



Construction of Evaluation Index System for the Policy Effect of Centralized Drug Procurement

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Abstract

Objective To construct an index system for evaluating the policy effect of centralized drug procurement, and to provide reference for comprehensively and systematically evaluating the policy of centralized drug procurement. **Methods** Through combing the policies and literature research, the focus and expected goal of China's centralized drug procurement policy were clarified. On the basis of policy concerns, combined with some theories and the implementation of drug centralized procurement policy, a primary evaluation index system was constructed. The index system was determined by expert consultation, and the weight of each index was calculated by analytic hierarchy process. **Results and Conclusion** The questionnaire recovery rates of the two rounds of expert consultation were 88.23% and 100%, the coefficients of authority of experts were 0.86 and 0.80, and the expert coordination coefficients were 0.338 and 0.294, respectively. Finally, the evaluation index system for the policy of centralized drug procurement was established, which included 4 first-level indicators, 10 second-level indicators and 23 third-level indicators. The evaluation index system constructed in this paper can not only make up for the deficiency of systematic evaluation of the policy effect of the current centralized drug procurement, but also provide reference for further improving this policy.

Keywords: centralized drug procurement; stakeholder; policy evaluation

With the continuous increase of medical expenses, how to effectively curb the unreasonable expenses has become a major economic and social problem in all countries of the world, and centralized drug procurement is one of the main measures^[1, 2]. The World Health Organization regards centralized drug procurement as an important tool to continuously improve supply, save funds and ensure access to drugs^[3]. In order to reduce drug prices and give full play to the role of strategic purchase of medical insurance funds,

in 2018, the National Medical Insurance Bureau began to pilot the procurement of drugs with large consumption in the medical insurance catalogue^[4], which has achieved remarkable results. In September 2019, centralized drug procurement was expanded from 11 pilot areas to the whole country^[5]. In January, 2021, the General Office of the State Council issued "Opinions on Promoting the Normalization and Institutionalization of Centralized Drug Procurement"^[6], which proposed to promote the normalization and institutionalization of centralized drug procurement. The release of this policy marked that China's centralized drug procurement entered a new era

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of normalization and institutionalization. However, some studies showed that although purchasing with quantity can reduce drug prices, it would lead to the increase of coordination costs such as inventory and supervision^[7] and the shortage of drugs^[8]. If we can evaluate the policy effect scientifically and systematically, it will be beneficial to the perfection of the policy. Therefore, it is necessary to build a comprehensive evaluation index to systematically evaluate the policy effect of centralized drug procurement.

1 Thoughts and principles of index system construction

1.1 Thoughts on the construction of index system

Firstly, we sorted out the concerns of policies related to centralized drug procurement issued at the national level, provinces and alliance areas in China, and formed an overall understanding of the connotation and composition of the targets evaluated by the indicators. Combining the theory and methods of policy evaluation and index construction, we determined that patients, medical institutions, pharmaceutical enterprises and medical insurance departments were the four dimensions of this evaluation index system, and the connotations of each dimension are as follows.

(1) Patients: The expected biggest beneficiary of centralized drug procurement policy is the patient^[9]. The policy of purchasing with quantity can reduce drug prices through “integration of recruitment and procurement” and “linking quantity and price”, which also cut the burden of patients’ drug expenses. The average price of the first six batches of drugs was reduced by 53%^[10], but the policy effect of the implementation of centralized drugs procurement on reducing patients’ economic burden needs further evidence.

(2) Medical institutions: As the main part of the national medical service system, public medical institutions play an important role in the orderly development of health care. The mechanism of hospital revenue from drug sales is a kind of compensation for the lack of investment in medical institutions by the Chinese

government. The policy of centralized drug procurement can further reduce drug prices and consolidate the achievements of separating hospital revenue from drug sales. At the same time, the centralized drug procurement organized by the government clearly stipulates the key content of the drug procurement contract, such as quality and amount, varieties, and procurement cycle, which can further standardize centralized drug procurement of medical institutions.

(3) Pharmaceutical enterprises: The implementation of the policy of centralized drug procurement has also had a great impact on the pharmaceutical enterprise. On the one hand, enterprises are willing to participate in the centralized drug procurement by clarifying the purchase quantity and enhancing their confidence in obtaining the agreed market share and expected sales volume. On the other hand, higher requirements are put forward for the production and supply level of drug suppliers through “quantity”, which may lead to small companies that win at low prices being forced to withdraw from the market competition of a certain drug due to capacity constraints, thereby improving the concentration of the industry and promoting the development of the pharmaceutical enterprise in a good direction.

(4) Medical insurance departments: The medical insurance department is the core organizer of centralized drug procurement, which integrates pricing, procurement and medical insurance payment. It aims to reduce the price of drugs and the burden of patients’ medication through the centralized drug procurement policy. Besides, generic drugs can be promoted to replace the original drugs, so as to save medical insurance funds and promote the sustainable development of med care system.

1.2 Thoughts on the construction of index system

The construction of policy evaluation index system needs to meet three principles: Comprehensive, systematic and operable^[11].

(1) The principle of comprehensiveness means that when constructing the evaluation index system, the affected objects and scope of the policy should



be comprehensively considered to ensure that the implementation of the policy is reflected in all aspects and dimensions. If we cannot follow the principle of comprehensiveness, it will easily lead to one-sided and fragmented presentation of the degree and influence of policy implementation.

(2) The systematic principle means that the research object is regarded as a system, and the influence of all aspects is comprehensively considered when constructing indicators. Meanwhile, the correlation and hierarchy among indicators are also considered.

(3) The principle of operability refers to the practice of operation in accordance with established methods, procedures and standards in order to achieve the expected goals. In the process of constructing indicators, indicators that have practical significance and can obtain reliable sources from public sources should be selected.

2 Construction of evaluation index system for the policy effect of centralized drug procurement

Based on the above-mentioned construction

ideas and methods, the content related to the effect of centralized drug procurement policy in four dimensions is comprehensively expanded, and the evaluation index system for policy effect of drug centralized procurement is initially formed. Then, the preliminary index system should be discussed many times, and the preliminary index system has been logically sorted out, refined, improved to eliminate redundant indicators. Finally, the first-level, second-level, third-level indicators and their specific descriptions, algorithms, data sources of indicator results, comparability of indicator results, and negative effects of policies reflected by indicator results should be combed, and the accuracy and completeness of indicators in each dimension must be repeatedly scrutinized to better realize the rationality and operability of the indicator system.

2.1 Indicators of patients

The patient indicators include 2 secondary indicators and 7 tertiary indicators. The secondary indicators can reduce the drug price and the burden of patients' drug expenses, see Table 1 for details.

Table 1 Indicators of patients

Secondary index	Tertiary index	Data source
Reduce drug prices	The largest decline in the price of centralized drug procurement	Shanghai sunshine medicine purchase network
	Average price decline of centralized drug procurement	Shanghai sunshine medicine purchase network
	Average price decline of similar non-selected drugs	Terminal sales data of public medical institutions
Reduce the burden of patients	Price index of winning bid drugs	Terminal sales data of public medical institutions
	Average daily cost of centralized drug procurement	Terminal sales data of public medical institutions
	Outpatient average drug cost growth rate	China Health Statistical Yearbook
	Growth rate of per capita drug cost of inpatients	China Health Statistical Yearbook

(1) Reducing the price of drugs: The maximum price reduction and average price reduction of drugs selected in centralized drug procurement is used to reflect the price changes of the winning drugs, and relevant data can be obtained from Shanghai Sunshine Procurement Network. Studies have shown that there is a "spillover effect" in the policy of centralized drug procurement^[12], that is, enterprises that fail to win

the bid will also reduce the price of drugs to some extent in order to gain market share of public medical institutions. Therefore, the average decline in the prices of similar non-selected drugs can help decision makers understand the effects beyond the purpose of the policy. The greater the average decline in the prices of similar non-selected drugs, the more obvious the "spillover effect" of the policy. The price index



can be used to reflect the changing direction, trend and degree of commodity prices at different times [13], and the price index of the winning drug can help to judge whether the decline in drug prices brought about by the centralized drug policy is long-term.

(2) Reducing the burden of drug costs: The daily cost limit recommended by WHO and the average change of drug costs in common indicators for judging drug costs is adopted to reflect whether the policy has brought about the decline of patients' drug costs. The defined expenses can reflect the daily expenses of patients taking certain drugs. The greater the defined daily expenses, the heavier the financial burden of

patients. Per-visit/per-capita medical expenses are the average medical expenses of patients per visit, and the relevant data can be obtained through "China Health Statistics Yearbook" over the years.

2.2 Indicators of medical institutions

The indicators of medical institutions include 3 secondary indicators and 8 tertiary indicators, among which the secondary indicators are to separate hospital revenue from drug sales, standardize drug procurement in medical institutions and promote generic drugs to replace original drugs, see Table 2 for details.

Table 2 Indicators of Medical Institutions

Secondary index	Tertiary index	Data source
Consolidate the medication mechanism	Proportion of drug income to hospital income	China Health Statistical Yearbook
	Proportion of patients' average medicine expenses to medicine expenses	China Health Statistical Yearbook
Standardize drug procurement in medical institutions	DDDs of centralized drug procurement	Terminal sales data of public medical institutions
	Proportion of similar non-selected alternative drugs used	Terminal sales data of public medical institutions
	Completion rate of agreed purchase quantity of centralized drug procurement	Terminal sales data of public medical institutions
Promote generic drugs to replace original drugs	Replacement rate of generic drug sales of centralized drug procurement	Menet
	Market share substitution rate of generic drugs for centralized drug procurement	Menet
	Proportion of the change of doctor's prescription	-

(1) Consolidate the achievements of separating hospital revenue from drug sales: Because the state's investment in medical and health system has been low for a long time, and public hospitals need a certain profit to maintain their daily expenses, the problem of hospital revenue from drug sales has become more serious, and the cost of medical treatment for patients has been rising. In 2017, public medical institutions completely canceled extra cost from drug sales, and the mechanism of hospital revenue from drug sales that lasted for more than 60 years in China was separated [14]. Centralized drug procurement can further reduce the price of drugs, which is conducive to consolidating

the achievements of separating hospital revenue from drug sales. This paper studies the proportion of average drug costs to medical expenses and the change of proportion of drug costs to reflect the achievements of procurement policy. In order to avoid the situation that the decrease of average drug costs is due to the increase of inspection expenses, it is necessary to pay attention to the proportion of inspection expenses to medical expenses.

(2) Standardizing centralized drug procurement of medical institutions: The completion rate of the agreed purchase quantity of centralized drug procurement refers to the ratio of the actual



purchased drug quantity to the contracted purchase quantity. The agreed purchase quantity is the main driving force for enterprises to reduce drug prices. If medical institutions cannot complete the agreed purchase quantity well, it will affect the enthusiasm of subsequent enterprises to participate in centralized drug procurement. The frequency of drug use can reflect the trend of a drug use in different years. The greater the frequency of drug use, the higher the frequency of drug use and the greater the clinical preference for the drug. The higher the proportion of similar non-selected drugs, the more frequent the substitution of selected drugs, which will affect the policy effect of centralized drug procurement.

(3) Promoting generic drugs to replace original drugs: Generic drug substitution is an important means to control drug costs which is widely used in the world at present. This study measures the effect of centralized drug procurement in promoting generic drugs to replace the original drugs from two aspects: the sales replacement rate and market share replacement rate

of generic drugs. For example, the greater the sales replacement rate and market share replacement rate of the winning generic drugs, the better the effect of this policy. However, because the quality and effect of generic drugs in the past were not as good as the original drugs, some doctors and patients were more inclined to use the original drugs. Therefore, it is necessary to make statistics on the change of a medical prescription (generic drugs were replaced by the original drugs). If the proportion of the change of a medical prescription is relatively high, it means we should strengthen drug guidance and policy propaganda.

2.3 Indicators of pharmaceutical enterprises

The indicators of pharmaceutical enterprises include 3 secondary indicators and 6 tertiary indicators, among which the secondary indicators can reduce the sales cost of enterprises, improve the concentration of pharmaceutical enterprise and their ability of drug supply, see Table 3 for details.

Table 3 Indicators of pharmaceutical industries

Secondary index	Tertiary index	Data source
Reduce the cost of enterprise sales	Sales expense rate of bid-winning enterprises in centralized drug procurement	CSMAR
	Change in sales personnel of bid-winning enterprises in centralized drug procurement	-
Improve the concentration degree of the pharmaceutical industry	Market share of the top 4 enterprises in pharmaceutical industry	Wind
	Market share of the top 8 enterprises in pharmaceutical industry	Wind
Improve the ability to guarantee drug supply	Average distribution rate of winning drugs in centralized drug procurement	Procurement data of medical institutions
	Response time of centralized drug procurement order	Procurement data of medical institutions

(1) Reducing the sales cost of enterprises: With the continuous development of China's market economy, the development of enterprises faces more challenges. Under such fierce market competition, increasing investment in sales has become an inevitable trend for these enterprises. The policy of centralized drug procurement can directly help enterprises to obtain the agreed purchase quantity and market share, which will save the sales cost of

enterprises. The cost of sales is mainly reflected by the proportion of sales expenses and sales staff. If the proportion of sales expenses of the bid-winning enterprises in centralized drug procurement decreases and the number of sales staffs decreases, it means this policy has helped the bid-winning enterprises reduce the sales cost.

(2) Improving the concentration of pharmaceutical industry: Industry concentration refers to the



proportion of the market share of a few top enterprises in an industry to the market share of the whole industry. The higher the industry concentration, the easier it is to supervise the production of enterprises. However, there have been some problems in China’s pharmaceutical industry, such as small scale of enterprises, large regional distribution differences, low efficiency of supervision and management, and low industry concentration, which leads to some difficulties in supervision and enterprises cannot guarantee the quality of drugs well.

(3) Improving the ability of drug supply: Centralized drug procurement integrates the nationwide purchasing volume and attracts a large number of enterprises to bid through a huge market share. Meanwhile, the medical insurance fund can be used to pay part of the purchasing expenses

in advance, and the payment period of medical institutions is stipulated, which reduces the pressure of recovering payment and makes enterprises willing to supply the winning drugs in time. The higher the average distribution rate of the winning drugs and the shorter the order response time indicate that the supply of enterprises is timely that can better meet the drug demand of patients.

2.4 Indicators of medical insurance departments

The indicators of medical insurance departments include 2 secondary indicators and 3 tertiary indicators, among which the secondary indicators can save medical insurance funds and expand the coverage of centralized drug procurement, see Table 4 for details.

Table 4 Indicators of Medical Insurance Department

Secondary index	Tertiary index	Data source
Saving medical insurance fund	Purchasing drugs with quantity actually saves medical insurance expenses	Medical insurance department
Expanding the coverage of centralized drug procurement	Quantity of centralized drug procurement	Shanghai sunshine medicine purchase network
	Diseases types covered by the centralized drug procurement	Shanghai sunshine medicine purchase network

(1) Saving medical insurance fund: The centralized drug procurement system directly forms the drug purchase price, and the purchase price and the quantity of drugs used together form the drug expense [15]. Therefore, whether the medical insurance expense is really saved needs to consider both the price of drugs and the actual quantity of drugs used.

(2) Expanding the coverage of centralized drugs procurement: In order to complete the use of selected drugs, more rigid management measures have been adopted in some areas, such as the management of selected drugs and non-selected drugs in a fixed proportion, drugs that win the bid are allocated to departments and further to doctors. Besides, some individual medical and health institutions even interrupt the supply of original drugs under the pressure of policy, which has certain restrictions on doctors’ prescription

rights and patients’ right to choose drugs. The coverage of the centralized drug procurement on the quantity and variety of drugs can reflect from whether patients and medical staff have enough drug choices.

3 Weight calculation of the effect of evaluation index system

3.1 Expert consultation

Experts for the consultation should be familiar with the research content and have relevant professional knowledge or practical experience [16]. The criteria for the including experts in this study are: (1) Working in centralized drug procurement or quantity-related fields for ≥ 5 years; (2) Intermediate and above professional titles; (3) Bachelor’s degree or



above, interested in research in this field.

3.1.1 Basic information of experts

The statistical results of the basic information of experts show that the experts who participated in the consultation came from medical institutions,

pharmaceutical enterprises, scientific research institutions and administrative departments closely related to the centralized drug procurement. Most of them are 40–49 years old (46.67%), who have worked for 20–29 years (33.33%) with master’s degree (46.67%), and the proportion of experts with associate senior and above professional titles is 73.33%, see Table 5 for specific results.

Table 5 Basic information of experts participating in consultation

Basic information		Number (%)	Basic information		Number (%)
Gender	Male	9 (60.00)	Professional title	Middle	4 (26.67)
	Female	6 (40.00)		Sub-senior	4 (26.67)
Age	30–39	3 (20.00)	Academic degree	Senior	7 (46.67)
	40–49	7 (46.66)		Bachelor	3 (20.00)
	50–59	4 (26.67)		Master	7 (46.67)
	60 and above	1 (6.67)		Doctor	5 (33.33)
Working years	Less than 10 years	2 (13.33)	Workplace	Government department	4 (26.67)
	10–19	4 (26.67)		Medical institution	4 (26.67)
	20–29	5 (33.33)		Pharmaceutical enterprises	2 (13.33)
	30–39	4 (26.67)		Universities and research institutes	5 (33.33)

3.1.2 Positive coefficient of experts

The positive coefficient of experts is generally determined by the recovery rate of questionnaires to reflect the attention of experts in related fields to research issues. In the first round of the study, 17 questionnaires were distributed, and 15 questionnaires were recovered, with an effective recovery rate of 88.23%. Three experts put forward suggestions for revising the questionnaires. A total of 15 questionnaires were distributed in the second round, and they were all recovered, with an effective recovery rate of 100%. The recovery rate of the two surveys is more than 70%, which shows that the positive coefficient of experts is high.

3.1.3 Degree of authority of experts

The authority of experts will have a great influence on the rationality and reliability of index evaluation. Therefore, when dealing with the evaluation results of experts, we should consider the authority of experts on research issues. The degree of authority

is generally determined by two factors: the basis of experts’ judgment on indicators ($C\alpha$) and the familiarity of experts with indicators (C_s). The degree of authority of expert is expressed by the authority coefficient Cr . The degree of authority of expert can also be expressed as the arithmetic average of the judgment basis coefficient and familiarity coefficient, that is, $Cr = (C\alpha + C_s)/2$. After calculating experts’ familiarity and judgment of the indicators, we find that the degree of authority of the two rounds of expert consultation is 0.86 and 0.80 respectively, both of which are greater than 0.70, indicating that the experts have a high degree of authority in the construction of the evaluation index system for centralized drug procurement.

3.1.4 Coordination coefficient of expert opinions

Different experts may have different views on the same index, and the expert coordination coefficient is used to judge whether they have great differences on a certain index. The coordination coefficient can be expressed by Kendall’s W test statistics, and the value



of *W* is between 0 and 1. If the value is closer to 1, the coordination is better. The Kendall coordination coefficient of the first round of expert consultation was 0.338, and the coordination coefficient of the second round of expert consultation was 0.294, and both *P* values were less than 0.01, which was statistically significant, indicating that experts scored all indicators in a consistent way.

3.1.5 Concentration of expert opinions

The average value and coefficient of variation are used to reflect the concentration degree of experts' opinions. The coefficient of variation indicates the coordination degree of experts' opinions on a certain

index and reflects the relative dispersion degree of experts' evaluation of various indexes. The smaller the coefficient of variation is, the higher the coordination degree among experts will be.

The results showed that the average scores of the 10 secondary indicators were all above 3, among which reducing the burden of patients' drug expenses was the highest (4.67) and improving the concentration of pharmaceutical industry was the lowest (3.53). The feasibility scores of the indicators were all above 3.8 points. The coefficient of variation of the secondary indicators were all below 0.25, which shows that experts unanimously agree on the importance and feasibility of the secondary indicators. See Table 6 for specific results.

Table 6 Concentration of opinions of expert consultation (secondary indicators)

Primary index	Secondary index	Significance		Feasibility	
		Mean	Variable coefficient	Mean	Variable coefficient
Dimension of patient	Reduce drug prices	4.47	0.19	4.07	0.18
	Reduce the burden of medicine	4.67	0.22	3.93	0.23
Dimension of medical institutions	Consolidate and break the medication mechanism	4.27	0.21	4.07	0.22
	Standardize drug procurement in medical institutions	3.67	0.20	3.87	0.19
	Promote generic drugs to replace original drugs	4.13	0.24	3.87	0.22
Dimension of pharmaceutical industry	Reduce the cost of enterprise sales	3.80	0.23	3.80	0.20
	Improve the concentration degree of the pharmaceutical industry	3.53	0.15	3.87	0.19
Dimension of medical insurance department	Improve the ability to guarantee drug supply	4.00	0.22	4.07	0.17
	Saving medical insurance fund	4.20	0.26	4.00	0.23
	Expand the coverage of centralized drug collection	4.07	0.20	3.80	0.15

3.2 Weight calculation

3.2.1 Calculation method and steps

Analytic hierarchy process (AHP) is used to determine the weights of indicators at all levels^[17]. The steps of determining the weights are as follows: (1) Judgment matrices should be established according to

the comprehensive scores of each indicator evaluated by consulting experts. The numbers 1–9 and their reciprocal are quoted as scales (see Table 7) to define the judgment matrix $A = (a_{ij}) n \times n$; (2) The weight coefficient (*w*) of each factor should be calculated. The weight vector *w* can be calculated by arithmetic average method. Because each column in the judgment matrix *A* approximately reflects the distribution of



weights, the arithmetic average of all column vectors can be used to estimate the weight vectors, that is, $W_i = \frac{1}{n} \sum_{j=1}^n \frac{a_{ij}}{\sum_{k=1}^n a_{kj}}$, $i = 1, 2, \dots, n$; (3) The maximum characteristic root λ_{max} of the judgment matrix should be calculated. $\lambda_{max} = \sum_{i=1}^n \frac{(BW)_i}{nW_i}$; (4) The

consistency coefficient $CI = \frac{\lambda_{max} - n}{n - 1}$ is calculated; (5) The value of the consistency index RI is found to calculate the consistency ratio CR , where $CR = CI / RI$. When $Cr < 0.10$, it is considered that the judgment matrix has passed the consistency test, see Table 7 for the definition of judgment matrix scale.

Table 7 Definition of Judgment Matrix Scale

Scale	Meaning
1	Two factors are of equal importance
3	The former is slightly more important than the latter
5	The former is obviously more important than the latter
7	The former is strongly more important than the latter
9	The former is extraordinary more important than the latter
2, 4, 6, 8	The intermediate value of the above adjacent judgments
Reciprocal	If the importance ratio of factor i to factor j is a_{ij} , then the importance ratio of factor j to factor i is $a_{ji} = 1/a_{ij}$

3.2.2 Determine the weights of indicators at all levels

The results show that when evaluating the policy effect of centralized drug procurement, we need to focus on the impact of the policy on patients and medical institutions, with the weights of 0.46 and 0.28, respectively. The weight of reducing drug prices and reducing the burden of patients' drug expenses in patient dimension is 0.17 and 0.83, respectively, indicating that experts pay more attention to reducing patients' drug expenses. The implementation of the centralized drug procurement has brought about a significant decline in the price of the winning drugs, but patients will be more sensitive to the overall drug costs when they see a doctor. Therefore, compared with the decline in the price of the winning drugs, it is more important to reduce the burden of drug costs for patients. In the dimension of medical institutions, promoting generic drugs to replace original drugs has a higher weight (0.58), while purchasing with quantity can consolidate the achievement of separating hospital revenue from drug sales to a certain extent, but the

key reason for the existence of the mechanism lies in the imperfection of the compensation system of public medical institutions, so this index is slightly less important than other indicators (0.11). In the dimension of pharmaceutical industry, although the drug centralized procurement can directly award the market share of the winning drugs to enterprises, it can achieve the purpose of reducing the sales expenses of enterprises. Besides, it is regarded as a prerequisite for the bid winning drugs to have passed consistency evaluation, which puts forward higher requirements for the comprehensive ability and scale of enterprises. However, from the national level and the patient's point of view, whether drugs can be supplied in time and guaranteed for a long time is more important. So, the weight score of improving drug supply is higher (0.63). In terms of medical insurance dimension, compared with saving medical insurance fund, the index of expanding drug coverage in centralized drug procurement has a higher weight (0.67). See Table 8 for the weights of indicators at all levels in the evaluation index system for policy effect of centralized drug procurement.



Table 8 Evaluation indicators of the policy effect of centralized drug procurement

Primary indicators and weights	Secondary indicators and weights	Combination weight	Tertiary indicators and weights	Combination weight		
Patient (0.46)	Reduce drug prices (0.17)	0.078	The largest decline in the price of purchased drugs with volume (0.18)	0.014		
			Average price decline of purchased drugs with volume (0.32)	0.025		
			Average price decline of similar non-selected drugs (0.26)	0.020		
	Reduce the burden of patients (0.83)	0.382	Price index of winning bid drugs (0.24)	0.019		
			Average daily cost of purchased drugs with volume (0.39)	0.149		
			Outpatient average drug cost growth rate (0.32)	0.122		
Medical institution (0.28)	Consolidate achievement of the medication mechanism (0.11)	0.031	Growth rate of per capita drug cost of inpatients (0.29)	0.111		
			Proportion of drug income to hospital income (0.54)	0.017		
			Proportion of patients' average medicine expenses to medicine expenses (0.46)	0.014		
	Standardize drug procurement in medical institutions (0.31)	0.087	DDD of purchased drugs with volume (0.27)	0.023		
			Proportion of similar non-selected alternative drugs used (0.32)	0.028		
			Completion rate of agreed purchase quantity of centralized drugs (0.41)	0.036		
	Promote generic drugs to replace original drugs (0.58)	0.162	Replacement rate of generic drug sales of centralized drug collection (0.31)	0.050		
			Market share substitution rate of generic drugs for centralized drug collection (0.42)	0.068		
			Proportion of secondary dressing change (0.27)	0.044		
Pharmaceuticals industry (0.09)	Reduce the cost of enterprise sales (0.11)	0.010	Sales expense rate of bid-winning enterprises in quantity procurement (1)	0.010		
			Improve the concentration degree of the pharmaceutical industry (0.26)	0.023	Market share of the top 4 enterprises in pharmaceutical industry (0.58)	0.014
	Market share of the top 8 enterprises in pharmaceutical industry (0.42)	0.010				
	Improve the ability to guarantee drug supply (0.63)	0.057			Average distribution rate of winning drugs in centralized procurement (0.47)	0.027
					Response time of centralized drug order (0.53)	0.030
	Medical insurance department (0.17)	Saving medical insurance fund (0.33)	0.056	Purchasing drugs with quantity actually saves medical insurance expenses (1)	0.056	
Expand the coverage of centralized drug collection (0.67)				0.114	Quantity of drugs purchased with quantity (0.46)	0.052
		Purchasing with quantity covers disease types (0.54)	0.062			

4 Discussion

Policy effect evaluation can not only be

an important basis for perfecting, optimizing or terminating policies, but also be an important tool to promote scientific and democratic decision-



making. Based on the policy concerns, this study evaluates the policy effect of the centralized drug procurement by combining the stakeholder theory and the policy evaluation theory, which provides a method for comprehensively and systematically evaluating the policy. In addition, it can also fill the lack of systematic evaluation on the policy effect of centralized drug procurement to some extent.

Based on the four dimensions of patients, medical institutions, pharmaceutical industry and medical insurance department, this study follows the principle of index construction and combined with the concerns of relevant policies on centralized drug procurement and forms an index system for evaluating the policy effect of centralized drug procurement. The index system consists of 4 primary indicators, 10 secondary indicators and 23 tertiary indicators. In the process of index construction, firstly, we sort out the main concerns of the relevant policies on centralized drug procurement at the national level in China and form an overall understanding of the connotation and composition of the targets evaluated by the index. Then, we determine the indicators based on theory and policy practice. Secondly, according to the research goal, the content of each indicator is expanded as comprehensively as possible from the depth and breadth, which ensures the systematic index construction. In addition, 7 indicators in the effect evaluation system can be obtained from the terminal sales data of public medical institutions, 4 indicators are obtained from “*China Health Statistics Yearbook*”, and 10 indicators can be obtained from official websites or open information channels. A total of 22 indicators (92%) are supported by reliable data sources, and the evaluation indicators have good operability.

5 Research deficiency and prospect

In the process of constructing the policy effect for evaluation index system, it is found that the negative effects brought by the policy, such as restricting doctors’ prescription rights and increasing non-drug costs. Therefore, we should further explore how to

quantify and evaluate the expected and unexpected negative effects brought by the policy. The evaluation index constructed in this study is based on the focus of the current drug centralized procurement policy, but the policy is constantly developing and improving, so the policy effect of evaluation index system should also keep pace with the times and constantly improve its pertinence.

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