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Forecasting China's Medical Insurance Policy for Urban Employees Using a Microsimulation Model

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Abstract

This paper uses microsimulation techniques to model individual's medical behavior and forecast the effects of different settings of medical insurance policies. The aim of the simulation is to measure the possible change and difference in policies in the process of implementation of the medical insurance policy settings for government policy makers. Based on predicting the medical expenses for urban employees in Zhenjiang, Jiangsu Province of China, the medical insurance policy was simulated over the five-year forecast period 2002 - 2006. The results estimated that the medical expenses of medical insurance participants in Zhenjiang will increase over this period. Retirees were found to be the main group of participants receiving the highest share of medical resource expenditure, with their medical expenses accounting for more than 45% of total medical expenses of all age groups. The proportion of medical expenses paid by the social pool funds for all groups of participants will increase annually. In addition to the base case forecasting the current policy setting, this paper also modeled two other policy settings to investigate what happens to key output variables if the policy settings are changed.

Keywords:
Medical Insurance, Policy Research, Microsimulation, Model

Introduction

1.1

By the late-1970s, medical insurance was available to the bulk of the Chinese population (roughly 90%, including virtually all urban residents and 85% of those in rural areas) (World Bank 1997). Coverage was almost always obtained through employment. The public or government health insurance program (gongfei yiliao) provided coverage to the employees of state agencies and organizations, as well as veterans and university students. Workers at state and non-agricultural collective enterprises received worker's or labour insurance (laodong baoxian) through their employers. In both cases there were avenues through which coverage could also apply to the worker's dependents (Henderson et al. 1995).

1.2

Since 1980, China's society and economy have undergone a profound reform process, transforming it from a planned economy to one increasingly relying on the market to regulate supply and demand. However, the medical insurance system was already failing to meet the

needs of social and economic development. And so China began to explore the establishment of a new and more efficient medical insurance system in the mid-1980s (China's State Council 1998). In principle, China's medical insurance is managed locally, and combines social pool and personal accounts. The basic medical insurance program covers all employers and employees in urban areas. The funds for basic medical insurance come mainly from premiums paid by both employers and employees: the premium paid by the employer is about six percent of the total wage bill, while that paid by the employee is two percent of his or her wage. Retirees are exempted from paying the premiums. The individuals' premiums together with 30% of the premiums paid by the employers go to the personal accounts, and the remaining 70% of the premiums paid by the employers goes to the social pool funds (China's State Council 2004).

1.3

Medical expenses are shared by the medical insurance and individuals. Outpatient treatment fees (smaller amounts) are mainly paid from the personal account, while hospitalization expenses (larger amounts) are paid mainly from the social pool fund. The minimum and maximum payments from the social pool fund are clearly set out. The minimum payment is, in principle, about 10 percent of the average annual wage of local employees, and the maximum payment is about four times the average annual wage of local employees. The medical expenses between the minimum and maximum standards are mainly paid from the social pool fund, and the individual pays a certain proportion. Expenses paid by retirees for medical treatment and medicine are lower than those paid by people in employment.

1.4

The ongoing medical insurance reform in urban areas of China has had a profound impact on the financing, management and provision of health services. The new medical insurance system has made outstanding achievements in medical insurance reform (China's State Council 2004; Akin, Dow and Lance 2004). However, China is now an ageing society. As the ageing of the population occurs, the number of elderly people is increasing. This will impose a heavy burden on medical insurance (Ma 2000; Gao, Tang and Tolhurst 2001). Given China's considerable size and diversity, the reform of China's urban medical insurance system faces many heavy tasks, such as expanding the coverage of medical insurance steadily to include eligible people in all kinds of employment in urban areas, strengthening and improving medical insurance management and services, and optimizing the medical insurance settings (Gao, Tang and Tolhurst 2001).

1.5

This paper uses microsimulation models to predict the medical expenses of urban employees in Zhenjiang, Jiangsu Province. The effect of implementation of the medical insurance policy is predicted on the basis of a static microsimulation model. The simulation commences in 2002 and forecasts medical insurance policy settings over five years until 2006. Based on the simulation for the current medical insurance policy, this paper also simulated two other policy settings. One setting reduces the proportion allocated to the personal accounts, the other enhances the employees' contribution to the social pool funds. Through the model, the actions of social pool funds and personal accounts are simulated through the process of payment, disbursement, and surplus.

Zhenjiang's basic medical insurance system

2.1

Zhenjiang, located in Jiangsu province, with an urban population of 1.01 million, is a medium-size city on the south bank of the Yangzi River, 200 km northwest of Shanghai. The city was chosen by Chinese central government as one of two pilot programs for medical insurance reform in January 1995. From 1 January 2002 onwards, Zhenjiang has implemented the basic medical insurance system as outlined below.

Basic medical insurance fund

2.2

Employers pay 9 percent of the total amount of its employees' annual wages; employees pay 2 percent of their wages as the basic medical insurance premium. For employees whose annual

wages are more than 300% of the average annual wages, their premium is based on 300% of the average annual wages as their wages. Retirees and their employers do not need to pay for the medical insurance. For senior retirees, who joined the Chinese revolutionary movement before 1949, their employers pay 7,500 Yuan (1US$ is about 8.01 China Yuan) for each person annually.

Rate allocated to the participants' personal accounts

2.3

A share of the basic medical insurance premium is then allocated to each employee's personal account, the share varying by group-type (age). That is, of the 11 percent of wages contributed jointly by employer and employee, 3 percent for employees under age 34 years, 4 percent for employees aged between 35 and 44 years, 5 percent for employees aged above 45 years, and 6 percent for retirees. For senior retirees, 3,000 Yuan is allocated to the personal accounts annually for each person. The remaining of the premium goes to social pool funds.

Implementation mode and individual disbursement rate

2.4

For incurred medical expenses of clinic or hospital care, the individuals first use their personal accounts and then out-of-pocket directly to pay the bill. The minimum medical expenses (threshold) payment required to trigger a social pool fund is 10% of annual wages for employees and 5% of pension income for retirees. The medical expenses less than the threshold are paid by personal accounts first and then directly by the individual concerned. For employees and retirees, the maximum medical expense covered by the basic medical fund is 30,000 Yuan (four times the average annual wages).

2.5

Under the ceiling (30,000 Yuan), medical expenses are shared by a social pool fund, personal account and individuals. The maximum direct payment by individual without reimbursement from either personal account or a social fund is 3,500 Yuan annually. The basic medical fund subsidizes the remaining expenses when the direct payment by the individual exceeds 3,500 Yuan. A large-sum fund will cover the medical expenses beyond the ceiling of 30,000 Yuan.

2.6

For clinic payments, there are two kinds of cases in which the personal account has been exhausted. One case is that if the remaining expense is below the threshold for reimbursement, then the individual pays the bill; the other case is that if the remaining expenses exceed the ceiling, then this excess is paid jointly by the individual and the social pool fund. The fund pays the greater part of the bill and is dependant on the level of hospital as showed in Table 1.

Table 1: Reimbursement rate by individual and the fund whenever the clinic expenses exceed the ceiling

Hospital's level	Rate by individual (%)	Rate by pool fund (%)
Large hospital	35	65
Medium hospital	30	70
Small hospital	25	75

2.7

For incurred hospitalization expenses, participants first pay the bill from their personal accounts. Whenever the personal account has been exhausted, the individual pays the bill if the money is within the threshold for reimbursement. The money exceeded the threshold is covered by the individual and the social pool fund jointly, of which the fund pays a large part. The rate of hospitalization expenses paid by retirees is half of that by employees.

Large-sum fund for serious illness

2.8

For serious illness, a large-sum medical expenditure fund has been established. Employees and retirees pay an extra 5 Yuan and 4 Yuan each month respectively. The amount of medical expenses beyond the ceiling of 30,000 Yuan is covered by this large-sum fund.

2.9

There are three kinds of payments depending on the amount of individual's annual medical expenses. The amount of expenses between 30,000 and 100,000 Yuan will be covered by the large-sum medical expenditure fund entirely. The amount of expenses between 100,000 and 200,000 Yuan will be covered by the large-sum medical expenditure fund mostly, while the individual contributes 5% of the expenses. The amount of expenses above 200,000 Yuan will be covered by the large-sum medical expenditure fund and the individual jointly, in which the individual will contribute 10% of the expenses.

Methodology and related works

3.1

In this research we adopted a static microsimulation technique to model the medical insurance policy for urban employees who are covered by the basic medical insurance in China.

3.2

Microsimulation models are computer programs that are built using individual level data. This data is used to determine what is happening currently at the individual level. The programs then allow for simulation, predicting what the population will do in the future based on certain assumptions. The results are then aggregated, so that the behaviour of the population as a whole, or sections of the population, can be identified.

3.3

The major advantage of microsimulation models for social and economic policy analysis is that they produce results which can be analyzed at the individual level. Thus, the distributional impact of a policy measure across different types of families or different geographical regions can be assessed (Li and Gao 1999).

3.4

An overview of what constitutes microsimulation, the various types of models, some of the technical characteristics and considerations, and examples of model applications can be found in Harding (1996), Li and Gao (1999) and Gupta and Kapur (2000). Microsimulation has proven to be a particularly useful tool for policy analysis. There is a broad range of microsimulation models but essentially there are only two types: static or dynamic (Harding 1996). Static models take a cross-section of the population at a particular point in time and different policy rules are applied.

3.5

The range of application of microsimulation is quite broad. In the past two decades, microsimulation models have become very powerful tools in many countries. Such models, typically, have often focused on taxation, social security and cash transfer programs. For example, the TRIM microsimulation model is used to simulate tax programs, health programs and transfer programs in America (Giannarelli and Zedlewski 1996), Fredriksen and Stølen (2003) used microsimulation model to study possible ways to moderate the future pension burden in Norway, Lagergren (2003) constructed a simulation model to simulate the future needs of long-term care of elderly persons in Sweden.

3.6

Over the last few years, the National Centre for Social and Economic Modelling of Australia has extended the benefits of its traditional microsimulation modelling to the health and aged care arenas, including the Pharmaceutical Benefits Scheme, private health insurance, hospital and medical services usage and costs, and the need for aged care services (Brown, Abello, Phillips and Harding 2004; Harding, Abello, Brown and Phillips 2004).

3.7

Yet, despite having made a major contribution to the development of tax/transfer policies, there are few examples internationally where microsimulation has been used to model health and aged care policy effects (Walker 2000; Abello, Brown, Walker and Thurecht 2003; Brown and Harding 2002). In December 2003, an International Microsimulation Conference on Population, Ageing and Health was held in Canberra and a number of papers were presented on a range of health applications (see: http://www.natsem.canberra.edu.au/conference2003).

Construction of the model

4.1

This paper describes the adoption of static microsimulation methods (Harding 1996; Brown, Abello, Phillips and Harding 2004) to simulate the medical insurance policy, produce exported datasets and then aggregate the implementation effects of the policy.

4.2

Referring to Zhenjiang's basic medical insurance regulations, the model used each insured person as the base simulation unit. The basic time unit the model simulates is a month. The model firstly simulates participants' medical consumption behaviors and the payment of a medical insurance premium month by month until the end of the forecast year. The model then considers the changes of the participants age group, their wages, and outpatient and inpatient medical expenses, and so on. The model continues into the next year until the end of the simulation period. Finally, the model aggregates the annual participants' medical expenses, summarizes consumption and surplus of the social pool fund and personal accounts for the overall simulation period.

Basic micro files

4.3

The microsimulation input datafiles (Li and Gao 1999) were constructed from a sample of original administrative individual data of Zhenjiang in 2001, and the medical consumption data of all participants from 1997 to 2001. All of the data used in this research were provided by the Medical Insurance Management Bureau of Zhenjiang. In 2001, the number of medical insurance participants in Zhenjiang was 279,423, males numbering 156,952 (56.17%) and females 122,471 (43.83%). Adopting the method of random sampling, more than 50,000 records from the participants' personal records datasets were obtained, giving a sampling ratio of 20%.

4.4

After accomplishing random sampling, the representativeness of the sample was checked. The participants' gender, age distribution and income in the sample datafiles were analyzed and the outcomes compared with the collectivity datafiles. Results show that the sampling method was very effective in achieving a very high level of representiveness of the population. Table 2 presents the representativeness of age in the sample.

Table 2: Representativeness of age

	Employees (age)				Retirees	Senior retirees	All persons
	≤ 34	35–44	≥ 45	All employees			
Average age (year)							
Population	28.3	39.3	50.0	38.4	63.0	73.5	45.4
Sample	28.2	39.3	50.0	38.4	62.9	73.5	45.5
Standard deviation (year)							
Population	3.98	2.88	4.17	9.57	9.30	4.36	14.74
Sample	3.96	2.87	4.16	9.58	9.21	4.29	14.71

Function Modules and Model Parameters

4.5

The model includes three function modules: participant module, outpatient module and inpatient module.

4.6

The participant module simulates the changes in group-type of participants, such as new entries to the medical insurance scheme, retirement from work, and drop off from the medical insurance scheme. Through the analysis of participant's group-type changes over the period 1997 to 2001, it was found that the proportion of individuals aged under 34 years had a slightly declining trend year by year, while the proportions of the other two age groups of employees (35-44 years and above 45 years) and retirees showed an increasing trend yearly. The number of employees under the age of 34 years decreased 2.10% annually, while the other two age groups of employees and the retirees increased by 0.19%, 0.29%, and 1.62% respectively. The number of senior retirees decreased 1.73% annually due to death. For the five years forecasting in our research, the model assumed that the population of participants had a trend similar to the period from 1997 to 2001.

4.7

While forecasting the year 2002, the model took participants in 2001 as the base data, altering the participant construction by random sampling in corresponding age groups. In detail, 2.10% of employees under 34 years of age was dropped off, 0.19% of employees aged 35-44 years, 0.29% of employees above 45 years and 1.62% of retirees were added respectively to the corresponding age group randomly. At the same time, 1.73% of senior retirees were dropped off randomly. Then the annual wages or pensions of individuals were increased or decreased depending on the trend of period of 1997-2001. After adjusting the participants' wages level, the final datafiles of participants in 2002 was obtained.

4.8

In the same way, when forecasting the year 2003, the equal proportions of participants in each group like the year 2002 were changed to alter the participant construction. Their wages level was then adjusted, and so on, until the end of simulation in 2006.

4.9

The outpatient module simulates the behavior process in participants' medical use of clinics, using a month as a time unit. In China, employees receive outpatient care from clinics that are usually located in hospitals. If employees require inpatient care they will be admitted to hospitals for one or more night's stay.

4.10

In the outpatient simulation, the important outcome was to calculate the clinic rates and the empirical distribution of clinic expenses. Clinic rate calculates proportion of individuals who have clinic care (allow for multiple episodes) per month. The clinic rates and outpatient consumption levels of participants in 2001 were taken as the simulating parameters for the forecast year. In order to acquire the distributions of participants in attending doctors and their medical expenditure in 2001, classifications of participants according to hospital levels in which the clinic was located, patient's gender and group-type were made.

4.11

In analyzing the clinic expenses, 100 Chinese Yuan was taken as the subsection interval, and the medical expenses were divided into 16 segments, namely "0-99", "100-199", "200-299", ..., "1500 and over". The participants' clinic expenses in 2001 were analyzed monthly by classifications of individuals' gender, group-type and hospital levels. And then the clinic rates and clinic cost empirical distribution for each month were obtained: these were necessary parameters for this module. Table 3 illustrates the result for large hospitals. From Table 3, for example, in the first month there are 7.05% of male aged under 34 years had clinical services and 68.81% of them had medical expenses between 0-99 Yuan.

Table 3: Participants' clinic rates and expenses empirical distribution in large hospitals in 2001

Month	Sex	Group	Clinic rates	0-99	100-199	...	1400-	1500	Mean

							1499	and over	(1500-)
01	1	1	0.0705	0.6881	0.2120	...	0.0000	0.0021	1874
01	1	2	0.0764	0.6614	0.2095	...	0.0004	0.0035	3028
01	1	3	0.1047	0.6076	0.2368	...	0.0002	0.0055	2787
01	1	4	0.1101	0.5736	0.2343	...	0.0003	0.0055	3686
01	1	5	0.4151	0.2333	0.2570	...	0.0032	0.0043	2683
01	0	1	0.0951	0.6874	0.2088	...	0.0000	0.0013	3408
01	0	2	0.0931	0.6603	0.2206	...	0.0000	0.0011	3237
...	...	...	...	...	...	...	...	...	...
12	0	4	0.1706	0.5461	0.2087	...	0.0000	0.0223	2217
12	0	5	0.4706	0.3170	0.2143	...	0.0017	0.0093	2848

4.12

The inpatient module simulates the hospitalization behavior process of participants, using a month as the basic time unit. The important task was to calculate the hospitalization rates and the empirical distributions of inpatient expenses.

4.13

Similar to the outpatient module, the hospitalization rates and inpatient consumption levels of participants in 2001 were taken as the simulating parameters of the forecast year. The hospitalization expenses in 2001 were analyzed. The hospitalization rates and inpatient consumption empirical distributions of participants for each month in 2001 were then obtained.

Follow up adjustment

4.14

Those parameters which have important effects on policy simulation, such as participants' age structure, annual income level, and outpatient or inpatient medical expenditure level need to be adjusted annually. The variables, which are necessary in the process of simulation, such as participants' number, gender structure, and the changing level of inpatient or outpatient medical expenses, were obtained from participants' personal database and medical expense databases over the period of 1997 to 2001. These historic data provided distribution and changing trends of participants' population, inpatient and outpatient medical expenses.

4.15

We also used the average annual increase rates of participants' outpatient, inpatient medical expenses from 1997 to 2001 as the estimates of increasing parameters, the annual increasing rates being 11.11% and 14.30% respectively. The model compared the output results with actual data to estimate the precision of the output and made the appropriate adjustments.

Medical insurance policy framework

4.16

Figure 1 shows the framework of the medical insurance policy model for Zhenjiang. Through simulating and analyzing the premium collection, disbursement of funds and the balancing of these two factors from 2002 to 2006, the implementation and function of selected medical insurance policy settings were predicted.

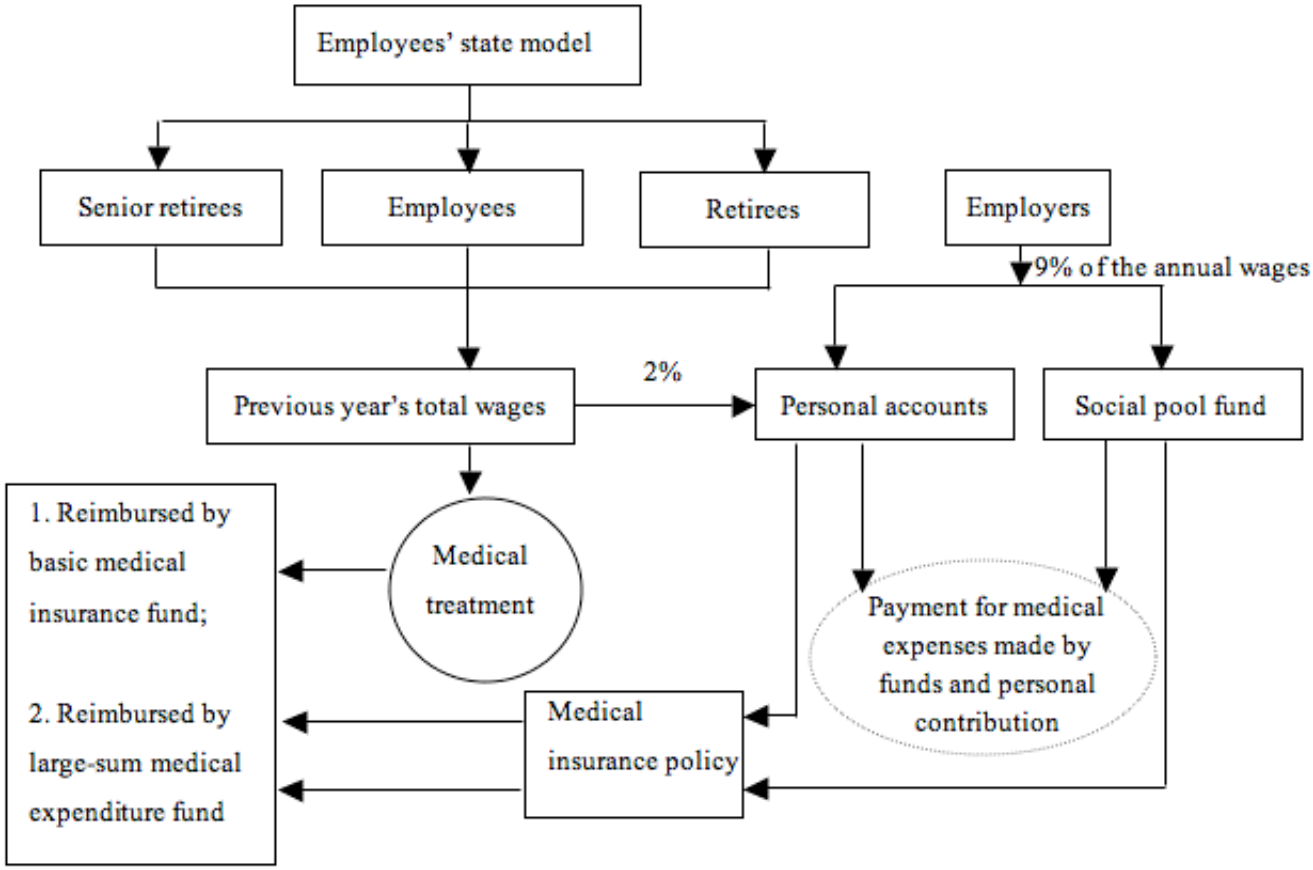

Figure 1. Policy model's framework for urban medical insurance reform

4.17

Under the model, different combinations of policy parameters can be simulated. These policy parameters could include percentage of wages allocated to personal accounts and social pool funds when financing the basic medical insurance, and the ceiling of reimbursement.

4.18

The goal of policy simulation is to explore the conditions under which the basic medical insurance funds can meet expenses, under the precondition of guaranteeing the employees' basic needs for medical services. Through adjustment of the payment rates of employers and employees, and the expenditure proportion paid by social pool funds and individuals, the ability of employers and employees to meet the fund requirements and submit their payments on time can be ascertained.

Basic results of simulation

5.1

Table 4 reflects the participants' demographic distribution from 2002 to 2006. The total number of participants is estimated to decrease slightly year by year. The distribution of different groups of participants also varies with time, for example the number and proportion of employees under the age of 34 years is estimated to decrease over time. In addition, the proportion of senior retirees is also reducing slightly. In the meantime, the proportions of the other groups of participants are estimated to increase, especially for retirees. As predicted, the proportion of retirees will reach nearly 30% of total employees in 2006.

Table 4: Contribution of different groups of participants, 2002 – 2006

Year	Employees (age)			Retirees	Senior retirees	Total
	≤ 34	35–44	≥ 45			
Number of participants						

2002	72,102	67,213	59,164	78,276	2,623	279,378
2003	70,453	67,308	59,450	79,544	2,583	279,338
2004	68,863	67,399	59,726	80,768	2,542	279,298
2005	67,298	67,479	60,002	81,976	2,502	279,258
2006	65,769	67,559	60,273	83,155	2,467	279,222
Proportion (%)						
2002	25.81	24.06	21.18	28.02	0.94	100.00
2003	25.22	24.10	21.28	28.48	0.92	100.00
2004	24.66	24.13	21.38	28.92	0.91	100.00
2005	24.10	24.16	21.49	29.35	0.90	100.00
2006	23.55	24.20	21.59	29.78	0.88	100.00

5.2

Table 5 shows the prediction results of the expenses for both clinic and hospital services over the period 2002 – 2006. The expenses for clinics and hospitals mount up each year, the average annual rate of increase being 11.35% and 13.68% respectively. It shows that the proportion of total expenses due to clinic expenses from 2002 to 2006 has a slow downward movement, although clinic expenses still account for a little over 61% of total expenses.

Table 5: Medical expenses analysis, 2002 – 2006

Year	Medical expenses (1000 Yuan)			Proportion
	Clinic	Hospitalization	Total	of clinic (%)
2002	199,349	122,202	321,552	62.17
2003	221,887	139,343	361,231	61.94
2004	246,248	159,180	405,427	61.51
2005	274,746	180,895	455,641	61.35
2006	306,410	204,050	510,460	61.28

5.3

Table 6 presents the simulation results of the average expenses for clinic and hospitalization respectively per participant. It shows that the medical expenses for all groups of participants are increasing. It is estimated that the annual fee-for-service for each senior retiree reaches 13,393 Yuan by 2006 (including both clinic and hospitalization expenditure). Collectively, the average growth rate of clinic expenditure over the 5 years will be 11.36%, and 13.69% for hospitalization.

Table 6: Projected average expenses for clinic and hospitalization per participant, 2002 – 2006

	Employees (age)							Annual growth
Item	≤ 34	35–44	≥ 45	Subtotal	Retirees	Senior retirees	Total	rate (%)
Clinic expenses (Yuan)								
2002	452	511	730	555	986	4613	714	
2003	502	570	815	620	1088	5098	794	11.32
2004	557	629	901	687	1207	5571	882	10.99
2005	620	701	1003	766	1342	6201	984	11.59
2006	686	780	1113	852	1495	6982	1097	11.54
Hospitalization expenses								

(Yuan)								
2002	126	185	355	214	887	3902	437	
2003	139	216	402	244	1003	4404	499	14.04
2004	164	243	465	283	1124	5096	570	14.25
2005	191	266	525	320	1272	5717	648	13.66
2006	200	300	589	356	1435	6411	731	12.81

Simulating results for medical insurance policy

6.1

Having illustrated how medical expenses are forecast to increase over 2002-06 due to demographic pressures, this section considers alternative strategies for meeting these increased expenses. The model first simulated the current medical insurance policy in Zhenjiang and predicted five-year implementation, with 2002 as the commencement year. Adjusted policy parameters refer to the basic simulation results, simulated to the adjusted policy settings and then compared results with the current policy settings.

Results of implementation of current medical insurance policy

6.2

Table 7 presents the medical expenses of insured persons and payment. One can see that the proportion of payment from the personal accounts decreases annually: it is estimated to decrease 4.07% in 2006 compared to 2002. In contrast, the proportion of payment by the fund increases annually, by 3.65% in 2006, compared to 2002. At the same time, self-payment increases about 0.39%. Payment by employers remains almost constant.

Table 7: Projected medical expenditure and its disbursement, 2002 – 2006

Items	Paid by personal accounts	Paid by the social pool fund	Paid by individuals	Paid by employers	Total medical expenses
Disburse fee (1000 Yuan)					
2002	116,755	150,222	50,278	4,296	321,552
2003	126,191	172,562	57,601	4,877	361,231
2004	137,129	197,759	65,037	5,502	405,427
2005	150,034	226,078	73,328	6,201	455,641
2006	164,558	257,126	81,828	6,948	510,460
Percentage (%)					
2002	36.31	46.72	15.64	1.34	100.00
2003	34.93	47.77	15.95	1.35	100.00
2004	33.82	48.78	16.04	1.36	100.00
2005	32.93	49.62	16.09	1.36	100.00
2006	32.24	50.37	16.03	1.36	100.00

6.3

Table 8 reports the predicted distribution paid by the social pool funds for different groups of participants over the period 2002 - 2006. It can be seen that the proportion paid by the social pool funds for all groups increased slightly. It is estimated by the year 2006 that the proportion of retirees and senior retirees' medical expenses covered by the social pool funds will reach about 61.86% and 62.35% respectively. In the meantime, the proportion paid by the funds for

employees is about 36.71%. By the year 2006, the total proportion of expenses covered by the funds is approximately 50.37%.

Table 8: Proportion paid by the social pool funds for different groups of participants (%), 2002 – 2006

Year	Employees (age)				Retirees	Senior retirees	All persons
	≤ 34	35–44	≥ 45	All employees			
2002	30.75	33.38	37.19	34.27	58.72	53.05	46.72
2003	30.94	34.08	38.49	35.12	59.62	55.38	47.77
2004	31.79	34.36	39.58	35.93	60.42	57.95	48.78
2005	32.20	34.28	40.30	36.35	61.25	60.10	49.62
2006	31.68	34.55	41.10	36.71	61.86	62.35	50.37

6.4

Table 9 shows the trends of total amount of social pool funds and personal accounts. From the year 2002 to 2006, the average annual increase in the rate of medical insurance funds is 9.59%, and it is estimated that by 2006 the total amount of funds is 364.08 million Yuan. The amount of deposits in personal accounts grows substantially, which is estimated to contain 161.42 million Yuan by 2006. In the meantime, the social pool fund is overspent annually, it is estimated that the accumulated five-year overspent money will reach 59.53 million Yuan.

Table 9: Total amount of social pool funds and personal accounts (million Yuan), 2002 – 2006

Year	Total fund	Personal account	Social pool fund	Cumulative surplus of personal account	Cumulative surplus of social pool fund
2002	252.38	227.64	144.99	110.89	-5.23
2003	275.94	245.45	156.04	119.26	-16.52
2004	302.18	267.79	168.39	130.66	-29.37
2005	331.44	294.71	182.17	144.68	-43.91
2006	364.08	325.95	197.60	161.42	-59.53

Adjusting the allocated rate to personal accounts

6.5

The predicted result of current policy implementation shows that the ageing trends bring great pressure on social funds, resulting in the social funds overspending annually. In the meantime, the personal accounts are predicted to have greater deposits. From the year 2002 to 2006, of the total funds, the social fund account for about 55.04%, with 44.96% for the personal accounts. This result shows that the allocation rate to personal accounts maybe a little high and there should be some opportunity to reduce the rate.

6.6

Based on the above analysis, the allocation rates for the personal accounts were adjusted, in order to reduce the risk of social pool funds becoming bankrupt. In detail, the allocation rate for employees and retirees is reduced by one percent and the rate for senior retirees remains the same. For example, the allocation rate for employees under age 34 years reduced from 3% to 2% of their annual wages. The reduction of the allocation rates to personal accounts results in the more percentage of insurance premiums go to social pool fund. This would help to relieve pressure on the social fund. On the request of the Medical Insurance Management Bureau of Zhenjiang, the adjustment commenced from 2004 and continued until 2006.

6.7

Table 10 gives the prediction results of expenditure distribution paid by the social pool funds for different groups of participants after adjustment. It can be seen that the proportion paid by the funds for all groups increased slightly. It is estimated by the year 2006 that the proportion of retirees and senior retirees' medical expenses covered by the social pool funds will reach 63.79% and 62.35% respectively. The proportion paid by the funds for employees is about 38.61%. By 2006, the total proportion of expenses covered by the funds is more than 52%, which is higher than that of the pre-adjustment figure.

Table 10: Proportion paid by the social pool funds for different groups of participants (%), 2002 – 2006

Year	Employees (age)				Retirees	Senior retirees	All persons
	≤ 34	35-44	≥ 45	All employees			
2002	30.75	33.38	37.19	34.27	58.72	53.05	46.72
2003	30.94	34.08	38.49	35.12	59.62	55.38	47.77
2004	33.14	35.41	40.50	37.00	61.78	57.95	49.91
2005	34.18	35.89	41.70	37.97	63.03	60.10	51.20
2006	33.97	36.45	42.77	38.61	63.79	62.35	52.16

Note: results after adjustment of allocation rate to the personal accounts

6.8

Table 11 shows the trends of total amount of social pool funds and personal accounts over the period of 2002 – 2006 after adjustment of the allocation rate. It shows that after allocation adjustment, the proportion of the social pool funds to the total funds increases to 62.70%, while the proportion of personal accounts is 37.30%. The deposit of personal accounts is reduced. Furthermore, it is estimated the social pool fund is overspent 29.34 million Yuan in five years, reduced to 50.56% of that of pre-adjustment.

Table 11: Total amount of social pool funds and personal accounts (million Yuan), 2002 – 2006

Year	Total fund	Personal account	Social pool fund	Cumulative surplus of personal account	Cumulative surplus of social pool fund
2002	261.74	227.64	144.99	110.89	-5.23
2003	282.23	245.45	156.04	119.26	-16.52
2004	325.75	235.90	200.28	110.43	-2.09
2005	349.11	239.06	217.58	107.53	-15.73
2006	377.88	249.48	236.93	108.53	-29.34

Note: Results after adjustment of allocation rate to the personal accounts

Increasing the collecting rate of the funds

6.9

The other policy setting is to increase the collecting rate for the social pool funds while the allocation rates to the personal accounts remain the same as the current policy scheme. The prediction result for current policy implementation shows that the average annual increase rate of medical insurance fund (9.59%) is much less than that of the medical expenses (12.25%). This is the main reason for the social pool fund is overspending each year. It also brings increasing pressure on the social medical insurance funds.

6.10

Referring to this argument and other related research results (Shen 2003;Lin 2004), there is

some argument for enhancing the premium rate for employees. This policy setting raised the basic insurance rate for employees from 2% to 3% of their wages. At the same time, to release the ageing pressure and to further reduce the financial risk to the social pool funds, retirees would pay 1.5% of their pensions to the basic insurance. Because the allocation rates to the personal accounts remain the same as the current policy scheme, so the raised premiums all go to social pool fund. It would be expected that the funds paid out by social funds reduce after this adjustment. On the request of the Medical Insurance Management Bureau of Zhenjiang, the adjustment commenced from 2004 and continued until 2006.

6.11

Table 12 shows the trends in total amount of social pool funds and personal accounts over the period 2002 – 2006 after adjustment of the collecting rate. It is estimated that the proportion of the social pool funds to the total funds increases to 59.49%, while the proportion of personal accounts is 40.51%. After adjustment, although the social pool fund is also overspent, compared with pre-adjustment, the expenses reduced tremendously to 15.49 million Yuan (from 59 million Yuan without adjustment).

Table 12: Total amount of social pool funds and personal accounts (million Yuan), 2002 – 2006

Year	Total fund	Personal account	Social pool fund	Cumulative surplus of personal account	Cumulative surplus of social pool fund
2002	261.74	227.64	144.99	110.89	-5.23
2003	282.23	245.45	156.04	119.26	-16.52
2004	341.23	267.79	204.10	130.66	6.34
2005	371.86	294.71	221.82	144.68	-4.25
2006	406.20	325.98	241.64	161.42	-15.49

Note: results after increasing the collecting rate of the funds

Discussion and conclusions

7.1

The basic simulation for participants shows that the number of employees under the age of 34 years is estimated to decrease over the period of 2002 – 2006. In the meantime, the number of the other groups of participants is estimated to increase, particularly for retirees. The age structure of participants shows the ageing trends currently occurring among China's urban population.

7.2

The simulation result also suggests that expenditure on clinic and hospital related medical costs by participants will continue to increase annually. Among the different groups of participants, retirees are the main group accounting for most of the medical expenses. The proportion of medical expenditure for retirees is estimated to reach 47.72% of the total expenditure by 2006.

7.3

The simulation result for the current medical insurance policy indicates that the social pool funds overspent 5.23 million Yuan in 2002. The amount of overspending will increase annually, as predicted, to be 59.53 million Yuan in 2006. On the contrary, the personal accounts have a large cumulative surplus, which is estimated to reach 161.42 million Yuan in 2006.

7.4

This study simulated two other different policy settings. One reduced the proportion allocated to the personal accounts; the other enhanced the employees' contribution to the social pool funds.

7.5

With the increase of life expectancy and the decline in the number of employees, the participants' demographic structure shows the ageing population of medical insurance participants. It is estimated that retirees (including senior retirees) in Zhenjiang will amount to more than 30% of the total participants in medical insurance in 2006. The elderly people's share of total medical expenditure will increase annually, which is estimated to be 47.72% for retirees and 6.47% for senior retirees in 2006. As the ageing of the population quickens, the burden on the social pool funds is increasing. This problem must be addressed and appropriate measurements should be taken as outlined below:

1. The coverage of medical insurance should be increased through designing different kinds of medical insurance programs suitable for different groups of people and encouraging uninsured employees and young people to participate in medical insurance. A multi-level social security system should be established to enlarge the coverage of participants. The ageing trends are dependant on the participants' age structure.
2. The allocation rate to the personal accounts should be adjusted at an appropriate time. The simulation result for the current medical insurance policy predicts that the personal accounts in Zhenjiang will contain 161.42 million deposits in 2006. However, at the same time, the social pool funds overspend accumulatively 59.53 million Yuan. It will be necessary to adjust the rate structure of personal accounts and social funds. This study adjusted the allocation rate to the personal accounts. The allocation rate for employees and retirees was reduced by one percent whilst retaining the same rate for senior retirees. After this adjustment, the surplus in personal accounts was reduced and the overspending of the social pool funds was reduced. It is estimated that compared with that of pre-adjustment, the accumulative overspending of social funds would reduce by 30.19 million Yuan (50.56%).
3. The contribution percentage to the medical social pool funds should be enhanced and retirees should pay moderate premiums. The present slow increase the medical insurance social funds results in the overspending of social funds. The prediction result for current policy implementation indicates that the average annual increase rate of medical insurance fund is 9.59%, but the annual increase rate of medical expenses is 12.25% which is much greater than the increase rate of the funds. This accounts for the fact that the social funds cannot afford to meet medical expenses. It is essential to choose the appropriate time to adjust the payment percentage to social funds in order to reduce the implementation risk of medical insurance. Retirees belong to a group of people who have a stable income and are able to afford the premiums equal to or less than that of employees. Having retirees pay a slightly higher percentage of their pension income can not only compensate the shortage of medical insurance funds, but also can reduce the conflict between employees and retirees.

7.6

This study modeled the adjustment of payment to the funds by raising the basic insurance rate for employees from 2% to 3% of their wages. At the same time, retirees pay 1.5% of their pension to the basic insurance funds. The simulation result shows that, after this adjustment, the social pool funds increase slightly. It is estimated that the social pool funds will account for 59.49% of the total funds in 2006, while the proportion of personal accounts is 40.51%. Through adjustment, although the social pool fund is still overspent, compared with pre-adjustment, the discrepancy was reduced tremendously (15.49 million Yuan), a drop of 73.98%.

7.7

This paper predicted the implementation effect of medical insurance policy in Zhenjiang, Jiangsu province on the basis of a static microsimulation model. It shows that the microsimulation model is a powerful tool to represent the complexity of the different medical insurance policy settings and forecast future cost impacts. Based on individual data, the model can both examine the effects of medical insurance policy changes for different groups of individuals and forecast in detail the outcomes of different policy settings. In addition to the base case using existing policy settings, the paper also modeled two other policy settings to investigate what happens to key output variables if the policy settings are changed.

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