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RESEARCH ARTICLE

Changes in public trust in physicians: empirical evidence from China

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Abstract **Studies examining the trends in public trust in physicians have provided a considerable amount of valuable policy implications for policymakers compared with cross-sectional studies on this topic in many countries. This study investigated changes in public trust in physicians in China based on two cross-sectional national surveys conducted in 2011 and 2016 and identified the determinants of these changes. The results indicated 83.4% of respondents in 2011 reported trust or strong trust in physicians in China, which decreased to 64.2% by 2016. The results of ordinal logistic regression demonstrated that public trust in physicians in China had decreased significantly from 2011 to 2016 ($P < 0.001$) after adjusting for other independent variables. Self-reported health status, self-rated happiness, and self-identified social class were all associated positively with public trust in physicians in China. The results also confirmed that decreasing public satisfaction with the most recent treatment experience was the major determinant of decreasing public trust in physicians in China. The findings of this study suggest that decreasing public trust in physicians deserves considerable attention from national policymakers and that improving satisfaction with treatment experiences would be the most effective strategy for enhancing public trust in physicians in China.**

Keywords trust in physicians; public trust; physician-patient relationship; health system performance

Introduction

Public trust in physicians has long been recognized as being crucial to the efficient functioning of a country's healthcare system [1,2]. Public trust is also used as an indicator to measure the performance of the healthcare system at the national level in many developed countries [3–6]. A comparison of public trust in physicians in Germany, the Netherlands, and England and Wales was conducted to examine the performance of these healthcare systems at the international level [7]. More recently, rankings of public trust in physicians in 29 industrialized countries have been reported [8].

Although the literature on public trust in physicians in developed countries has been increasing, most studies on this topic have involved cross-sectional research, providing less valuable policy implications for policymakers compared to studies that evaluate trends in public trust [9]. Trends in public trust in physicians have been investigated only in the United States and the Netherlands. In these countries, public trust in physicians has remained stable over the past 30 years (in the United States) and from 1997 to 2004 (in the Netherlands) [8,9]. Studies have proposed the presence of a major imbalance between the importance of public trust in physicians and the prioritization of research on this topic [10].

The aforementioned studies were conducted in developed countries, and few studies have explored this issue in the developing world (except for one cross-sectional study on public trust in physicians in Trinidad and Tobago) [11]. The primary objective of the present study is to fill the knowledge gap regarding public trust in physicians in developing societies. Specifically, this study examined quantitative changes in public trust in physicians in China. This country offers an important and attractive setting for evaluating public trust in physicians. Since its birth in 1949, the People's Republic of China has undertaken a series of remarkable health system experiments. In 1984, China turned its healthcare system, wherein its government

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had owned and operated all healthcare facilities, completely on its head almost as an afterthought to dramatic free-market reforms [12]. One legacy of China's market experiment is a widespread perception that physicians place their economic welfare ahead of patients' interests [13]. Since 2009, in the ongoing evolution of the Chinese healthcare system, the Chinese government has officially abandoned the experiment with a healthcare system based on market principles and committed to providing affordable basic healthcare for all Chinese people and creating a high-quality, trusted physician workforce [14].

This study examined changes in public trust in physicians in China based on the results of two cross-sectional national surveys conducted in 2011 and 2016 and identified the determinants of these changes. In addition to providing appropriate policy implications for national policymakers in China, the findings can provide insights into the healthcare systems of other developing countries with similar socioeconomic and cultural backgrounds and provide a reference for comparing changes in public trust in physicians at the international level.

Materials and methods

Data sources

Two cross-sectional surveys were used as the data sources in this study. The first data source was a health survey conducted by the International Social Survey Program (ISSP) from 2011 to 2013 in 31 countries and 1 region (Taiwan region). Although Taiwan had 2199 respondents in the ISSP, it was excluded from this study because of the huge difference in healthcare systems between the Chinese mainland and Taiwan region, and the objective of this study is to examine changes in public trust in physicians in the Chinese mainland under the setting of varied healthcare system experiments. The survey was conducted from November to December 2011 in the Chinese mainland. A multistage stratified random-sampling method was adopted for data collection, and all data were collected through face-to-face (paper and pencil) interviews conducted in 26 provincial areas (the total number of provincial areas in Chinese mainland is 31). A total of 5617 respondents aged $\geqslant$ 18 years were recruited. The ISSP database was released publicly for research in 2015 [15].

The second survey, which was conducted by our research team, was identical to the aforementioned ISSP health survey. All data were collected through computer-assisted telephone interviews (CATI) in the same 26 provincial areas of Chinese mainland between January and February 2016. Specifically, potential respondents were contacted through random digit dialing. After being generated, telephone numbers were classified on the basis of provinces. Calls were conducted to fulfill a quota sample, with the target number of completed surveys being 200 in each provincial area. A total of 43 892 phone numbers were dialed, and 4521 respondents aged $\geqslant$ 18 years completed the survey.

After removal of survey responses with missing data, 4586 and 4260 responses to the 2011 and 2016 surveys, respectively, were analyzed in this study.

Measurements

Public trust in physicians was set as dependent variable and measured using the following question: "How much do you agree or disagree with the statement 'all things considered, doctors can be trusted in China' on a scale from 1 (strongly disagree) to 5 (strongly agree)"?

Because no previous study has examined the determinants of changes or trends in trust in physicians, the commonly identified determinants of public trust in physicians in prior cross-sectional studies were set as independent variables [4,5,16–19]. These independent variables include satisfaction with the most recent treatment experience, self-reported health status, self-rated happiness, self-identified social class, and frequency of doctor visits. Satisfaction with the most recent treatment experience was measured using the following question: "How satisfied or dissatisfied were you with the treatment you received when you last visited a doctor on a scale from 1 (completely dissatisfied) to 7 (completely satisfied)"? Demographic characteristics (sex, age, educational level, marital status, urban or suburban dwelling, and gross domestic product (GDP) per capita of the residential province) were also collected and used as independent variables. Detailed descriptions of the variables are listed in Tables 1 and 2.

Statistical analysis

Descriptive statistics were used to analyze the dependent and independent variables.

Characteristics such as sex, age, and educational level of the study participants differed between the two surveys, and the general population was enrolled from the most recent accessible Chinese national census data (for the year of 2010) [20]. Thus, post-stratification weights with multiple factors were applied to make the distributions of characteristics of the participants from the two surveys comparable to the equivalent census results. Specifically, because the national census data include crosstabs for sex*age*education for the entire Chinese population and the sample tables had no small cell sizes, this study used a single big year*sex*age*education table for the calculation of the weights. Weights were also normed to ensure the weighted *N* for each analysis was equal to the un-weighted *N* [21,22]. This study also pooled data obtained in the two

Table 1 Characteristics of the demographic variables from the surveys and the national census (%)

Variable	2010	2011 (n = 4586)		2016 (n = 4260)	
	Value	Value	Weighted value	Value	Weighted value
Sex					
Male	50.6	45.4	50.5	49.9	50.5
Female	49.4	54.6	49.5	50.1	49.5
Age (year)	–	47±16	43±16	37±14	42±15
18–29	25.9	15.8	25.7	35.3	25.7
30–39	20.6	17.7	20.4	27.4	20.4
40–49	22.0	22.4	21.9	16.0	21.9
50–	31.5	44.1	32.0	21.3	32.0
Education					
Primary school and below	29.8	36.7	30.3	6.8	30.3
Junior high school	43.6	31.2	43.3	16.2	43.3
High school and professional school	15.4	17.7	15.3	22.8	15.3
College and above	11.2	14.4	11.1	54.1	11.1
Marital status					
Others	24.9	20.7	22.4	28.7	18.8
Married	75.1	79.3	77.6	71.3	81.2
Urban or rural dwelling					
Outside of urban areas	49.4	42.8	44.5	40.5	35.8
In urban areas	50.6	57.2	55.5	59.5	64.2
Health insurance coverage					
No health insurance	5.0	12.9	14.3	8.1	8.4
Private health insurance	5.0	3.7	3.9	8.1	8.5
Public health insurance	90.0	83.4	81.8	83.9	83.0
GDP per capita in each province (10 thousand RMB)	–	4±1.9	4±1.7	6±2.8	6±2.7

Data in 2010 were from the Chinese national census data. Data on GDP per capita in each province were from the National Statistics Yearbook in 2016. All plus-minus values in this table were mean±SD. In terms of marital status, others refer to the people who were single, divorced, widowed, or separated.

surveys and generated a new variable "survey year" (0 for 2011 and 1 for 2016) to examine quantitatively the changes in public trust in physicians between 2011 and 2016.

Because trust in physicians, the dependent variable, is an ordinal variable with five response categories, ordinal logistic regression was used to assess the associations of public trust in physicians with the independent variables. We evaluated the fit of regression models by using Nagelkerke's pseudo R^2. SPSS (version 24.0, IBM Corp., USA) was used to analyze the survey data, and the statistical significance was set at $P < 0.05$.

Results

Study population characteristics

As shown in Table 1, several characteristics of the respondents in the two surveys were consistent with the Chinese national census data. The census data indicate 75.1% of Chinese adults were married; 79.3% and 71.3% of the respondents to the 2011 and 2016 surveys were married, respectively. The census also found that 50.6% of Chinese adults lived in urban areas, whereas 57.2% and 59.5% of the respondents to the 2011 and 2016 surveys reported living in urban areas, respectively. The Chinese national census data also show that 90% of Chinese adults were covered by public health insurance; 83.4% and 83.9% of the survey respondents in 2011 and 2016 were covered by public health insurance, respectively. However, considerable differences were observed in the distribution of sex, age, and educational level between the surveys and census data. For example, the census data show that 29.8% of Chinese adults had received an elementary school education or lower in 2010. By contrast, the corresponding proportions of the respondents in the 2011 and 2016 surveys were 36.7% and 6.8%, respectively. As mentioned previously, to make the results computed from the two surveys more representative of the Chinese population, we weighted all data from the 2011 and 2016 surveys by using post-stratification weights with multiple factors. After being weighted, all characteristics of the respondents in the two surveys were generally consistent with those in the

Table 2 Comparison of variables between the surveys in 2011 and 2016 (%)

Variable	2011 (n = 4586)	2016 (n = 4260)
Trust in physicians	3.82±0.73	3.53±0.81
Strongly disagree	1.0	0.7
Disagree	7.9	14.0
Neither agree nor disagree	7.7	21.1
Agree	74.6	60.2
Strongly agree	8.8	4.0
Self-identified social class	4.14±1.77	4.60±2.24
Range	1–10	1–10
Self-reported health status		
Poor	10.0	3.0
Fair	33.8	30.9
Good	21.5	8.6
Very good	25.6	29.3
Excellent	9.0	28.1
Self-rated happiness		
Very unhappy	1.7	1.0
Quite unhappy	6.8	3.6
Neither unhappiness nor happiness	11.0	14.9
Quite happy	60.1	55.1
Very happy	20.3	25.5
Frequency of doctor visits		
Never	19.6	38.2
Seldom	40.8	43.1
Sometimes	26.6	11.2
Often	11.4	7.1
Very often	1.7	0.4
Satisfaction with the last treatment		
Completely dissatisfied	1.0	0.4
Very dissatisfied	2.5	2.7
Fairly dissatisfied	8.2	10.8
Neither satisfied nor dissatisfied	12.6	31.4
Fairly satisfied	63.1	44.0
Very satisfied	10.2	5.2
Completely satisfied	2.4	5.5

The descriptions of each variable were weighted by using post-stratification weights with multiple factors. Plus-minus values are mean±SD.

Chinese national census data. Detailed descriptions of the weighted demographic variables are listed in Table 1.

Descriptions of changes in public trust in physicians

Table 2 presents the descriptions of the dependent and independent variables in this study. Specifically, 83.4% of respondents in 2011 reported as having trust or strong trust in physicians, but this proportion decreased to 64.2% by 2016. The mean of trust in physicians also decreased from 3.82 in 2011 to 3.53 in 2016. The proportion of respondents who were fairly or highly satisfied with their most recent treatment experience decreased from 75.7% in 2011 to 54.7% in 2016.

Determinants of public trust in physicians

Table 3 shows that public trust in physicians in China was significantly lower in 2016 than in 2011 [coefficient = −0.880 (−1.006, −0.754), $P < 0.001$]. A comparison of the absolute values of coefficients for each significant independent variable revealed survey year had considerably stronger effects in the ordinal logistic model as compared to all the other variables.

The ordinal logistic regression results show satisfaction with most recent treatment experience was associated positively with public trust in physicians in China [coefficient = 0.571 (0.526, 0.616), $P < 0.001$]. A comparison of the absolute values of coefficients for each

Table 3 Ordinal logistic regression for public trust in China's physicians (n = 8846)

	Coefficient	Standard error	P	95% confidence interval
Year (2016/2011)	−0.880	0.064	<0.001	−1.006 to −0.754
Satisfaction with most recent treatment experience	0.571	0.023	<0.001	0.526 to 0.616
Self-rated happiness	0.174	0.029	<0.001	0.117 to 0.231
Frequency of doctor visits	−0.014	0.026	0.599	−0.065 to 0.038
Self-reported health status	0.085	0.021	<0.001	0.044 to 0.126
Self-identified social class	0.050	0.012	<0.001	0.026 to 0.073
Sex	−0.016	0.048	0.735	−0.110 to 0.077
Age	0.013	0.002	<0.001	0.010 to 0.016
Marital status	−0.044	0.057	0.437	−0.155 to 0.067
Urban or rural dwelling	−0.028	0.052	0.587	−0.131 to 0.074
GDP per capita in each province	−0.036	0.010	0.001	−0.056 to −0.016
Elementary school and below	0.179	0.095	0.059	−0.007 to 0.364
Junior high school	0.028	0.081	0.728	−0.186 to 0.130
High school and professional school	0.218	0.089	0.015	−0.393 to −0.042
College and above	Reference			
No health insurance	−0.088	0.073	0.230	−0.231 to 0.056
Private health insurance	0.183	0.096	0.056	−0.005 to 0.370
Public health insurance	Reference			

The results were weighted by using post-stratification weights with multiple factors. Pseudo R^2 of the model (Nagelkerke) was 0.171, and P<0.001.

significant independent variable indicated satisfaction with the most recent treatment experience had the second highest effect on the model after the aforementioned variable.

Self-rated happiness, self-reported health status, self-identified social class, and respondents' age were all associated positively with public trust in physicians. In addition, GDP per capita in each province was associated negatively with public trust in physicians [coefficient = −0.036 (−0.056, −0.016), $P < 0.01$]. The absolute values of coefficients for each independent variable showed the aforementioned significant variables had much weaker effects on the ordinal logistic regression model than the survey year and satisfaction with the most recent treatment experience.

Discussion

All data from the two surveys were weighted to ensure the distributions of characteristics of respondents comparable to the equivalent census data, respectively. In addition to the characteristics of respondents, the weighted distributions of each independent variable between the two surveys became more accordant to the counterpart from non-weighted data. For example, 15.5% and 6.4% of the respondents from the two surveys reported visiting the doctor often or very often in 2011 and 2016, respectively. After being weighted, 13.1% and 7.5% of the respondents were in this category, respectively (Table 2, Supplementary Table S1). However, the results show the weighting had limited effects on the dependent variable. Specifically, 83.4% and 64.8% of participants reported trust or strong trust in physicians in 2011 and 2016, respectively. After being weighted, the counterparts were 83.4% and 64.2% in 2011 and 2016, respectively. Furthermore, through comparisons of the results from logistic regressions between the weighted and non-weighted data, weighting had negligible effects on the relationship between dependent and independent variables. Nevertheless, the relationships between public trust in physicians and characteristics of respondents were transformed by the post-stratification weighting (Table 3, Supplementary Table S2). Therefore, we believe that weighting is necessary for this study and that it has not changed the general outcomes of this study.

All data of public trust in physicians in China in 2011 were obtained from the ISSP survey. The same questionnaire was used for other countries in the ISSP survey. Thus, data on public trust in physicians in China in 2011 is comparable with that in developed countries. Studies have shown that public trust in physicians (the proportion of respondents who trust or strongly trust in doctors in their country) in China in 2011 ranked first among the 30 countries or regions in the ISSP survey [8]. Furthermore, because public trust in physicians in China in 2011 is comparable to that in 2016, public trust in physicians in China in 2016 is comparable to other countries' data from the ISSP survey. According to the data analyses, in 2016, public trust in physicians in China ranked 20th among the

same 30 countries or regions [8]. Therefore, either the value or ranking of public trust in physicians in China in 2016 indicate that public trust in physicians in China is not going in the right direction.

The results of this study show public trust in physicians in China decreased dramatically from 2011 to 2016. In addition to observing a decrease from 83.4% in 2011 to 64.2% in 2016, logistic regression confirmed the decrease in public trust in physicians was significant after adjusting for other variables. The absolute values of coefficients for all significant independent variables in the logistic model indicated survey year had much stronger effect than any other significant independent variable. Therefore, decreasing public trust in physicians in China was confirmed in this study. Public trust in physicians in the United States and the Netherlands has remained stable. Consequently, China's national policymakers should focus more attention to increasing public trust in physicians in China actively compared to their counterparts in the United States and the Netherlands. As noted, the Chinese government has officially abandoned the market-oriented healthcare system and has committed to creating trusted medical workforces since 2009. However, decreasing public trust in physicians between 2011 and 2016 demonstrated the ongoing healthcare reform should be evaluated comprehensively. Furthermore, the previous study also shows the country's publicly owned but profit-driven hospitals successfully resisted the latest reform efforts, a reality that could reflect the hospitals' power within China's political system, and how frustrated authorities sought to use market forces once again to bring the hospital sector into line [14,23]. Studies have argued that rebuilding public trust in physicians may be expensive and have been left too late if the government waits until public trust has been eroded or even broken before adequate analysis is performed [10]. Therefore, the decreasing public trust in physicians is an urgent issue for China's healthcare system.

The results of this research demonstrate self-rated happiness, self-reported health status, and self-identified social class of respondents were associated positively with public trust in physicians in China. These results are in accordance with the determinants of public trust in physicians in developed countries, such as the UK, as reported by previous studies [4]. Nevertheless, no changes were observed in the three variables between the two surveys. For example, 80.4% and 80.6% of respondents were quite or very happy with their current lives in 2011 and 2016, respectively. Moreover, the mean of self-rated social class increased from 4.14 in 2011 to 4.60 in 2016. Therefore, we deduce that self-rated happiness, self-reported health status, and self-identified social class were not the cause of decreasing public trust in physicians between 2011 and 2016. We also believe that attempting policy changes regarding these three variables would not enhance public trust in physicians.

Critical citizens, those who are younger and highly paid as well as have higher educational attainment, are considered to have low public trust [24]. The results of this study show respondents with high school or professional school education had lower probability of trust in physicians than those with a college education or higher. Furthermore, the GDP per capita in each residential province of respondents was associated negatively with public trust in physicians, and age of respondents was associated positively with public trust in physicians. This study found no strong evidence to confirm the low trust of critical citizens in physicians. Studies on trust in physicians among patients in Shanghai have also reported similar results [25]. The results of this study indicate that demographic variables were not responsible for the decrease in public trust in physicians in China.

Satisfaction with the most recent treatment experience was associated positively with public trust in physicians in China and had a strong effect on the logistic model. These results are also in accordance with studies conducted in developed countries [26,27]. This study also demonstrated the proportion of respondents who were fairly or above satisfied with their last treatment experience decreased from 75.7% in 2011 to 54.7% in 2016. The proportion of respondents who were very or completely satisfied with their last treatment experience in 2011 was 12.6%, which ranked the country in the 29th position among the 30 countries or regions included in the ISSP survey. The corresponding proportion in China in 2016 (10.7%) resulted in the country occupying the last position, similar to Russia [8]. We believe that decreasing satisfaction with treatment experiences is one of the major determinants of the decreasing public trust in physicians in China. Compared with the aforementioned independent variables, improving satisfaction with treatment experiences is more feasible to enhance public trust in physicians. Researchers have argued that improving satisfaction with treatment experiences may lead to broader improvements rather than detracting from general quality improvement efforts [28]. Therefore, improving satisfaction with treatment experience should be the priority if public trust in physicians in China is to be increased.

Several limitations of this paper should be noted. First, data used in this study were all self-reported and are thus subject to the limitations of such reporting. Second, two cross-sectional studies were utilized to describe changes in public trust in physicians in China. However, to examine the trend in public trust, data from at least three years and continuous surveys are required to determine the causality between public trust in physicians and independent variables, particularly in terms of satisfaction with treatment experiences.

Public trust in physicians in China has decreased significantly between 2011 and 2016. In contrast to the stable trend in public trust in physicians in developed

countries, the decreasing trust of the Chinese population in physicians deserves considerable attention from national policymakers. Our results lead us to believe decreasing satisfaction with treatment experiences is the major determinant of decreasing public trust in physicians in China. Consequently, improving satisfaction with treatment experiences may be the most feasible approach to enhancing public trust in physicians.

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Compliance with ethics guidelines

Dahai Zhao and Zhiruo Zhang declare they have no conflict of interest. This article does not contain any studies with human or animal subjects.

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