | Bed utilization rate (%) | Average length of stay (day) | Number of institutions (units) | Number of beds (pieces) | Number of health technicians (persons) |
| Total  | 1115957673        | 59.6             | 6.4                         | 36461                         | 1333909              | 1181125                         |
| Province       | Population | Urbanization Rate | GDP (2017) | GDP Per Capita (2017) | GDP Growth Rate (2017) |
|----------------|------------|-------------------|------------|-----------------------|------------------------|
| Tianjin       | 1118660    | 29.9              | 141        | 4156                  | 4785                   |
| Hebei         | 37669318   | 51.2              | 2005       | 71819                 | 46252                  |
| Shanxi        | 12999311   | 34.2              | 1313       | 31018                 | 20800                  |
| Inner Mongolia| 11164829   | 37.6              | 1301       | 22443                 | 18582                  |
| Liaoning      | 18879270   | 43.0              | 1032       | 31889                 | 18802                  |
| Jilin         | 10381316   | 32.2              | 777        | 18015                 | 18786                  |
| Heilongjiang  | 8095059    | 41.2              | 972        | 23886                 | 18953                  |
| Jiangsu       | 95010187   | 64.8              | 1053       | 70655                 | 80588                  |
| Zhejiang      | 103560583  | 52.7              | 1155       | 18781                 | 48514                  |
| Anhui         | 58985812   | 55.9              | 1365       | 58458                 | 47492                  |
| Fujian        | 30082642   | 45.2              | 881        | 30845                 | 31926                  |
| Jiangxi       | 29305492   | 66.2              | 1588       | 56328                 | 42213                  |
| Shandong      | 73425470   | 60.4              | 1592       | 97171                 | 91972                  |
| Henan         | 108333667  | 63.1              | 2042       | 114445                | 84447                  |
| Hubei         | 54379337   | 76.5              | 1139       | 77677                 | 68705                  |
| Hunan         | 42454661   | 69.8              | 2208       | 101561                | 71971                  |
| Guangdong     | 70046256   | 54.5              | 1184       | 60584                 | 81174                  |
| Guangxi       | 45621530   | 59.9              | 1264       | 65278                 | 64270                  |
| Hainan        | 11399527   | 39.0              | 299        | 6016                  | 9109                   |
| Chongqing     | 19984296   | 76.3              | 872        | 42048                 | 28829                  |
| Sichuan       | 99266468   | 72.2              | 4433       | 131474                | 93589                  |
| Guizhou       | 34735531   | 47.8              | 1341       | 42349                 | 40432                  |
| Yunnan        | 55743238   | 50.6              | 1355       | 52877                 | 44223                  |
| Tibet         | 4569848    | 24.0              | 678        | 3653                  | 3965                   |
| Shaanxi       | 23888469   | 50.9              | 1544       | 36220                 | 43447                  |
3.2. Static analysis of health resource allocation efficiency based on DEA-BCC model

The DEA-BCC model is used to analyze the health resource allocation efficiency of township hospitals in 29 provinces and cities in China in 2018. The results are shown in Table 4. The mean values of the comprehensive technical efficiency, pure technical efficiency and scale efficiency of the health resources allocation of township hospitals in 29 provinces and cities were 0.585, 0.751 and 0.802 respectively, indicating that the overall resource allocation efficiency of township hospitals was relatively low. The comprehensive technical efficiency, pure technical efficiency and scale technical efficiency of Tianjin, Jiangsu, Zhejiang, Qinghai and Ningxia are all 1. The scale return remains unchanged, and DEA is relatively effective, indicating that the allocation of health resources in these provinces and cities reaches "Pareto Optimality", maximization of input and utilization, and maximization of output efficiency. Shanxi, Henan, Hubei, Hainan, Chongqing, Sichuan, Tibet, Xinjiang and other regions of the pure technical efficiency is 1, but the comprehensive technology efficiency and scale efficiency of less than 1, are all weak DEA effective, including Shanxi, Henan, Hubei, Hainan, Chongqing, Sichuan, Xinjiang and other regions the size of diminishing returns, in towns and townships health resources in these areas are redundant, investment growth is greater than the output growth, short-term scale results in the decrease of output efficiency; The increasing return to scale in Tibet indicates that the input of health resources in the region is insufficient, but the output growth is higher than the input growth. DEA in Heilongjiang is weak and effective, and its scale technical efficiency is 1, but the comprehensive technical efficiency and pure technical efficiency are only 0.295, indicating that township hospitals in Heilongjiang have a low output efficiency due to the very insufficient input of health resources, which ultimately leads to a poor level of health resource allocation efficiency. DEA of the other 15 provinces and cities is the non-DEA efficient. Inner Mongolia and Jilin show increasing returns to scale, indicating that their health resource investment is insufficient. The health resources of towns and villages in Inner Mongolia and Jilin can be optimized by increasing the investment. The other 13 provinces and cities all show the trend of diminishing returns to scale, with output growth rate less than input growth rate and insufficient output.

Table 4. DEA analysis results of health resource allocation efficiency of national township hospitals in 2018.

| Region      | Comprehensive technical efficiency (crste) | Pure technical efficiency (vrste) | scale technical efficiency (scale) | reward of scale |
|-------------|------------------------------------------|---------------------------------|-----------------------------------|-----------------|
| Tianjin     | 1.000                                    | 1.000                           | 1.000                             | -               |
| Hebei       | 0.415                                    | 0.456                           | 0.911                             | drs             |
| Shanxi      | 0.371                                    | 1.000                           | 0.371                             | drs             |
| Inner Mongolia | 0.365                                  | 0.368                           | 0.993                             | irs             |
Liaoning  0.557  0.794  0.702  drs
Jilin    0.335  0.336  0.997  irs
Heilongjiang 0.295  0.295  1.000  -
Jiangsu  1.000  1.000  1.000  -
Zhejiang 1.000  1.000  1.000  -
Anhui    0.608  0.678  0.897  drs
Fujian   0.490  0.523  0.936  drs
Jiangxi  0.384  0.609  0.631  drs
Shandong 0.537  0.589  0.912  drs
Henan    0.606  1.000  0.606  drs
Hubei    0.617  1.000  0.617  drs
Hunan   0.309  0.473  0.653  drs
Guangdong 0.678  0.687  0.987  drs
Guangxi  0.464  0.595  0.780  drs
Hainan   0.787  1.000  0.787  drs
Chongqing 0.448  1.000  0.448  drs
Sichuan  0.508  1.000  0.508  drs
Guizhou  0.439  0.457  0.961  drs
Yunnan  0.615  0.634  0.970  drs
Tibet    0.809  1.000  0.809  irs
Shaanxi  0.301  0.431  0.699  drs
Gansu   0.441  0.844  0.522  drs
Qinghai  1.000  1.000  1.000  -
Ningxia  1.000  1.000  1.000  -
Xinjiang 0.577  1.000  0.577  drs
Mean    0.585  0.751  0.802

Note: "drs", "irs" and "-" in the table refer to diminishing, increasing, and constant returns to scale, respectively. crste = vrste *scale, where an index greater than 1 indicates improvement in technical efficiency, an index less than 1 indicates decline in technical efficiency, and an index equal to 1 indicates unchanged technical efficiency.

3.3. Dynamic analysis of health resource allocation efficiency based on DEA-Malmquist index model

3.3.1. Change of Malmquist index of health resources in township health centers nationwide from 2015 to 2018. Dea-malmquist index model was used to analyze the change of total factor productivity of health resources in township hospitals, and the results are shown in Table 5. From 2015 to 2018, the average total factor productivity index of township health centers nationwide was 0.979, with an average drop of 2.1%. The change index of technical efficiency and the change index of technological progress decreased 1.3% and 0.9%, respectively, and the change index of pure technical efficiency and the change index of scale efficiency decreased 0.8% and 0.5%, respectively. From the perspective of year-to-year changes, the total factor productivity index shows a gradually decreasing trend. In 2017-2018, the total factor productivity index declines the most, by 4.9%, among which the technical efficiency change index decreases by 1.7% and the technical progress index decreases by 3.2%. The
change index of technical efficiency increased the most in 2015-2016, with an increase of 0.7%, and
decreased the most in 2016-2017, with a decrease of 2.8%. The technology progress index increased
by 1.4% in 2016-2017 and declined in the other two years. The change index of pure technical
efficiency increased 2.1% in 2017-2018, decreased to different degrees in 2015-2016 and 2016-2017,
and decreased to the greatest extent in 2015-2015, with a decrease of 3.8%. The scale efficiency
change index increased by 4.7% in 2015-2016 and declined by the most in 2017-2018, by 3.7%.

Table 5. Malmquist index and decomposition index of health resources of township health centers in
China from 2015 to 2018.

| Year     | Technical efficiency Change Index (effch) | Technical Progress Index (tech) | Pure technical efficiency change Index (pech) | Scale efficiency change Index (sech) | Total Factor productivity Index (tfpch) |
|----------|------------------------------------------|---------------------------------|---------------------------------------------|------------------------------------|--------------------------------------|
| 2015-2016| 1.007                                    | 0.992                           | 0.962                                       | 1.047                              | 0.998                                |
| 2016-2017| 0.972                                    | 1.014                           | 0.994                                       | 0.979                              | 0.986                                |
| 2017-2018| 0.983                                    | 0.968                           | 1.021                                       | 0.963                              | 0.951                                |
| Mean     | 0.987                                    | 0.991                           | 0.992                                       | 0.995                              | 0.979                                |

Note: tfpch=effch*tech, effch=pech*sech.

3.3.2. Change of Malmquist index of health resources in township and town health centers in 29
provinces and cities from 2015 to 2018. From 2015 to 2018, 11 regions with total factor productivity
index greater than 1 were Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Fujian, Shandong, Henan, Hunan,
Guangdong and Guizhou. Liaoning province had the highest total factor productivity index at 1.043,
with an average increase of 4.3%. The technical efficiency change index was greater than 1, with an
increase of 5.6%. However, the technological progress index was less than 1, which decreased by
1.2%. Since the improvement of the technological efficiency change index was greater than the
decline of the technological progress index, the total factor productivity index increased to some
extent, indicating that the health resource allocation efficiency of township hospitals in these regions
showed an overall trend of increase. In the other 18 regions, the total factor productivity index was
less than 1, and the efficiency of health resource allocation decreased. Among them, the total factor
production index of Tibet was at least 0.860, which decreased by 14%. It was the result of the joint
decline of technical efficiency change index and technical progress index. The total factor productivity
index of 18 regions declined, 5 regions were caused by technological efficiency decline, 6 regions
were caused by technological efficiency decline, and 7 regions were caused by both technological
efficiency decline and technological regression. In combination with the overall situation, the decline
of technical efficiency and technical decline jointly restrict the growth of health resource allocation
efficiency of township hospitals (see Table 6 for the specific situation).

Table 6. Malmquist index and decomposition index of health resources of township health centers in
29 provinces and cities from 2015 to 2018.

| Region | Technical efficiency Change | Technical Progress Index (tech) | Pure technical efficiency change Index | Scale efficiency change Index | Total Factor productivity Index |
|--------|-----------------------------|---------------------------------|----------------------------------------|-------------------------------|---------------------------------|

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| Province          | Index(efch) | (pech) | (sech) | (tfpch) |
|------------------|------------|--------|--------|---------|
| Tianjin          | 1.000      | 0.928  | 1.000  | 0.928   |
| Hebei            | 0.937      | 1.004  | 0.922  | 1.017   | 0.941   |
| Shanxi           | 0.955      | 0.991  | 1.000  | 0.955   | 0.947   |
| Inner Mongolia   | 0.992      | 0.976  | 0.991  | 1.001   | 0.968   |
| Liaoning         | 1.056      | 0.988  | 1.188  | 0.889   | 1.043   |
| Jilin            | 1.040      | 0.979  | 0.823  | 1.264   | 1.018   |
| Heilongjiang     | 0.995      | 0.957  | 0.874  | 1.138   | 0.952   |
| Jiangsu          | 1.000      | 1.036  | 1.000  | 1.000   | 1.036   |
| Zhejiang         | 1.000      | 1.023  | 1.000  | 1.000   | 1.023   |
| Anhui            | 1.029      | 1.009  | 0.994  | 1.035   | 1.038   |
| Fujian           | 1.004      | 1.001  | 0.988  | 1.016   | 1.005   |
| Jiangxi          | 0.967      | 0.989  | 0.973  | 0.994   | 0.957   |
| Shandong         | 0.974      | 1.030  | 1.003  | 0.971   | 1.003   |
| Henan            | 0.960      | 1.044  | 1.000  | 0.960   | 1.002   |
| Hubei            | 0.964      | 1.015  | 1.000  | 0.964   | 0.978   |
| Hunan            | 1.006      | 0.999  | 0.995  | 1.011   | 1.005   |
| Guangdong        | 0.974      | 1.036  | 0.977  | 0.997   | 1.009   |
| Guangxi          | 0.937      | 1.026  | 0.943  | 0.994   | 0.962   |
| Hainan           | 0.997      | 0.986  | 1.078  | 0.925   | 0.983   |
| Chongqing        | 1.006      | 0.967  | 1.000  | 1.006   | 0.973   |
| Sichuan          | 0.965      | 1.014  | 1.000  | 0.965   | 0.979   |
| Guizhou          | 1.038      | 1.002  | 1.017  | 1.021   | 1.040   |
| Yunnan           | 0.931      | 1.011  | 0.907  | 1.026   | 0.941   |
| Tibet            | 0.932      | 0.923  | 1.000  | 0.932   | 0.860   |
| Shaanxi          | 0.963      | 0.989  | 1.038  | 0.928   | 0.953   |
| Gansu            | 1.011      | 0.978  | 1.117  | 0.905   | 0.989   |
| Qinghai          | 1.000      | 0.925  | 1.000  | 1.000   | 0.925   |
| Ningxia          | 1.000      | 0.955  | 1.000  | 1.000   | 0.955   |
| Xinjiang         | 1.010      | 0.977  | 1.000  | 1.010   | 0.987   |

4. Discussion

4.1. The overall level of health resource allocation is low, and the regional resource allocation is not balanced

In 2018, the mean value of the comprehensive efficiency of health resource allocation in township hospitals nationwide was 0.585, indicating that the overall health resource allocation in township hospitals nationwide was low. DEA results of township health centers in 29 regions show that the
comprehensive technical efficiency of Tianjin, Jiangsu, Zhejiang, Qinghai, Ningxia is 1, and the health resource allocation efficiency DEA is relatively effective. Other regions are in weak effective or ineffective state, among which the comprehensive technical efficiency of Heilongjiang, Shaanxi, Hunan and other regions is only 0.295, 301, 309, respectively, indicating that there are large regional differences in the efficiency of health resources allocation in towns and villages across the country, and the health resources allocation is very unbalanced.

4.2. Total factor productivity of health resource allocation shows a downward trend, and is influenced by changes in technological efficiency and technological progress index

From 2015 to 2018, the total factor productivity of health resource allocation in township hospitals across the country dropped from 0.998 to 0.951, and the efficiency showed a downward trend and the decline gradually expanded. The average annual technological efficiency change index and technological progress index both declined to different degrees, and the index values were 0.987 and 0.991 respectively. In 2015-2016, the decline in total factor productivity was mainly due to the technical recession. In 2016-2017, the technical level has been improved to some extent, but the total factor productivity has declined due to the sharp decline in technical efficiency. In 2017-2018, both the decline in technological efficiency and the decline in technological decline resulted in a significant reduction in total factor productivity. On the whole, the Malmquist index is influenced by both the technological efficiency change index and the technological progress index, and the influence of the technological efficiency change index is greater than that of the technological progress index. There are some problems in the management and technology of township health centers nationwide.

5. Suggest

In terms of the scale of township hospitals, it is necessary to increase the input of health resources in township hospitals, improve the overall level of medical services, rationally plan the distribution of regional health resources, and balance the differences among regions. Parts such as Shanxi, Chongqing technical efficiency is 1, but the scale of technical efficiency less than 0.500, the present size of diminishing returns, the output and input does not match, output growth is lower than investment growth, according to the situation of the region, towns and townships should take scientific and reasonable planning investment scale, improve output efficiency of health resources, lead to the relative DEA effective. The scale technical efficiency of township health centers in Heilongjiang is 1, but the technical efficiency is only 0.295. Its comprehensive technical efficiency is mainly affected by technical efficiency. To improve the allocation efficiency of health resources in this region, the technical efficiency can be improved by increasing the input of health resources and introducing excellent health technical personnel. In the areas where DEA is ineffective, not only the technical level should be improved, but also the scale of township hospitals and the input of health resources should be adjusted scientifically, so as to improve the allocation of health resources. In order to improve the allocation efficiency of health resources, we should not blindly increase the input of resources or expand the scale, but should make targeted resource planning and allocation to avoid resource waste.

At the level of personnel training in township hospitals, it is necessary to continuously strengthen the professional technical training of health personnel in township hospitals, carry out relevant exchange conferences, invite experts in the industry to give lectures, and improve the medical service ability of health personnel. At the same time, it can cooperate with medical colleges and universities to jointly cultivate high-level medical technical personnel, and continuously provide professional technical personnel for township hospitals to ensure the normal provision of medical services within the hospital.

Based on management level in towns and townships, update towns and townships managers management idea, promote the wisdom of medical and company managers by keeping up with the development of The Times, learning a new management pattern, the medical management informatization and make efficient information service platform, to apply "Internet + medical" model.
in towns and townships [12], promoting efficiency of management of towns and townships and technical efficiency.

It is necessary to strengthen the financial support and policy preference for township health centers at the level of government decision-making. Studies have shown [13] that government financial subsidies have a significant impact on the technical efficiency index of township health centers. By increasing the financial subsidies of township health centers, it is possible to introduce advanced medical equipment and promote the technological innovation of township health centers, so as to promote their technological progress. The government's implementation of preferential policies for medical treatment at the grass-roots level and the policy of assistance at the grass-roots level can guide residents to seek medical treatment at the grass-roots level, which can not only solve the problem of residents' difficulty in seeking medical treatment, but also promote the construction of medical alliance and the sustainable development of township hospitals, so as to maximize the utilization of health resources of township hospitals.

Due to certain limitations in the study, only some internal factors of township hospitals were selected for analysis, and lacks the influence analysis of external factors. Therefore, the key approaches to solve the problem could not be found intuitively. In the later research, regression analysis will be used to further analyze the factors affecting the efficiency of township health centers.

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