Evaluation of the Effect of New Health Reform Policy of China Based on Prospect Theory

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Abstract

Background: New health reform policy of China has gone through more than ten years from 2009 to 2019, it has come a critical period. It is important to evaluate the effect of health system reform policy, but there are a few existing studies and the researchers have not considered the impact of psychological factors on person decision-making. This study using the prospect theory can overcome this defect. Let the evaluation of the effect of new medical reform policy of China more scientific and reasonable.

Methods: Data on the effect of the new health reform from China Health Statistics Yearbook and National Bureau of Statistics of China were obtained. And the indicators were selected by Corrected Item Total Correlation and Cronbach’s α reliability coefficient. The selected indicator data were calculated by the prospect theory model. Meanwhile the gray relation analysis method is introduced to enlarge the difference between the advantages and disadvantages to making the comprehensive evaluation result more obvious.
Results: The results of comprehensive evaluation of the effects of health reform policies in China fluctuated from 2000 to 2017. From 2000 to 2004, the fluctuation range of the comprehensive prospect value is large; from 2004 to 2009, the comprehensive prospect value shows a slow downward trend; from 2009 to 2012, the comprehensive prospect value has decreased slightly, and then it has rebounded substantially; from 2012 to 2014, the comprehensive prospect value is stable; and from 2014 to 2017, the comprehensive prospect value is declining.

Conclusions: This study showed that the implementation of new health reform policy of China has a significant impact on China's medical and health system. The new health reform advanced hard in exploration. It is worth affirming that the overall goal and direction of the new health reform are correct, but the practice is unsatisfactory. The releasing and implementation of supporting policy have the important influence on the progress of the new health reform. And the effect of the policy will decrease with the increase of the total amount. Therefore, scientific and effective late management can ensure that the policy continues to play its role.

Keywords: new health reform; prospect theory; policy evaluation

Background

With the publication of the document on *Deepening the Reform of the Medical and Health System* in March 2009, China has begun a new health reform[1]. A sound basic medical and health system has been established by the new health reform of covering urban and rural residents, to ensure the safety, effectiveness, quality and
low cost of medical treatment for Chinese[2,3]. New health reform policy of China has gone through more than ten years from 2009 to 2019. In the past ten years, health system of China has been continuously improved. The public hospital reform, hierarchical medical system and essential drugs system have been improved steadily [4]. But there are still some difficult problems remain unresolved, Chinese have been puzzled by "difficulty and high cost of getting medical service ". Nowadays, health reform policy of China has come a critical period. At this point, evaluating the effect of health system reform policy by using scientific methods is critical to its continued advancement.

Since the new health reform policy launched by China, there are a large number of researchers have analyzed and discussed the new health reform policy from different perspectives, and they have been seeking scientific and effective evaluation methods. The data related to health system reform policy from 2000 to 2017 will be analyzed in this study, the scientific and reasonable models and evaluation indicators will be selected. And then try to explore the variation of effects before and after the implementation of the new health reform policies, so as to analyze various new health reform policies and provide suggestions and references for further improvement of the new health reform policies in China.

After reform and opening up, China has accelerated the pace of economic development[5 - 7]. In order to develop the health services with Chinese characteristics, China has began a long-term health system reform[8]. Health system
of China has undergone a transformation from government-led to market-led mode before 2009[9,10]. Through the "marketization" to stimulate medical enterprises, which has led to the rapid development of the health system of China. However, the drawbacks of the market-oriented model have became increasingly prominent. The primary health institutions have been weak gradually[11], because of the government's investment in health was seriously inadequate and medical service institutions generally pursued economic interests, and the public health system has been vulnerable[12]. “difficulty and high cost of getting medical service” has became a livelihood problem puzzled Chinese. In view of the various problems, the community began to doubt the "marketization" of the health system. Therefore, in order to break the original health system and build a new scientific health system, health reform must begin as soon as possible, which will solve the historical problem of "difficulty and high cost of getting medical service " thoroughly[13,14].

The problem of "getting medical service difficulty" is mainly caused by unreasonable allocation of medical resources. High quality medical resources are concentrated in the tertiary public hospitals of the city, and the shortage of primary medical resources has become a common phenomenon in China[15,16]. Therefore, how to make medical resources go to the primary health institutions, which has undoubtedly became a major challenge to the new health reform policy[17]. Based on this point, the reform of regional health system has been focusing on adjusting the allocation of medical resources, " Integrated Health System "is the major method
to promote the rational allocation of regional medical resources and the implementation of the policy of hierarchical medical system[18]. At the same time, China has been attaching importance to training high-level general practitioners and let them go down to the grass-roots unit [19]. China hopes that these measures can divert patients, make the allocation of medical resources more reasonable, and then solve the problem of" getting medical service difficulty ".

The causes of the problem of " high cost of getting medical service" are complex, which mainly include: (1) unreasonable operation mechanism of medical institutions[20]; (2) unbalanced development of health services; (3) irregular order of medicine production and circulation. In view of the above problems, China government has been committing to letting medical institutions more public welfare, so as to make health services more equitable and accessible to public. In order to break down the phenomenon of "to increase the revenue of hospital by excessive sales of drugs", China has been implementing the policy of canceling medicine markups in public hospitals, reconstructing the scientific compensation mechanism, medical service price system and doctor's personnel salary system. Reforming the payment mode of medical insurance in order to avoid excessive medical treatment and increase medical insurance financial subsidies[21].And China government has implemented "Major Disease Protection Policy"to reduce the burden of medical treatment for patients, to prevent patients becoming or returning poverty due to illness. In the aspect of drug price reduction, China government has also introduced
relevant supporting policies such as "Two Invoice System", "Centralized Procurement with Target Quantity " and "Price Negotiation" to support it[22]. Evaluating policies can analyze whether these are scientific and the implementation is effective, which is important for functioning smoothly[23,24]. In recent years, there are some researchers in various industries have conducted in-depth research on policy evaluation[25-29]. The main research methods are the use of theoretical tools and construction models. Hongsoo Kim and Boyoung Jeon established a policy evaluation framework based on the six-step method to evaluate the care system effect in Korean[30]. Pengfei G and Yingnan Z have put forward three key factors of the policy evaluation system, analyzed their relationship, and built an evaluation system accordingly, so as to evaluate the green transformation policy of the city[31]. Xiaoshan C et al. have used the Keynes DSGE model to assess euro monetary policy and pointed out effective ways to increase policy returns[32]. Haiqun M and Chang F have evaluated the information policy of China, introduced the S-CAD method to systematically test the policy documents, and excavated the problems in the process of policy formulation and implementation[33].

To sum up, there are various methods for policy evaluation, but few researchers evaluate the evaluation of the effect of health reform policy[34,35]. And the existing studies have evaluated the policy mainly by giving weights subjectively, the impact of psychological factors on person decision-making has not been fully considered. However, the prospect theory can avoid this shortcoming. At the same time, the gray
relation analysis method is introduced to enlarge the difference between the advantages and disadvantages, making the comprehensive evaluation result more obvious. Therefore, based on the prospect theory, this paper will take the effect evaluation of the new health reform policy as the research object, and establish a set of scientific and feasible indicators system of the effect of the new health reform policy, in order to provide reference for the implementation and improvement of the new health reform policy.

**Methods**

**Theory brief**

Prospect theory, also known as the expectation theory, is proposed by Nobel Laureate Kahneman and cognitive psychologist Amos Tversky[36]. It is used to predict the individual's decision-making in the face of risk, which is different from the traditional theory of expectancy[37]. Prospect theory divides the risk decision-making process into two stages: editing and evaluation. In the editing stage, decision makers collect and process information according to frame and reference point; in the evaluation stage, decision makers make decisions based on value function and weighting function[38,39]. Therefore, the prospect value function \( v(x) \) and the probability weight function \( \omega(p) \) will influence the prospect value together, the prospect value can be expressed by the following formula:  

\[
U = \sum \omega(p) v(x).
\]

Grey System Theory originated from the Control Theory, which was put forward by Julong D, a famous Chinese Control Scientist in 1981[40]. Grey Relation Analysis
GRA, as a multi-factor system analysis method, is based on the grey system theory. The core of GRA is to explore the geometric correspondence among the factors by relying on the data series of each factor[41]. It is important to quantitatively determine the primary and secondary factors affecting dependent variables according to the size of grey relation coefficient. Compared with other analysis methods, the grey relational analysis method has a lower requirement on the sample size of each factor in the system, which can reduce the loss caused by information asymmetry to a large extent, and is suitable for solving the problem of determining the relation degree of less sample size[42]. The grey relation analysis method can be expressed by the following formula:

$$\xi_i(k) = \frac{\min_{i} \min_{k} |x_0(k) - x_i(k)| + \rho \max_{i} \max_{k} |x_0(k) - x_i(k)|}{|x_0(k) - x_i(k)| + \rho \max_{i} \max_{k} |x_0(k) - x_i(k)|}$$

**Indicators and data screening**

Scientific and representative are particularly important for the evaluation indicators of the new health reform. Based on the research and analysis of literatures and the actual situation of new health reform policy of China, the evaluation of the effect of the new health reform policy should involve the national economic situation, government health expenditure, health expenditure and health service efficiency, so as to establish a comprehensive multi-indication evaluation system[43-45].

In this paper, the data of various indicators related to the effect of the new health reform policy from 2000 to 2017 are obtained from *China Health Statistics Yearbook* and *National Bureau of Statistics of China (Table 1)[46,47]. In order to
purify the indicators system, SPSS19.0 is used for data analysis, and the Corrected Item-Total Correlation (CITC) is used as the standard of purifying indicators, and Cronbach's alpha reliability coefficient is used to test the consistency of the Indicators system. The results showed that the CITC of “average hospitalization days”, “natural growth rate of population”, “number of health institutions” and “number of medical and health institutions” was less than 0.5, so it was excluded. Generally, the internal consistency of the Indicators of $\alpha > 0.7$ is good, and two Indicators—“the number of health personnel” and “the number of medical postgraduates”, are excluded in turn. Finally, we get the evaluation Indicators system of the effect of the new health care reform policy after purification (Table 2).
Table 1 Data related to indicators to evaluate the effects of new health reform policy of China

| Year | Number of medical and health institutions | Number of health personnel | Number of medical postgraduates | Total health expenses (billion CNY) | Personal health expenditure/total health expenses (%) | Government expenditure on medical and health services (billion CNY) | Government spending on health care (billion CNY) | Person times of visits to hospitals (billion times) | Hospital bed utilization rate(%) | Hospital average hospital day | Natural population growth rate (%) | Per capita GDP (CNY) | Health price index | Per capita disposable income of urban residents (CNY) |
|------|--------------------------------------------|----------------------------|---------------------------------|----------------------------------|-----------------------------------------------------|--------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------|----------------------------|-------------------------------|------------------|-----------------|------------------------------------------------|
| 2000 | 1034229                                   | 6918383                    | 128494                          | 4586.63                          | 58.98                                               | 407.21                                           | 211.00                                       | 12.86                                         | 60.6                           | 12.2                                       | 7.58                                           | 7902             | 100.3            | 6255.7                                                   |
| 2001 | 1029114                                   | 6874527                    | 165197                          | 5025.93                          | 59.97                                               | 450.11                                           | 235.75                                       | 12.5                                          | 61.1                           | 11.8                                       | 6.95                                           | 8670             | 100.3            | 6824.0                                                   |
| 2002 | 1005004                                   | 6528674                    | 203000                          | 5790.03                          | 57.72                                               | 497.41                                           | 251.66                                       | 12.43                                         | 64.6                           | 10.9                                       | 6.45                                           | 9450             | 98.5             | 7652.4                                                   |
| 2003 | 806243                                    | 6216971                    | 268925                          | 6584.10                          | 55.87                                               | 603.02                                           | 320.54                                       | 12.13                                         | 65.3                           | 11.0                                       | 6.01                                           | 10600            | 101.2            | 8405.5                                                   |
| 2004 | 849140                                    | 6332739                    | 326286                          | 7590.39                          | 53.64                                               | 679.72                                           | 371.60                                       | 13.05                                         | 68.4                           | 10.8                                       | 5.87                                           | 12400            | 99.1             | 9334.8                                                   |
| 2005 | 882206                                    | 6447246                    | 364831                          | 8659.91                          | 52.21                                               | 805.52                                           | 453.31                                       | 13.87                                         | 70.3                           | 10.9                                       | 5.89                                           | 14259            | 99.5             | 10382.3                                                  |
| 2006 | 918097                                    | 6881184                    | 397925                          | 9843.34                          | 49.31                                               | 834.82                                           | 602.53                                       | 14.71                                         | 72.4                           | 10.9                                       | 5.26                                           | 16602            | 100.2            | 11619.7                                                  |
| 2007 | 912263                                    | 6964389                    | 418612                          | 11573.97                         | 44.30                                               | 1153.30                                          | 957.02                                       | 16.38                                         | 78.2                           | 10.8                                       | 5.17                                           | 20337            | 102.1            | 13662.5                                                  |
| 2008 | 891480                                    | 7251803                    | 446422                          | 14535.40                         | 40.42                                               | 1397.23                                          | 1577.10                                      | 17.82                                         | 81.5                           | 10.7                                       | 5.08                                           | 23912            | 102.9            | 15549.4                                                  |
| 2009 | 916571                                    | 7781448                    | 510953                          | 17541.92                         | 37.46                                               | 2081.09                                          | 2001.51                                      | 19.22                                         | 84.7                           | 10.5                                       | 4.87                                           | 25963            | 101.4            | 16900.5                                                  |
| 2010 | 939287                                    | 8207502                    | 538177                          | 19980.39                         | 35.29                                               | 2565.60                                          | 2331.12                                      | 20.4                                          | 86.7                           | 10.5                                       | 4.79                                           | 30567            | 103.3            | 18779.1                                                  |
| 2011 | 954389                                    | 8616040                    | 560168                          | 24345.91                         | 34.80                                               | 3125.16                                          | 3360.78                                      | 22.59                                         | 88.5                           | 10.3                                       | 4.79                                           | 36018            | 102.9            | 21426.9                                                  |
| 2012 | 950297                                    | 9115705                    | 589673                          | 28119.00                         | 34.34                                               | 3506.70                                          | 3789.14                                      | 25.42                                         | 90.1                           | 10.0                                       | 4.95                                           | 39544            | 101.7            | 24126.7                                                  |
| 2013 | 974398                                    | 9790483                    | 611381                          | 31688.95                         | 33.90                                               | 3838.93                                          | 4429.82                                      | 27.42                                         | 89.0                           | 9.8                                        | 4.92                                           | 43320            | 101.5            | 26467.0                                                  |
| 2014 | 981432                                    | 10234213                   | 621323                          | 35312.40                         | 31.99                                               | 4288.70                                          | 4958.53                                      | 29.72                                         | 88.0                           | 9.6                                        | 5.21                                           | 46629            | 101.7            | 28843.9                                                  |
| 2015 | 983328                                    | 10693881                   | 645655                          | 40974.64                         | 29.27                                               | 5191.25                                          | 5822.99                                      | 30.84                                         | 85.4                           | 9.6                                        | 4.96                                           | 49351            | 102.7            | 31194.8                                                  |
| 2016 | 983394                                    | 11172945                   | 667064                          | 46344.88                         | 28.78                                               | 5867.38                                          | 6497.20                                      | 32.7                                          | 85.3                           | 9.4                                        | 5.86                                           | 53935            | 103.8            | 33616.2                                                  |
| 2017 | 986649                                    | 11749872                   | 806103                          | 52598.28                          | 28.77                                               | 6550.45                                          | 7007.51                                      | 34.39                                         | 85.0                           | 9.3                                        | 5.32                                           | 59660            | 106.0            | 38396.2                                                  |
| Target layer | Standard layer | Indicator layer | Indicator type |
|--------------|----------------|----------------|----------------|
| New health reform policy of China effect evaluation | National economic situation | Per capita GDP (CNY) | Benefit type |
|              |                | Health price index | Cost type |
|              |                | Per capita disposable income of urban residents (CNY) | Benefit type |
|              | Government expenditure on health | Government expenditure on medical and health services (billion CNY) | Cost type |
|              | Medical and health expenses | Government spending on health care (billion CNY) | Cost type |
|              | Health service efficiency | Total health expenses (billion CNY) | Cost type |
|              |                  | Person times of visits to hospitals (billion times) | Benefit type |
|              |                  | Hospital bed utilization rate (%) | Benefit type |
Use of indicators

Based on the prospect theory, this paper uses grey relational analysis method to enlarge the difference between the advantages and disadvantages of the indicators, and then calculates the weight of the indicators by using the entropy weight method. The specific steps are given below.

Dimensionalization of indicators:

According to the principle of reward and punishment, the range of indicators value is limited to $[-1, 1]$. If the indicator value is greater than the average value, it is positive; if the indicator value is less than the average value, it is negative. The formula can be expressed as follows:

$$
X_{ij} = \begin{cases} 
\frac{a_{ij} - \sum_{i=1}^{n} a_{ij}}{\max\{\sum_{i=1}^{n} a_{ij}, \sum_{i=1}^{n} a_{ij} - \min(a_{ij})\}}, & \text{if } a_{ij} \text{ is a benefit indicator}, \\
\frac{\sum_{i=1}^{n} a_{ij} - a_{ij}}{\max\{\sum_{i=1}^{n} a_{ij}, \sum_{i=1}^{n} a_{ij} - \min(a_{ij})\}}, & \text{if } a_{ij} \text{ is a cost indicator}.
\end{cases}
$$

(1)

The decision matrix can be simplified as follow:

$$
X = (x_{ij})_{n \times m} = \begin{bmatrix}
X_{11} & X_{12} & \cdots & X_{1m} \\
X_{21} & X_{22} & \cdots & X_{2m} \\
\cdots & \cdots & \cdots & \cdots \\
X_{n1} & X_{n2} & \cdots & X_{nm}
\end{bmatrix}
$$

(2)

Determine the ideal scheme and the grey relation coefficient:

Let $x_{i}^{+} = \max\{x_{ij}, 1 \leq i \leq n\}$, $x_{i}^{-} = \min\{x_{ij}, 1 \leq i \leq n\}$, the ideal solution is: $S^{+} = \{x_{1}^{+}, x_{2}^{+}, \ldots, x_{m}^{+}\}$, $S^{-} = \{x_{1}^{-}, x_{2}^{-}, \ldots, x_{m}^{-}\}$. Then obtain the gray relation coefficient as follow:

$$
\xi_{ij}^{+} = \frac{\min_{j} \min_{i} |x_{ij} - x_{i}^{+}| + \rho \max_{i} \max_{j} |x_{ij} - x_{i}^{+}|}{|x_{ij} - x_{i}^{+}| + \rho \max_{i} \max_{j} |x_{ij} - x_{i}^{+}|}
$$

(3)
\[ \xi_{ij} = \frac{\min_j \min_i |x_{ij} - x_j| + \rho \max_j \max_i |x_{ij} - x_j|}{\max_j \max_i |x_{ij} - x_j|} \]  

(4)

Where, \( \rho = 0.5 \).

**Entropy weight method to determine indicators weight:**

\[ p_j = \frac{\sum_{i=1}^{n} \left( x_{ij} / \sum_{i=1}^{n} x_{ij} \right) \times \ln \left( \sum_{i=1}^{n} x_{ij} / \sum_{i=1}^{n} x_{ij} \right) / \ln n}{\sum_{j=1}^{m} \left( x_{ij} / \sum_{i=1}^{n} x_{ij} \right) \times \ln \left( \sum_{i=1}^{n} x_{ij} / \sum_{i=1}^{n} x_{ij} \right) / \ln n} \]  

(5)

Where, \( x_{ij} = \frac{x_{ij}-\min_i}{\max_i - \min_i} \);  

If \( x_{ij} / \sum_{i=1}^{n} x_{ij} = 0 \),  

Then define \( \lim_{x_{ij} / \sum_{i=1}^{n} x_{ij} \to 0} \left( x_{ij} / \sum_{i=1}^{n} x_{ij} \right) \times \ln \left( x_{ij} / \sum_{i=1}^{n} x_{ij} \right) = 0 \).

**Calculate the comprehensive prospect value:**

If the scheme \( i \) is inferior to the positive ideal solution, the scheme is loss-type; if the scheme \( i \) is better than the positive ideal solution, the scheme is a benefit-type.

Therefore, the value function \( v(x_{ij}) \) as follow:

\[
\begin{align*}
v^+(x_{ij}) &= (1 - \xi_{ij})^\alpha \\
v^-(x_{ij}) &= -\lambda (1 - \xi_{ij})^\alpha
\end{align*}
\]  

(6)

The decision weight function \( \omega(p_j) \) as follow:

\[
\begin{align*}
\omega^+(p_j) &= \frac{p_j^+}{p_j^+ + (1-p_j)^\gamma^+} \frac{1}{\gamma^+} \\
\omega^-(p_j) &= \frac{p_j^-}{p_j^- + (1-p_j)^\gamma^-} \frac{1}{\gamma^-}
\end{align*}
\]  

(7)

Then the comprehensive prospect value of the scheme \( S_i \) as follow:

\[ U_i = \sum_{j=1}^{m} \omega^+(p_j) v^+(x_{ij}) + \sum_{j=1}^{m} \omega^-(p_j) v^-(x_{ij}) \]  

(8)

Where, \( \gamma^+ = 0.61 \), \( \gamma^- = 0.69 \), \( \alpha = 0.88 \), \( \lambda = 2.25 \).

**Results**

The results of comprehensive evaluation of the effects of health reform policies in
China fluctuated from 2000 to 2017 (Figure 1). According to the trend of the curve, it can be divided into five stages: from 2000 to 2004, the fluctuation range of the comprehensive prospect value of the effect of health reform policy is large; from 2004 to 2009, the comprehensive prospect value of the effect of health reform policy shows a slow downward trend; from 2009 to 2012, the comprehensive prospect value of the effect of health reform policy decreases slightly, and then it rebounds substantially; from 2012 to 2014, the comprehensive prospect value of the effect of health reform policy is stable; and from 2014 to 2017, the comprehensive prospect value of the effect of health reform policy is declining.

![Figure 1 Evaluation results the effect of health reform policy of China from 2000 to 2017](image)

**Discussion**

Comparing the comprehensive evaluation results of the effect of health reform policy with the development process of health reform policy of China, we can see that the implementation of new health reform policy in 2009 has a significant impact
on health system of China.

From 2000 to 2004, China began to promote the process of "marketization" of the medical system in an all-round way[48]. Although the government have increased health investment year by year, it still could not afford the rapid growth of total health expenditure. The government's financial input was seriously insufficient and the market was not regulated reasonably in time, which leaded to the failure of the health service market. Therefore, the comprehensive prospect value of the health reform policy effect fluctuates greatly from 2000 to 2004. The attack of SARS virus in 2003 led to a sharp decline in the comprehensive prospect value of the health reform policy effect, which also exposed the loopholes of the public health emergency mechanism and the weakness of the prevention system of China[49].

From 2004 to 2009, due to the inherent drawbacks of the "marketization" mechanism, the phenomenon of chasing interest has spread in the health industry in China, and various problems began to appear, such as imbalance of medical resources allocation, rapid growth of drug fees, imperfect medical insurance system and chaotic circulation links[50]. In view of the above problems, the government has tried to alleviate them by increasing the proportion of health finance, but it only cured the symptoms, not cured the root causes for health system of China. It can only be relieved temporarily, and it is impossible to fundamentally alleviate the burden of medical expenditures for the citizens. Therefore, the comprehensive prospect value of the health reform policy effect from 2004 to 2009 shows a slow
downward trend.

At the beginning of the implementation of the new health reform policy, China government puts the implementation of the essential drug system, the improvement of grass-roots medical services, the training of suitable talents and the promotion of basic medical security system in the first place[51]. From the trend of the comprehensive prospect value from 2009 to 2012, it can be seen that the pre-investment led to a small decline in the comprehensive prospect value of the effect of the new health reform policy, but the subsequent sharp recovery shows that the pre-reform policy effects are significant. During the period of 2012 to 2014, the investment of several supporting policies, including the reform of public hospitals, the training of general practitioners, and the mechanism of protect and rescue for major diseases, coupled with the superposition of the diminishing marginal effect of the early policies, which led to a short plateau of the comprehensive prospect value of the effect of the new health reform policy of China. From the comprehensive prospect value of the effect of the new health reform policy in China from 2014 to 2017, the effect of the policy implementation is not obvious during this period, and the comprehensive prospect value shows a downward trend. By analyzing the implementation of various policies, we can see that the relatively easy content of the new health reform has been basically completed so far, and has entered a critical stage. During this period, the formulation and pilot stage of the new policy, including "hierarchical medical system", "canceling medicine markups " and "Two
Invoice System”, has not yet fully played its effectiveness, and its development is very slow. For example, the system of "hierarchical medical system" was proposed in 2013, and related documents were issued in 2015 to establish its general program. It was not until the end of 2018 that the trial of "hierarchical medical system" was launched[52]. Another example, public hospitals have been the focus of the new health reform since 2012, and the "canceling medicine markups" is the main key point, but until 2017, it was fully implemented in public hospitals[53]. Due to the time lag of nearly five years between policy formulation and implementation, the comprehensive prospect value of health reform policy effect of China shows a downward trend from 2014 to 2017.

**Conclusion**

From the calculation results of the effect of the new health reform policy of China, the new health reform is difficult to promote in the exploration. It is worth affirming that the overall goal and direction of the new health reform are correct, but the practice is unsatisfactory. Timeliness and sustainability are crucial to the effective implementation of policies. As an important measure to rebuild the health service system of China, the releasing and implementation of the new health reform policies are related to the smooth progress of the new health reform. In addition, the effect of any policy will decrease with the increase of the total amount. Therefore, we should focus on the following three aspects to ensure that the new health reform policy is scientific and effective, and can continue to exert its effectiveness. First, policy
makers should combine theory with practice to formulate new health reform supporting policies adapted to national conditions of China. Second, the administrative departments should cooperate closely, clarify the division of tasks and strengthen supervision to provide guarantees for the implementation of policies. Third, a reasonable incentive mechanism should be gradually established during the implementation process to ensure that the new health reform policy can continue to exert its effects and enable the citizens to obtain long-term benefits.

The new health reform has gone through more than 10 years under the situation of interest game and fierce confrontation among all parties. Although it is faced with numerous obstacles in this process, it has always been moving forward in the midst of contradictions. It can be predicted from the progress status that the new health reform policy is expected to look up successfully in the next few years. When health reform is only in progress, but not completed, China should make full use of its institution advantages, combine with innovative ideas, and explore a new health reform road which is scientific, beneficial and sustainable.

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**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**
Not applicable.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

YYG designed the study, prepared and analysed the data, performed the statistical analysis, interpreted the results and drafted the manuscript. ZH review and revised the manuscript critically. Both authors read and approved the final manuscript.

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Abbreviations

CNY: Chinese Yuan Renminbi

CITC: Corrected Item-Total Correlation

GRA: Grey Relation Analysis

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Figures, tables and additional files

Table 1 Data related to indicators to evaluate the effects of new health reform policy of China

Table 2 New health reform policy of China effect evaluation indicator system

Figure 1 Evaluation results the effect of health reform policy of China from 2000 to 2017