Modelling of Medical Insurance Reform in China and its Influence on the Socio-Economic Status of Urban Employees and Residents

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Outline

- Background
  - Medical insurance reform
  - Research aims and framework

- Construction of Microsimulation models
  - Data sources used in the research
  - Model for urban employed population
  - Model for urban non-working residents

- Results and Summary
Medical Insurance Reform in China

- Since the late 1980s, commenced the medical insurance reform.
- Established a medical insurance system for the urban employed in 1998.
- Set up a new cooperative medical care system in rural regions in 2002, to cover all rural residents.
- At the end of September 2007, 79 cities were selected to launch a pilot medical insurance program for urban non-working residents.
Research Aims and Framework

Focus on two key questions

1. Is the current social medical insurance policy for urban employees sustainable in a short term period over 2006-2010?
   - Predict the medical expenses for urban employees and retirees using microsimulation techniques.

2. What is the cost of expanding the social medical insurance to the urban residents without jobs?
   - Model medical expenses on families. Predict medical insurance policy effects on urban non-working residents.
Create two static microsimulation models

Model for urban employees

- Administrative data of the medical insurance participants in 2001-2005
- Editing, processing and estimating
- Build a base file for medical insurance participants in 2005 with the information of personal accounts, medical expenses.
- Statistical match
- Five years prediction of medical services
- Simulate the medical expenses using Microsimulation models and predict the impacts of medical insurance policy settings over 2006-2010.

Model for urban residents

- Individual records from the national population census in 2000.
- Updating individual records to 2005
- Update the population to the target year using generalised regression weighting method. Add information from National health services surveys.
- Model medical expenses for 2008-2010
- Modelling medical expenses on family units. Predict medical insurance policy effects on urban non-working residents.
Cooperated with Kunming, Yunnan Province
Basic Information of Kunming

- Total population in 2005 was 6.08 million, with 3.53 million of urban population (58%).
- Commenced the urban medical insurance scheme in April 2001, about 1.08 million employed registered the scheme in 2005.
- One of the 79 pilot cities chosen by the Chinese central government to establish the basic medical insurance scheme for urban residents.
Medical insurance for urban employees

- **Personal savings accounts** – include employees contribution plus 30% of employers contribution.

- **Social pool fund** – 70% of employers contribution.

- **Serious illness fund** – 0.6% of the total wage bill by employers plus 0.1% of the income by employees annually.

- **Government official fund** – 1% of the government officials total wage bill by local governments.
Payment mode of medical expenses for employees

Service type
- Clinic services
- Hospitalization

Payment
- Personal account
- Social pool fund
- Out of pocket
- Serious illness fund

Clinic services – Clinic treatment, Pharmacies, Chronic disease, Special check-ups.
Hospitalization – Hospital admission, Special disease, Emergency, Hospital transfer.
Medical insurance for urban residents

- Commenced in October 2007 in Kunming;
- Established a social pool fund;
- Covers medical costs incurred in hospitalization services, clinic services for serious illnesses and clinic emergencies.

Medical insurance premiums for urban residents (Yuan)

<table>
<thead>
<tr>
<th>Individuals</th>
<th>Government subsidies</th>
<th>Levy of individual</th>
<th>Total premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult residents</td>
<td>170</td>
<td>70</td>
<td>240</td>
</tr>
<tr>
<td>Concession individuals</td>
<td>240</td>
<td>–</td>
<td>240</td>
</tr>
<tr>
<td>Children and students</td>
<td>90</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Concession individuals</td>
<td>100</td>
<td>–</td>
<td>100</td>
</tr>
<tr>
<td>Students in tertiary education</td>
<td>90</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Concession individuals</td>
<td>100</td>
<td>–</td>
<td>100</td>
</tr>
</tbody>
</table>

In 2005, the average annual wage was 14,400 Yuan (RMB), average one time hospitalization cost was about 6500 Yuan.

In 2005–2008
1 AUD = 6.0 to 6.5 Yuan
Data Sources for Urban Employees

Administrative Medical Care Data 2001-2005

- Basic information datasets of the medical insurance participants.
- Individual insurance status alteration datasets.
- Medical insurance premium datasets.
- Medical expenses datasets of general clinic services and medications.
- Medical expenses datasets of hospitalization and special disease treatments.
Administrative Medical Care Data

Base file in 2005
- Personal information dataset;
- Personal account dataset;
- Fund balances dataset;
- Medical expenses dataset;
- Sets of parameters.

- Basic individual information
- Individual demographic information
- Status alteration type; death information
- Income records; Premium collection.
- Clinic and medication services;
  - Clinic special check-ups;
  - Chronic disease treatment;
  - Hospitalization services.
- Hospitalization treatment expenses
- Clinic services expenses
Data Sources for urban residents

- 0.095% population sample of Kunming from the 2000 National Population Census.
  - Results assembled from the 1% population survey of Kunming conducted in December 2005. Kunming had a population of 6.08 million at the end of 2005.

- Administrative data of medical insurance employed population over 2001-2005.
  - Estimated results from modelling the insured employees and retirees for 2006-2010.

- Reports from the National Health Services Surveys conducted in 1998 and 2003 respectively.
Simulation framework for employees

1. **Initiate**
   - Y = 2006

2. **Employee**
   - Starting
   - Medical insurance
   - Medical expenses
   - Clinic, pharmacy
   - Out of pocket
   - Personal accounts
   - Pool funds
   - Aggregate

3. **To next year**
   - Y = Y + 1

4. **Adjust incomes**
   - Officials
   - New entry
   - Death
   - Out of pocket payment
   - Personal accounts
   - Pool funds

**Pool funds include:**
- Social pool fund;
- Serious illness fund;
- Government official fund.

**Analysis, report**

**NATSEM**
Model the Medical Insurance Scheme

- Constructing basic medical insurance micro datasets for the year 2005.
  - Create individual records of the scheme participants
  - Add incomes and set personal savings accounts
  - Identify the government officials
  - Establish medical expenses distributions

- Predicting medical expenses for 2006-2010.
  - Run death module and new entry module
  - Adjust income and set different funds
  - Project medical expenses
  - Calculate balances of different kinds of funds

- Assess medical insurance policy settings.
Project the number of insured over 2006-2010

Left: Estimation of the total number of insured employed over the period of 2006-2010

Below: Estimated number and percentage of different age groups of participants
Different kinds of medical services expenditure

Cost percentage of different kinds of medical services.
The percentage of clinic items cost has increase trends;
The proportion of hospitalization cost to the total expenses is around 60 – 64 % annually.

Cost percentage of different kinds of medical services on average over 2002-2010.
The proportion of cost of Chronic disease / Special check-ups remains stable with years.
Employees, more than half of their costs (54.1%) come from clinic services, followed by hospitalization services (42.8%). Retirees, more than three quarters (77.3%) of their costs come from hospitalization. Around 10% of the costs come from the general clinic services and medications.
Six kinds of payments for medical expenses

On average, approximate 80% of the medical costs are covered by personal savings accounts plus the three pool funds. The remaining 20% are paid by individuals themselves.
Considering the personal savings accounts
Deficit estimation in 2010

The lower the income, the more possibility there is of negative balances in personal savings accounts. The average deficit amount for retirees is 74% higher than that for employees.
For example, 25 per cent of employees, in the lowest quintile group, whose accounts go into a deficit will have a deficit amount greater than 11.5% of their annual income, while the similar figure is 3.89% for the top quintile group.
Balances of three kinds of Pool Funds – *Base case*

**Percentage of balances of three kinds of pool funds**

*Under the Base case, the maximum payments are kept unchanged, but the medical expenses would increase annually. This results in the pressure on the social pool fund to be transferred to the serious illness fund.*

SPF – Social Pool Fund
SIF – Serious Illness Fund
GOF – Government Official Fund
Hospitalization payment mode

Over top coverage

<table>
<thead>
<tr>
<th>90%</th>
<th>10%</th>
</tr>
</thead>
</table>

Serious illness fund area

<table>
<thead>
<tr>
<th>85%</th>
<th>15%</th>
</tr>
</thead>
</table>

Threshold payment
Self payment under scheme
Totally self payment

Self payment
Serious illness fund area
Social pool fund area
Personal saving account
Or Out of pocket

NATSEM
Adjustment of Maximum Payment – Scenario One

Scenario one: Raise the maximum payment of SPF by about 2.5% each year over 2008 – 2010.

Percentage of balances of three kinds of pool funds after adjustment

After the payment adjustment, both SPF and SIF would keep a reasonable proportion of balance. Such policy change has not got much impact on GOF payment.
Model for Urban Non-working Residents

Focus on the following issues

- Obtain the distribution of different types of population in urban area in Kunming.
- Project different kinds of contributions for the medical insurance premiums.
- Estimate the incomes on the units of individuals and families.
- Project medical expenses on hospitalization services as well as clinic services for serious illnesses.
Framework of the Model

- **Population module**
  - Update the 2000 Kunming population Census records to the year 2005.
  - Estimate the population structure for the period of 2006-2010 and then update the population to each year of 2008-2010.

- **Matching module**
  - Prepare the population of insured individuals in 2005 under the medical insurance scheme for employees and retirees.
  - Statistically match this population with the updated population for urban residents in 2005.

- **Prediction module**
  - Estimate the premium subsidies by the governments.
  - For two medical insurance scenarios, project medical costs on hospitalization services.
Population Module

0.095% sample population in 2000, 5395 individuals

Enlarge to represent 10% of the total population of 5.78 million in 2000.

Five Benchmarks
608,570 individuals represents 10% of the population in 2005.

Update to 2005

1% of population survey in 2005

Benchmarks
Sex Male, Female
Age group 0-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65+
Residential Urban or Rural area
Nationality Han or Minority
Education Primary and under, Junior Second, Senior Second, Tertiary

Project to 2010

The estimated total population in 2010 is 6.356 million.
Matching Module

10% of personal dataset of medical insurance scheme in 2005

Statistical Match

10% of the population in Households of Kunming in 2005

Matching variables
Age  Years old
Sex   Male, Female
Employment status Employee, Retiree
Marital status Never, Married, Other
Age group 15-24, 25-34, 35-44, 45-54, 55-64, 65+

Together with health services information

Project:
Household income;
Medical expenses;
Government subsidies.
Projection Module

Labourers and adult residents
Medical Insurance premium

Individual records of insured employees and retirees
Wages and pensions
Hospital admission rates
Hospitalization expenses

Children under 15 years old

National health services
Surveys’ results

Hospital admission rates
Hospitalization expenses

Projection over 2008 – 2010

Insured adult residents and children
Household income; Hospitalization services; Medical expenses

Aggregate and Analysis
The family annual income in the highest quintile is 4.71 times the lowest quintile in 2005. The gap between the highest and the lowest is estimated to be wider by 2010, which is 5.34.
## Results for urban residents

### Distribution of population of employed and residents

<table>
<thead>
<tr>
<th>Year</th>
<th>Insured</th>
<th>Uninsured</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employed</td>
<td>Retired</td>
<td>Employed</td>
<td>Unemployed</td>
<td>Retired</td>
<td>Residents</td>
<td>Total</td>
</tr>
<tr>
<td>Population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>720938</td>
<td>360352</td>
<td>1115677</td>
<td>67976</td>
<td>116664</td>
<td>1128020</td>
<td>3441651</td>
</tr>
<tr>
<td>2008</td>
<td>803247</td>
<td>401659</td>
<td>1140241</td>
<td>70330</td>
<td>145995</td>
<td>1186056</td>
<td>3677198</td>
</tr>
<tr>
<td>2009</td>
<td>825088</td>
<td>412619</td>
<td>1147621</td>
<td>71063</td>
<td>156523</td>
<td>1206081</td>
<td>3747932</td>
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<tr>
<td>2010</td>
<td>847360</td>
<td>423788</td>
<td>1154660</td>
<td>71766</td>
<td>167456</td>
<td>1226169</td>
<td>3819434</td>
</tr>
</tbody>
</table>

For **insured** individuals, the ratio of employees to retirees is about **2:1**, while the ratio for **uninsured** individuals is about **8:1**. If the governments can encourage more employees to join the scheme, it will highly decrease the risk of the medical insurance pool fund.
### Population and percentage of non-working residents

<table>
<thead>
<tr>
<th>Year</th>
<th>Adult general</th>
<th>Adult concession</th>
<th>Child general</th>
<th>Child concession</th>
<th>Uni-student general</th>
<th>Uni-student concession</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>264146</td>
<td>82409</td>
<td>617370</td>
<td>17949</td>
<td>144026</td>
<td>2121</td>
<td>1128020</td>
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<tr>
<td>2008</td>
<td>274085</td>
<td>88013</td>
<td>651795</td>
<td>18911</td>
<td>150829</td>
<td>2423</td>
<td>1186056</td>
</tr>
<tr>
<td>2009</td>
<td>277363</td>
<td>89958</td>
<td>663919</td>
<td>19240</td>
<td>153071</td>
<td>2530</td>
<td>1206081</td>
</tr>
<tr>
<td>2010</td>
<td>280606</td>
<td>91931</td>
<td>676264</td>
<td>19569</td>
<td>155160</td>
<td>2639</td>
<td>1226169</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
<th>Adult general</th>
<th>Adult concession</th>
<th>Child general</th>
<th>Child concession</th>
<th>Uni-student general</th>
<th>Uni-student concession</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>23.42</td>
<td>7.31</td>
<td>54.73</td>
<td>1.59</td>
<td>12.77</td>
<td>0.19</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>23.11</td>
<td>7.42</td>
<td>54.95</td>
<td>1.59</td>
<td>12.72</td>
<td>0.20</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>23.00</td>
<td>7.46</td>
<td>55.05</td>
<td>1.60</td>
<td>12.69</td>
<td>0.21</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>22.88</td>
<td>7.50</td>
<td>55.15</td>
<td>1.60</td>
<td>12.65</td>
<td>0.22</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

The population of residents who are out of the labour market is estimated to be 1.18 million in 2008 and 1.22 million in 2010, which account for about a little more than 32 per cent of the total urban population.
Percentage of age groups of adult residents

Comparison of general and concessions

Notes: Left hand side for general residents and right hand side for concession residents.
Two scenarios in the model

**First scenario** – Insured adult residents have their hospital admission rate equal to 70% of that for the insured employed individuals.
### Results for scenario one

**Total hospitalization costs and distribution of different payments**

<table>
<thead>
<tr>
<th>Year</th>
<th>Insured population</th>
<th>Total cost</th>
<th>Self payment</th>
<th>Fund payment</th>
<th>Over payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>208300</td>
<td>45.09</td>
<td>21.52</td>
<td>18.22</td>
<td>5.35</td>
</tr>
<tr>
<td>2009</td>
<td>900410</td>
<td>242.85</td>
<td>103.60</td>
<td>89.42</td>
<td>49.83</td>
</tr>
<tr>
<td>2010</td>
<td>1107008</td>
<td>300.11</td>
<td>122.85</td>
<td>108.51</td>
<td>68.74</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Insured population</th>
<th>Total cost</th>
<th>Self payment</th>
<th>Fund payment</th>
<th>Over payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>208300</td>
<td>100.00</td>
<td>47.72</td>
<td>40.41</td>
<td>11.87</td>
</tr>
<tr>
<td>2009</td>
<td>900410</td>
<td>100.00</td>
<td>42.66</td>
<td>36.82</td>
<td>20.52</td>
</tr>
<tr>
<td>2010</td>
<td>1107008</td>
<td>100.00</td>
<td>40.94</td>
<td>36.16</td>
<td>22.91</td>
</tr>
</tbody>
</table>

Under the first scenario, for incurred hospitalization costs, around 36-41% is estimated to be covered by the social pool fund; the remaining 59-64% of the cost is paid by patients themselves.
### Balances of the social pool fund and individual spend on hospitalization

#### Results for scenario one

<table>
<thead>
<tr>
<th>Year</th>
<th>Levy (million)</th>
<th>Payment (million)</th>
<th>Balance (million)</th>
<th>Percentage</th>
<th>Number of population</th>
<th>Payment (million)</th>
<th>Average (Yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>29.37</td>
<td>18.22</td>
<td>11.15</td>
<td>37.96</td>
<td>208300</td>
<td>26.87</td>
<td>129</td>
</tr>
<tr>
<td>2009</td>
<td>128.24</td>
<td>89.42</td>
<td>38.82</td>
<td>30.27</td>
<td>900410</td>
<td>153.43</td>
<td>170</td>
</tr>
<tr>
<td>2010</td>
<td>157.70</td>
<td>108.51</td>
<td>49.19</td>
<td>31.19</td>
<td>1107008</td>
<td>191.59</td>
<td>173</td>
</tr>
</tbody>
</table>

#### Results for scenario two

<table>
<thead>
<tr>
<th>Year</th>
<th>Levy (million)</th>
<th>Payment (million)</th>
<th>Balance (million)</th>
<th>Percentage</th>
<th>Number of population</th>
<th>Payment (million)</th>
<th>Average (Yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>29.37</td>
<td>23.04</td>
<td>6.33</td>
<td>21.57</td>
<td>208300</td>
<td>35.63</td>
<td>171</td>
</tr>
<tr>
<td>2009</td>
<td>128.24</td>
<td>107.02</td>
<td>21.22</td>
<td>16.55</td>
<td>900410</td>
<td>186.90</td>
<td>208</td>
</tr>
<tr>
<td>2010</td>
<td>157.70</td>
<td>128.74</td>
<td>28.96</td>
<td>18.37</td>
<td>1107008</td>
<td>226.50</td>
<td>205</td>
</tr>
</tbody>
</table>
Proportion of annual family income on hospitalization treatment – Scenario One

For the 20% lowest income families, the proportion of family spend on hospitalization is between 4.8-6.8%, while the other quintile groups are estimated to be less than 1 per cent.
Summary

- Project the medical insurance schemes for both urban employees and residents over 2006-2010.
- The medical insurance scheme is expected going well in the coming years. However, governments need pay more attention to retirees and low income earners.
- Proportion paid by the social pool fund under the social insurance scheme for urban residents is quite low (40% in 2008). This results in the heavy burden on 20% lowest income families.
Thanks very much for your kind attention

Stone forest, Kunming