

Trends of out-of-pocket expenditure for influenza in China health and nutrition survey during 1989–2006

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Abstract

Objectives To examine the trends of out-of-pocket expenditure for influenza during 1989–2006 in China.

Methods Data were extracted from the China Health and Nutrition Survey (CHNS) during 1989–2006 (in seven waves). A fixed effect model with robust standard errors was employed to examine trends of out-of-pocket expenditure (adjusted to 2006 Chinese RMB).

Results The out-of-pocket expenditure increased from 11.92 RMB in 1989 to 50.75 RMB in 2006. The final sample for fixed effect model was 23,050 households. Income elasticity of out-of-pocket expenditure was 1.6%. Using 1989 as reference, the predicted increase was 242.23% [95% confidence interval (CI): 225.79–259.50%] in 2006; it was 143.54% in city hospitals [95% CI: 130.43–157.40%] compared to village clinics.

Conclusions Adjusted for inflation and income elasticity, Chinese households experienced an increase of more than double the out-of-pocket expenditure during 1989–2006. The expenditure was higher in higher-level facilities. Policy implications include the government fixed-budget financing to health providers could contribute to the rapidly increased financial burden; a referral system should be rebuilt; private health providers may play an important role in containing healthcare price in China.

Keywords Influenza · Out-of-pocket expenditure · Trends · China · Policy implication

Introduction

Influenza is an infectious disease affecting people of all ages throughout the world (Szucs et al. 2001). In annual influenza epidemics, 5–15% of the population is estimated to be affected with upper respiratory tract infections and 250,000–500,000 deaths every year around the world (World Health Organization 2003). For many individuals, influenza infection could be prevented through vaccination for both adults and children (Teo et al. 2005; Fitzner et al. 2001). It still represents a major challenge for public health worldwide (Szucs 2004; Principi et al. 2004; Monto 1999). The outbreak of new Influenza A (H1N1) which spreads over hundred countries in 2009 posed big threat to public health systems (World Health Organization 2009). In addition to the direct costs of medical care, the indirect costs of influenza are substantial and stem largely from absenteeism and loss of work productivity (Ng et al. 2002; Keech et al. 1998).

There is very little, if any, solid information on the direct economic burden on individuals and its trends in China, particularly for the burden of influenza in China over the period when China has experienced a major shift in the organization of health care system (XinhuaNet 2010; Akin et al. 2005). In China, the development of health care system still lags behind its economic growth, especially in terms of health insurance coverage (ChinaneWS 2010; Liu et al. 2008). According to National Bureau of Statistics of China, individual's out-of-pocket health expenditures accounted for 34.1% in 1989, 49.3% in 2006 of total medical expenditures (Ministry of Health of the People's

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Republic of China 2009). Similarly, out-of-pocket costs for treatment of influenza represent the major component of health care expenditure for this condition in China. An episode of prescription drugs for influenza treatment, largely paid out of pocket, usually cost individual's monthly salary (Chinanews 2010; Jihong Ding et al. 2010). In addition to the epidemiological significance of high prevalence in the population, out-of-pocket expenditure for influenza treatment was used as a population proxy for overall health care costs in China (Akin et al. 2005). This study examined trends of the burden of influenza using the household out-of-pocket expenditure and explored corresponding health policy implications.

Methods

Study design

This retrospective study used all current publicly available waves of the China Health and Nutrition Survey (CHNS): 1989, 1991, 1993, 1997, 2000, 2004, and 2006. Specifically, the dataset prepared for longitudinal analysis was used for data analysis. The CHNS, an ongoing international collaborative project between the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention, was longitudinally designed to examine the effects of the health, nutrition, and family planning policies and programs implemented by national and local governments and to see how the social and economic transformation of Chinese society is affecting the health and nutritional status of its population. Additional details about the study design and sampling strategies are available at <http://www.cpc.unc.edu/china>.

For each study year, the CHNS employed a multistage, random cluster process to draw a sample. All participating households were asked to complete a structured questionnaire which comprised the following basic components: (1) socio-demographics, gross household income, net household income, per capita household income, family size, etc. (2) Health and medical services, including what type of facility they go to for influenza treatment, and out-of-pocket expenditure per visit (1 US \$ = 7.95 RMB in 2006), etc.

Variables

Two sets of dummy variables were created for data analysis: study year and facility type. The facility type was classified as 'village clinic', 'township hospital', 'county hospital', 'city hospital', 'private clinic/hospital', and

'others facilities', which included work unit clinic or hospital, army hospital, pharmacy, etc. The out-of-pocket expenditure per visit and per capita household income were converted to 2006 Chinese RMB based on constructed consumer price index (China Health and Nutrition Survey 2010) and then both logarithmically transformed. The number of children (≤ 15 years old) and the number of elderly (≥ 65 years old) in a family in each period were also created.

Sample

There were a total of 27,522 households in the survey during 1989–2006. In 1989, 3,701 households participated in this project; 3,602 in 1991; 3,424 in 1993; 3,838 in 1997; 4,293 in 2000; 4,305 in 2004 and 4,359 in 2006. Overall, 2,480 households had participated in the survey for all study years. Among them, 23,466 households reported influenza treatment cost over time, while 65 observations with zero out-of-pocket expenditure were excluded because of logarithmic transformation. Other 351 observations dropped from fixed effect model due to missing values. Finally, 23,050 observations with complete information were used in the regression model.

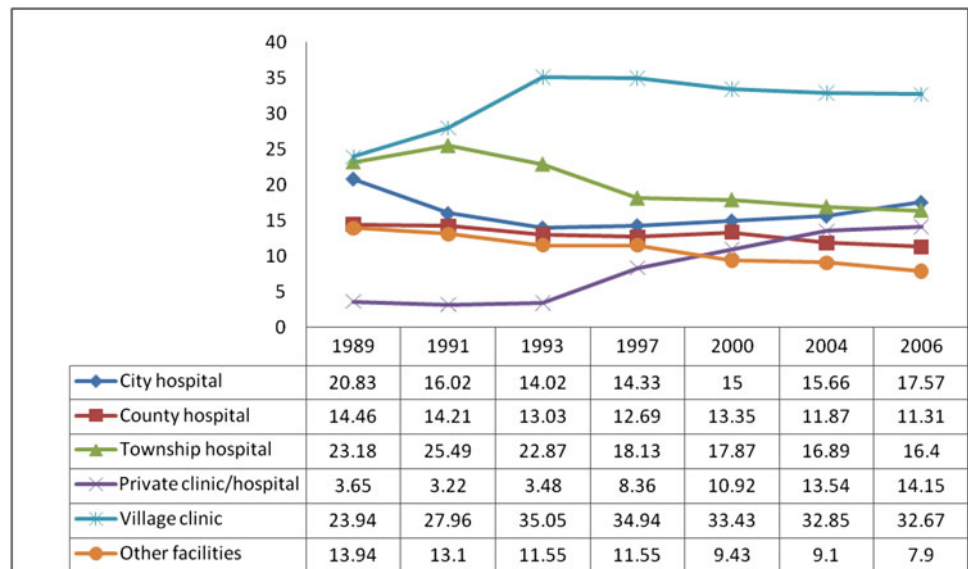
Data analysis

We described the overall trends of out-of-pocket expenditure per visit for treatment of influenza by comparing the expenditure differences across the facilities of different levels over the study years. A fixed effect model with robust standard errors of logarithmically transformed out-of-pocket expenditure were specified with study year dummies, and facility dummies, controlled for the logarithmically transformed per capita household income as well as the number of children (≤ 15 years old) and the number of elderly (≥ 65 years old) in a family in each period. A fixed effect model with robust standard errors was commonly used to take care of serial correlation issue in panel data analysis (Kezdi 2003). For the independent variables, the percentage changes in the predicted out-of-pocket expenditure were calculated using $100\% \times [\text{EXP}(\text{coefficient}) - 1]$. All statistical analyses were conducted using STATA 10.1 and a two-tailed p value < 0.05 was considered statistically significant.

Results

Figure 1 demonstrates the changes using different health facilities during 1989–2006. The overall pattern of receiving services from the health care facilities of different levels changed over time. Village clinics accounted for

Fig. 1 Patients distribution to health facilities in China Health and Nutrition Survey during 1989–2006 China (%)



the biggest percentage in all periods and the percentage tended to be stable since 1993. In contrast, the percentages of city hospital and private clinic/hospital increased since 1993. Township hospitals began to lose its share of providing services since 1991 and were even outnumbered by city hospitals in 2006. The county hospitals and other facilities maintain their shares over time.

Among 27,522 households, 85.3% (23,466) reported influenza treatment cost over time, ranging from 71.2 to 92.3% during study periods. The out-of-pocket expenditure increased from 11.92 RMB in 1989 to 50.75 RMB in 2006. Table 1 presents the out-of-pocket expenditure across facilities of different levels over time. The expenditure ranged from 17.79 RMB in private clinic/hospital to 59.47 RMB in city hospitals, followed by county hospitals, others facilities, township hospitals, village clinics and private clinics/hospitals in each study year. And the differences across different facilities tended to widen, but costs in the village clinics and private clinics/hospitals were almost the same during each study wave.

Table 2 displays the fixed effect model with robust standard errors to examine the association of factors (per capita income, study years, and health facilities). In this model, we use the data of 23,050 households with complete information and the model fits well ($F = 369.61$, $p < 0.001$). The model explained about 63.93% ($R^2 = 0.6393$, adjusted $R^2 = 0.5078$) variance of the dependent variable.

The fixed effect model suggested that the household income and expenditure for influenza treatments were positively correlated; however, the effect of household income on expenditure was limited since the elasticity of out-of-pocket expenditure for treatment with respect to per capita household income was approximately 1.6%. Using 1989 as reference year, Chinese households have reported a continuously rising out-of-pocket expenditure. Compared with out-of-pocket expenditure in village clinic, all health facilities except private clinic were associated with significantly higher out-of-pocket expenditure (all p values < 0.001). Private clinics were also associated with a slightly higher out-of-pocket cost, but the difference was not statistically significant ($p = 0.068$). The effect of the

Table 1 Out-of-pocket expenditure (in 2006 RMB) across facilities of different levels in China Health and Nutrition Survey during 1989–2006 China

	Village clinics	Township hospital	County hospital	City hospital	Private clinic/hospital	Others
1989	6.77	12.25	13.99	17.74	5.42	11.93
1991	7.14	12.17	14.78	22.86	6.23	16.81
1993	9.02	17.74	19.07	25.48	7.98	19.22
1997	16.16	21.19	27.40	44.29	10.64	31.86
2000	21.94	31.09	41.54	67.26	16.43	51.22
2004	23.65	33.80	50.48	99.13	23.74	57.91
2006	27.22	45.73	61.03	110.29	24.47	72.12
Total	17.79	24.78	34.31	59.47	18.20	37.14

Table 2 Fixed effect model with robust standard errors of logarithmic-transformed out-of-pocket expenditure in China Health and Nutrition Survey during 1989–2006 China

	Coefficient	Robust standard error	<i>p</i> value	Predicted increase (%)	95% CI of predicted increase (%)	
Log (income)	0.016	0.008	0.042	na	na	na
Year_1989: reference						
Year_1991	0.125	0.021	0.000	13.32	8.79	18.04
Year_1993	0.350	0.021	0.000	41.96	36.24	47.92
Year_1997	0.622	0.022	0.000	86.33	78.48	94.52
Year_2000	0.896	0.022	0.000	144.87	134.32	155.90
Year_2004	1.001	0.025	0.000	172.18	158.93	186.11
Year_2006	1.230	0.025	0.000	242.23	225.79	259.50
Village clinics: reference						
Private clinics/hospitals	0.049	0.027	0.068	4.99	−0.37	10.63
Township hospitals	0.530	0.021	0.000	69.95	63.22	76.97
County hospitals	0.877	0.029	0.000	140.48	127.02	154.74
City hospitals	0.890	0.028	0.000	143.54	130.43	157.40
Others	0.536	0.034	0.000	70.85	59.76	82.71
Number of children	0.007	0.009	0.423	0.71	−1.02	2.46
Number of elderly	−0.024	0.016	0.146	−2.35	−5.44	0.84
Constant	1.542	0.065	0.000	na	na	na

na Not available

number of children in a family was not significant, neither was the number of elderly (both *p* values > 0.05).

Discussions

In this study, the out-of-pocket expenditure per visit for influenza treatment tends to rise over time in Chinese households. After adjustment of inflation and other covariates, the overall out-of-pocket expenditure for treatment in 2006 was approximately three times as high as that in 1989. Most strikingly, the out-of-pocket expenditure in city hospitals was associated with approximately fivefold increase in 2006 compared with the level in 1989. One reason for this pattern of increased expenditure would be that hospitals in China have to increase service prices and pharmaceutical profits, because they only receive fixed budget from governments since early 1980s (Liu et al. 2000). The budget from governments only accounts for a small and decreasing share of healthcare facilities' revenue. It has been reported that the budget from governments only accounted for approximately 10% overall healthcare expenditure in 2008 (Ministry of Health of the People's Republic of China 2009). It suggests that the fixed-budget financing mechanism used by governments could contribute to increased financial burden experienced by Chinese households over the observational period. There are some recent financial initiatives to address the issue at the local government level, while their effects are still too early to

tell. For example, Beijing government is revoking the fixed-budget policy and paying off all the deficits of public hospital instead (XinhuaNet 2010).

Despite the differential cost across facilities, this study did not observe a declining trend of receiving care for influenza from the city hospitals. The percentage of people going to city hospital for influenza treatment rose slightly from 14.02% in 1993 to 17.57% in 2006. Such a trend can be partially explained by the urbanization over the study years. Patients in China within their financial constrain often prefer to a facility of the highest level due to lack of proper referral system. Consequently, the higher-level such as city and county, hospitals are often overloaded, while the lower-level hospitals are underutilized. Such utilization pattern justifies the need for efficient referral system in health reform in China (Liu et al. 2005; Ying et al. 2001). Establishing referral systems in China could contain health care cost and improve efficacy of health systems (e.g., increase use of primary care and preventive care).

Another important pattern observed in this study is that an increasing number of people have received treatment through private clinics/hospitals, which were associated with the lowest level of cost for treating influenza. During the study period, the privatization of health system in the rural areas has converted many health facilities into private clinics/hospitals (XinhuaNet 2010). By 2008, over 90% of clinics, 48% of outpatient department, and 18% of registered hospitals were private and for-profits facilities in China overall (Ministry of Health of the People's Republic

of China 2009). Recently, the China central government has recognized the important role of private health facilities in containing healthcare price and cost and a series of national policies has been implemented to encourage their developments. It is just not clear whether competition for patients between public and private hospitals can help to contain the escalating healthcare expenditure in the future.

This study has several limitations. First, it suffers from losses to follow-up and time gaps. Second, other variables that might affect treatment cost were not accounted for, such as health status of family member, treatment regimens and diagnostic tests. Beyond the treatment cost, the survey has very limited information in quality of care indicators, which the developed countries have used to measure the performance of health facilities. Third, as the study population age, they might have more severe influenza and then need more expensive treatment as suggested before (Simonsen et al. 2005). Also, there has been a well-documented over-utilization of antibiotics in treating influenza and influenza-like illness in China (Li et al. 2004; Cao et al. 2008). Despite these limitations, this study provides original information on trends of out-of-pocket expenditure for influenza treatment over time in China.

In conclusion, adjusting for inflation and income elasticity, Chinese households experienced an increase of more than double the out-of-pocket expenditure over the study period. Increasing rate of expenditure was much higher in higher-level facilities. Policy implications include the government fixed-budget financing mechanism to health providers could contribute to the rapidly increased financial burden; a lack of referral systems should be addressed in health reform; private health providers may play an important role in containing healthcare price in China.

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Conflict of interest The authors declare that they have no competing interests.

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