

Analyzing preferences for family doctor contract services in rural China: a study using discrete choice experiment

peipei Fu

Shandong University

Yi Wang

Shandong University

Shimeng Liu

Shandong University

Jiajia Li

Shandong University

qiufeng Gao

Shaanxi Normal University

Chengchao Zhou (✉ zhouchengchao@sdu.edu.cn)

<https://orcid.org/0000-0002-9364-3579>

Qingyue Meng

Peking University

Sean Sylvia

University of North Carolina at Chapel Hill

Research article

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Abstract

Background Preliminary evaluations have found that family doctor contract service has significantly controlled medical expenses, better managed chronic diseases, and increased patient satisfaction and service compliance. In 2016, China proposed the establishment of a family doctor system to carry out contract services, but studies have found uptake and utilization of these services to be limited. This study aimed to investigate rural resident preferences for FDGS from the public perspective in China. Methods A discrete choice experiment (DCE) was performed to elicit respondent preferences towards FDGS among rural residents in China. Attributes and levels were established based on literature review and qualitative methods. Five attributes consisted of cost, medicine availability, reimbursement rate, competence of the family doctor, and attitude of the family doctor were evaluated using mixed logit model. Results A total number of 609 residents were included in the main DCE analysis. Respondents valued high competence (coefficient 2.44, [SE 0.13]) and good attitude (coefficient 1.42, [SE 0.09]) of the family doctor most. Cost was negatively valued (coefficient -0.01, [SE 0.01]) as expected. Subgroup analysis was conducted after adjusting the interaction terms, we found that rural residents with chronic diseases prefer good attitude than those with no chronic diseases. The estimated willingness to pay (WTP) for "high" relative to "low" competence was 441.13 RMB/year and WTP for a provider with a "good" relative to a "poor" attitude was 255.77 RMB/year. Simulations suggest that, holding other factors constant, improving the competence of family doctors from poor to high had the largest effect on preference for signing the FDGS. We estimate that increasing the cost per year would reduce the uptake. Conclusion This present study suggested priorities should be given to strengthen and improve the quality of primary health care including family doctors' competence and attitudes so as to increase the uptake of signing FDGS. The contract service package including annual cost, insurance reimbursement rate and individualized services should be redesigned and become congruent with residents with different health status and their stated preferences.

Background

Foundational for population health, expanding access to quality primary care services are key priorities for all public health systems [1, 2]. In Western countries, family doctors are at the forefront of primary care delivery and play an indispensable role in providing comprehensive primary health services [3, 4]. While terms used to describe family doctors vary internationally—such as general practitioner (GP) and family physician—we define 'family doctor' in this study as a physician with specialist training in primary care and who practices in the community.

Previous evidence in a variety of countries has emphasized the role of primary care in achieving better population health outcomes while reducing costs. Indeed, physicians and public health systems providing more coordinated services have consistently achieved better health outcomes [3, 5]. Moreover, primary health care provided by family doctors has been shown to be highly cost-effective, preventing potential health complications and the need for specialized care through early prevention and screening [6, 7]. Preliminary evaluations have found that family doctor contract service has significantly controlled

medical expenses, better managed chronic diseases, and increased patient satisfaction and service compliance [8-10]. Family doctors often play the role of a “gatekeeper” in the primary health care system, ideally promoting the efficient allocation of health resources and inhibiting excessive medical costs associated with more expensive procedures [11, 12].

In order to provide comprehensive, coordinated, and preventative public health care to all citizens, the Chinese government proposed the establishment of a family doctor system to carry out contract services in 2016 [13]. Family doctor contract services (FDSCS) are provided by a care team which usually consists of family doctors, nurses, and public health physicians. The team is contracted to provide basic medical care services, public health services, and individualized health management. Under the working principles of full notification, voluntary contract signing and standardized service, general practitioners establish a long-term and stable service relationship with the serving families through contract signing. The National Medical Reform Office stipulates a full coverage rate by 2020.

In order to improve the implementation of FDSCS, it is important to understand residents' willingness to sign family doctors and explore its determinants. However, few studies reflect public views and preferences on FDSCS in China. In recent years, researches in China mainly focus on the significance of establishing family doctor system[14], and most of the research is in urban area[14-17]. There are also some explore the effect of family doctor policy [18-20]. Some researchers have noted the importance of establishing stable relationships with family doctor[21], but little is known about determinants underlining this scheme especially among rural residents with different health status. In terms of methods, logistic regression was mainly used to search for influencing factors in the study of family doctors in China. The existing international literature suggests that perceived quality of care [22-24]can be an influential determinant of demand for family doctor services alongside out-of-pocket costs and insurance coverage [25, 26]. Moreover, demand varies with socioeconomic characteristics and health status of patients [22-24]. A better understanding of the determinants of demand for FDSCS contracts, particularly attributes of the care provided in addition to pricing structure, are critically important in designing and refining family doctor services as China continues to invest in its primary healthcare system. The current study seeks to address this gap by using discrete selection experiments to explore residents' preferences for FDSCS, so as to provide useful information in designing and implementing family doctor service scheme for the next stage.

Methods

Discrete choice experiments (DCEs) are a quantitative method aiming at eliciting stated preferences. This method draws on Lancaster' consumer theory which assumes health-care interventions and policies are the combinations of attributes, and individuals' choice on these goods is based on various levels of attributes[27]. The DCE model has been widely used to predict the probability of take-up of various contract service plans and to determine preferences for goods services in lieu of observations on real-world market interactions.

DCE Questionnaire Design

To select representative attributes that could clearly depict and capture resident preferences for family doctor teams under the FDCS, we developed a DCE questionnaire through qualitative methods, which included a literature review as well as interviews with key figures. The five attributes of FDCS contracts described below were determined to be most relevant to uptake in our setting. A full description of the attribute selection and questionnaire implementation process is available in the Appendix.

- (1) Contract Price: This attribute refers to the annual signing expenses for an individual resident. After we reviewed public policies and guidelines on FDCS enacted by central and local governments, three levels were specified for this attribute: 0 CNY, 100 CNY and 200 CNY per year [28, 29].
- (2) Availability of medicines: Medicine availability refers to the ability to obtain affordable medicines necessary to maintain one's health [30]. We selected this attribute to indicate the accessibility of health services provided by the contracted family doctor team. We divide this attribute into two levels in our questionnaire: shortage and sufficient.
- (3) Insurance reimbursement rate: While health insurance was recently universalized in China, insurance reimbursement rates vary by plan and scheme. Previous studies have shown that a close relationship between medical insurance and patient choice of medical treatment [31]. Referring to reimbursement guidelines from the Shandong health commission, we divide this attribute into three levels in our questionnaire: standard reimbursement, 5% more than standard, and 10% more than the standard reimbursement rate.
- (4) Competence of the family doctor. The competence and skill of the physician is considered of great importance to patients [24, 32, 33]. This attribute refers to the resident's attention to physician credentials and perceived competence when selecting a family doctor. We divide this attribute into three levels in our questionnaire: low, medium and high.
- (5) Attitude of the family doctor. Many studies have shown a correlation between doctors' attitudes and patients' medical behaviors [34-36]. Thus, we sought to investigate the relative importance of perceived attitude in the decision to sign a family doctor team. Three levels were divided in the research: poor, normal and good.

Data Collection

This study was conducted in Shandong province, the second largest province in China. Within Shandong, 3 cities—Binzhou, Zibo, and Liaocheng—located in the northeast, central, and west regions of the province, respectively, were selected as study sites. Multi-stage random sampling was used to choose a sample of respondents representative of rural residents in each selected city. To do so, 2 counties in each city were first chosen at random. Within each county, 5 towns (the administrative level below the county) and 24 households in each town were chosen randomly. In this study, the questionnaire was administered

to 700 residents aged 18 and above, which is higher than the 600 observations recommended as sufficient for sub-group analysis [37].

Data was collected in this study through a DCE questionnaire administered by teams of trained enumerators at study households. At the beginning of each interview, enumerators described the purpose of the study and sought participant consent. Following consent, a brief introduction of the FDGS, recent public health policies launched by the government, and attributes in each choice set were explained. Each participant was asked to imagine different hypothetical scenarios in which different family doctor contract service plans are registered to enhance their health status. They were then asked to make discrete choices between pair-wise combinations of scenarios. A sample questionnaire choice is shown in Table 1.

Table 1 An example of a DCE question.

Attributes	Contract plan 1	Contract plan 2
Cost of the contract	200CNY/year	100CNY/year
Availability of medicine	Easy	Difficult
Reimbursement rate	Standard	10% more
Competence of family doctor	Medium	Low
Attitude of family doctor	Good	Normal
Which contract plan would you choose?	<input type="checkbox"/>	<input type="checkbox"/>

Please consider you are going to enroll in the contract service of family doctor for yourself. Of the following two contract plans, which contract plan would you choose?

Statistical Analysis

Data were first double-entered and coded using Epidata version 3.1, and the final data was then transferred to STATA 14.2 for all statistical analyses.

Random utility theory provided the theoretical foundation for the analysis of DCEs data [38]. Mixed logit models were used to estimate the utility of registering with one contract plan [38]. We assumed that respondents were relatively homogenous on demographic measures, hence their preference would be associated with choice variables. The utility function as specified as follows:

All attributes were dummy coded except for the costs of the contract, which was specified as a continuous variable to facilitate the calculation of willingness to pay (WTP). WTP was calculated to measure the trade-offs among various contract attributes. WTP was estimated as the ratio of the

coefficient to the negative of the coefficient on the contract cost attribute. The coefficients indicated the relative importance of the worst values for the categorical variables.

Finally, we conducted a simulation study to understand how the probability of signing contract services changed as attribute levels changed.

Results

Respondents' characteristics

609 rural residents from 3 cities of Shandong province were selected in the final sample for analysis, after excluding 91 respondents who failed to pass the consistency test. The characteristics of respondents are reported in Table 2. Respondents were aged 18-88 years old (mean=51.21years old), and about half (52.38%) were female. Around 20% of respondents had completed high school or above, and 54.7% reported their annual household income to be less than 40,000 RMB (\$5960.19 based on exchange rate of 6.71). The percentage of participants whose household, in the past six months, included pregnant women or children younger than six years were 15.93% and 27.91%, respectively. 32.4% of respondents had chronic diseases.

Table 2 Demographic characteristics of 700 respondents, in China

Characteristics	N=700	%
Age, years Mean±SD	51.21	±13.05
Sex		
Female	290	47.62%
Male	319	52.38%
Education		
Primary school degree or below	209	34.32%
Junior school degree	278	45.65%
High school degree or above	122	20.03%
Marital status		
Married	571	93.76%
Unmarried	38	6.24%
Household income per year^a		
<20000 CNY	161	26.44%
20000-40000 CNY	172	28.24%
40000-70000 CNY	175	28.74%
>70000 CNY	101	16.58%
With chronic diseases		
Yes	197	32.35%
No	412	67.65%
With pregnant women		
Yes	97	15.93%
No	512	84.07%
With 0-6 children		
Yes	170	27.91%
No	439	72.09%
Region		
Zibo	210	34.48%
Liaocheng	197	32.35%

Binzhou	202	33.17%
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Source Analysis data from questionnaire of rural residents in China. **Notes** The average exchange rate between US\$ and CNY in 2018 was: US\$1= CNY6.71.

Model Estimation

We estimated the mixed logistic model with and without interactions between attributes and chronic disease status. Model 1 considers the five attributes as independent variables. Model 2 tests the interactions of the main attributes and the effect of chronic disease status.

Table 3 results indicate that all attributes were statistically significant, with the coefficients of attributes having their expected signs. As expected, residents prefer an FDCS with lower costs, higher reimbursement rate, a sufficient availability of essential drugs, and a highly competent family doctor who treats patients with a warm and respectful attitude. In addition, the size of coefficients indicated that "competence of family doctors" and "attitude of family doctors" were the most valued attributes.

Subgroup analysis was conducted with interaction terms of gender, annual household income, educational attainment, marital status, and location, indicating no significant difference between subgroups. The chronic disease interaction terms were significant and positive for "attitude of family doctors." Thus, compared with individuals without chronic diseases, respondents with chronic diseases have a stronger preference for more friendly, respectful, and warm communication from their family doctors.

A sensitivity analysis was performed with participants who failed the consistency test, and no significant impact was observed. The standard deviation (SD) of all random coefficients were statistically significant, suggesting preference heterogeneity existed among the respondents.

We also estimated the WTP, which measures the amount an individual would give up to improve an attribute. The WTP estimates derived from the logit model indicate that respondents would pay 441.13 CNY for a family doctor with high diagnosis and treatment competence (relative to low), 255.77 CNY for a family doctor with a warm and friendly attitude (relative to bad), 114.14 CNY to have sufficient access to essential drugs, and 81.66 CNY to obtain an insurance reimbursement rate 10% higher than the standard. Thus, doctors' competence and attitude had the highest impact on rural residents' demand for FDCS contracts.

Table 3 Main Effect Model Estimation And Residents' Willingness To Pay For Different Attributes Of Contracted Services

Attributes	Coefficient ^a	WTP ^b (CNY)
	(SE)	(95% CI)
Contract costs	-0.006*** (0.001)	- -
Availability of medicine (easy)	0.63*** (0.06)	114.14 (87.55~140.74)
Reimbursement rate 5% more	0.31*** (0.06)	56.02 (33.24~78.81)
Reimbursement rate 10% more	0.45*** (0.08)	81.66 (53.19~110.14)
Medium competence of family doctor	1.24*** (0.08)	224.73 (188.37~261.10)
High competence of family doctor^c	2.44*** (0.13)	441.13 (377.92~504.35)
Normal attitude of family doctor	1.01*** (0.08)	182.18 (148.04~216.33)
Good attitude of family doctor	1.42*** (0.09)	255.77 (212.22~299.34)

Source Analysis data from questionnaire of rural residents in China. **Notes** Estimates of WTP through calculating the ratios of coefficients between each attribute level and the contract cost attribute.^aThe coefficients represents the mean relative utility of each attribute conditional on other attributes in a choice set, and the bigger the coefficient means more preferred attribute.^bThe average exchange rate between US\$ and CNY in 2018 was:US\$1= CNY6.71. ^cCompetence of family doctors was the most important attribute and has the largest WTP based on simulation study. 95%CI=95% confidence interval, SE= standard error, *** p<0.01, ** p<0.05, * p<0.1

Policy Simulation Results

A simulation experiment analyzing how the different FDCS attributes could interact was also conducted to investigate policy strategies to increase enrollment rate and public acceptance of FDCS.

Simulations suggest that, holding other factors constant, improving the competence of family doctors from poor to high had the largest effect on preference for signing the FDCS, the signing probability increased by 84%. Improving the attitude of family doctor from poor to good increased the signing probability by 61%. We estimate that increasing the cost per year would reduce the uptake.

Figure 1 presents a graphical summary of combined simulation results. The highest orange line indicates incentive combinations which were found to have the largest potential effect on FDCS preference. For free contracts, improving the competence of the family doctor from medium to high increased the probability by 84%. Based on a contract cost of 100 CNY, holding other factors constant, a family doctor team with high competence relative to low competence was predicted to increase FDCS signing probability by 74% and good attitude relative to bad was predicted to increase signing probability by 41%. These respective estimates decreased to 58% and 15% when the contract cost was set to 200 CNY rather than 100 CNY.

Discussion

According to proposed plans for FDCS, all Chinese residents shall be covered by family doctor teams and receive contracted services by the year 2020. This clearly implies that the first five-year stage of the implementation will rest on establishing and refining this policy. However, in order to attain this goal, it is urgent to consider and reflect public views on family doctor services, especially rural residents' preferences for contract services. This is especially important given criticisms of the low incentives to participate in FDCS as evidenced by the current low FDCS signing rate.

The key finding of this study is that rural residents highly value health care quality, including doctors' competence and attitude and these attributes strongly influence the uptake of FDCS contracts. This finding is in line with previous studies elsewhere. Previous studies in other settings have found that patients' choices have to be significantly influenced by the quality and experience of family doctors [39, 40]. A previous study from China also found that the ability of primary healthcare providers was the most important factor affecting residents' willingness to register with family doctors [41]. This suggests a major challenge for the FDCS program, particularly in remote rural regions lacking high-quality medical resources and facing shortages of qualified primary care providers. Several studies have highlighted the poor quality of primary care services in rural areas of China. A recent study found that most doctors and nurses working in primary health facilities do not hold a college degree and had only received 2-3 years medical training programs in China [42]. Another study employing standardized patients found that village clinicians were able to correctly treat presumptive cases of angina 61% of the time and dysentery 45% of the time[43]. Thus, the feasibility of FDCS may depend critically on improving the quality primary care.

In this study, respondents also regarded the attitude of the family doctor towards patients and a good doctor-patient relationship to be important. This result is also consistent with previous research, which has suggested that patients valued open communication with their health care providers, underscoring a desire for collaborative and patient-centered care (Muhlbacher AC, Bethge S, Reed SD and Schulman KA [44], [45, 46] [47]. Good doctor-patient communication could enhance patients' trust in family doctors and promote health care continuity. Patients with regular primary care doctors have been found more likely to adhere to advice on treatment and prevention, which improved patient satisfaction rates and decreased hospital admissions over time [48, 49].

The subgroup analysis indicated that rural residents with chronic diseases valued doctors' attitude much more than those without chronic diseases. The result is not surprising given that individuals with chronic illnesses have to visit doctors regularly and must receive consistent treatment. Therefore, this continuity in a patient-provider relationship may encourage patients with chronic diseases to value empathy, respect, and friendship higher. This finding is also consistent with research suggesting that the continuity in healthcare delivery can significantly improve healthcare quality, as family doctors can better treat and guide patients and their healthcare issues when trust is gained over time [48, 50].

Survey participants also considered medicine availability as an important determinant in their FDCS selection and registration decision. Similar to this finding, a DCE study reported that the availability of necessary medicine at health facilities significantly impacted the probability of the patient utilizing those public facilities [51]. Currently, China has a widely recognized issue of sufficient access to essential drugs at rural primary health service institutions, despite China's national essential drug policy aiming to guarantee access [8]. Because of this lack of availability, residents who have already signed family doctors and patients with chronic diseases often have to purchase drugs at secondary or other health facilities, undermining the effectiveness of contract services.

Monetary attributes, including contract cost and reimbursement rate, were found to have the smallest effects. The policy simulation results indicate that increasing contract cost would decrease signing willingness significantly. Somewhat unexpectedly, improving medical reimbursement rate was less valued by survey participants than the attributes of family doctor, such as their competence and attitude. This may be explained by the fact that contract plans were not well designed and may not have been based on data surrounding demand, which may result in an unreasonably set contract cost as well as reimbursement rate. These results are supported based on our qualitative interviews and focus group discussion, which suggested that several medical services in public health facilities were unnecessary and not in line with resident health demand. Most respondents were willing to pay a certain amount for an individualized service package as long as they could really benefit from it. Currently, the contract fee is determined by each city or county and is often based on how developed local health services are, funds based on medical insurance polling, and essential public health funding capacity [52]. Moreover, tailored and preferential medical insurance plans need to be enacted to target registered residents with different health demands.

Our study had a number of limitations. Due to resource constraints, this DCE study was conducted in a single province, which may limit the generalizability of the study results to other areas in China. Regarding the WTP, one previous study has suggested that the levels of the cost attribute can affect the estimate [51]. In this study contract cost levels were determined based on a pilot study and chosen to correspond to existing proposed implementations of the policy. Finally, since study design does not provide an opt-out option and participants were forced to choose their preferences, respondents may hold alternative choices and explanations not captured in our questionnaire, such as not registering with any family doctor or going only to the same family doctor. This limitation may have affected the precision of coefficient estimation. Future research should include an opt-out option and focus on capturing respondents' choices and behaviors more realistically.

Conclusions

This study found that rural residents valued health care quality characteristics—such as doctor competence, treatment techniques, and communication skills—more than non-quality attributes, which include an increased insurance reimbursement rate, a sufficient availability of essential drugs, and contract cost. These findings clearly suggest that policy makers must prioritize improving the quality of family doctors to increase the uptake of FDGS. Specifically, policies should focus on improving family doctors' competence, incentivize doctors to engage in patient-centered services, and encourage more trustful and respectful patient-provider relationships to ensure the quality of family doctor contract services. Results also suggest that uptake may be improved by offering tailored contract service packages in line with residents health status.

List Of Abbreviations

FDGS: family doctor contract service; CNY: China Yuan

Declarations

Ethics approval and consent to participate

The Ethical Committee of Shandong University, School of Public Health approved the study protocol. The investigation was conducted after the informed consents of all participants were obtained.

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

PF&CZ and SS conceived the idea and polished the manuscript. PF and YW coded and analyzed data, PF wrote the manuscript. SL, QG, JL, CZ and QM participated in interpretation of the data. All authors read and approved the final manuscript.

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Figures

Figure 1 Policy simulation with different attribute level

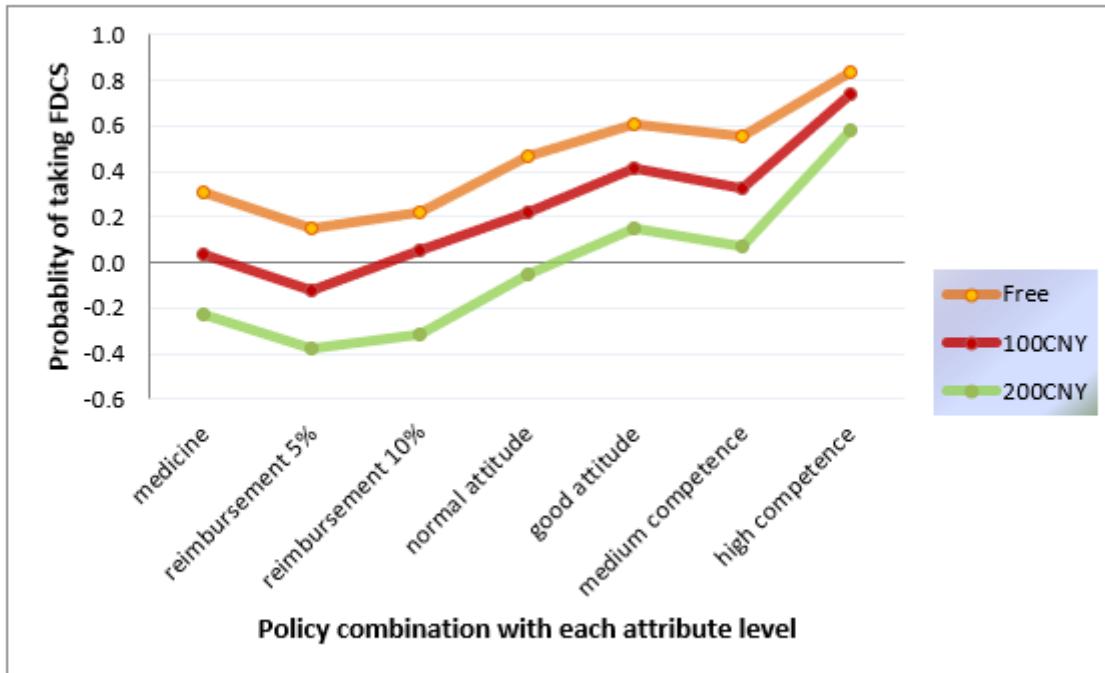


Figure 1

Policy simulation with different attribute level