Research Article

The Influence of Demographic Factors on Urban Medical Insurance Expenditure under Big Data

Ning Ye

Institute of Sociology, Hubei Academy of Social Sciences, Wuhan, Hubei 430070, China

Correspondence should be addressed to Ning Ye; ningye5566@qq.com

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As the urban basic medical insurance with the most widespread area and age coverage, a series of research is conducive to the optimization and better promotion of policies. As the main receptor of medical insurance, people analyze the impact of population factors on the expenditure of urban basic medical insurance, which is conducive to the improvement and implementation of the medical insurance system. In this paper, birth rate, total dependency ratio, urban population proportion, and educational population proportion were selected as independent variables, urban basic medical insurance expenditure was selected as dependent variables, and a regression model was established after data processing and analysis. The results show that the birth rate, the proportion of the urban population, and the expenditure of the urban basic medical insurance fund will change in the opposite direction; the expenditure of the urban basic medical insurance fund, the total dependency ratio, and the illiteracy rate will change in the same direction.

1. Introduction

1.1. Research Background of the Article. In recent years, medical difficulties often appear. Especially in big cities, there are often cases of queuing up to hang expert numbers, and the level of experts is also uneven [1]. The left-behind elderly and children in towns and rural areas are blocked, the only labor force works in other places, and the medical level of the township is too low, so it is difficult to get effective treatment for the disease. This is also the reason why the country vigorously promotes urbanization, which can allow more people to enjoy medical insurance. In our country, the concept of urban basic medical insurance belongs to the content of social medical insurance, which is composed of two parts: urban worker medical insurance and urban resident medical insurance. We adopt the medical insurance system with the government and the accordance with the principle of the payment standard and the general consistency of the treatment level [2, 3]. Urban basic medical insurance is the earliest development part of the social medical insurance system and also the most mature part of the operation mechanism of social insurance. By the end of 2018, the number of people participating in urban basic medical insurance was 1344.52 million, an increase of 167.706 million compared with 117.6814 million at the end of 2017, with the characteristics of wide coverage, low threshold, and high acceptance [4–6].

1.2. The Research Purpose of the Article. Compared with rural areas, cities and towns belong to frequent accidents, so the expenditure of urban basic medical insurance funds can better depict the welfare level of urban workers and residents [7, 8]. Compared with the “old” insurance form of rural medical insurance, the research on urban basic medical insurance has more significance for humanization and future development. Urban basic medical insurance fund, as the largest insurance coverage of social insurance, can effectively alleviate the problem of “difficult medical treatment” in the society, let residents have less financial pressure and concerns about medical treatment and greatly improve the psychological effect of social welfare. But changes in its spending are also vulnerable to all aspects of society. In recent years, the consumption level of residents has
gradually increased, and the population change is more obvious. Especially in modern urban areas, urban basic medical insurance has been unable to meet people's needs. With the current aging population, the two-child policy, and the acceleration of urbanization, as people are the main body of medical insurance for urban residents, the impact of demographic factors on urban medical insurance is particularly important. Therefore, it is very necessary to study the influence of the changing population factors on the basic medical insurance expenditure of urban workers.

1.3. Source Analysis of the Data. The data for this paper were taken from the China Statistical Yearbook for 17 years from 2002 to 2018. The expenditure of urban basic medical insurance fund, birth rate, total dependency ratio, urban population, total population, total population aged 6 years old and above, and population aged 6 years and above were selected as the basic indicators. The comparison between urban population and total population is the proportion of urban population; another research variable is the illiteracy rate of the total population aged 6 and over. The illiteracy ratio can better reflect the depth of contemporary education under the condition of excluding people under 6 years old without a strong sense of autonomy [9]. In recent years, with the expansion of urban basic medical insurance fund expenditure with its influence, the expenditure trend of urban basic medical insurance funds is shown in Figure 1.

1.4. The Survey Methodology Used in the Article. Therefore, the expenditure of urban basic medical insurance fund is taken as the dependent variable, and the birth rate, total dependency ratio, urban population proportion, and illiteracy rate are taken as the independent variables. The research methods used in this paper mainly include the EG two-step cointegration test and the Granger causality test. EG two-step cointegration test is a regression method for nonoriginal stationary variables, which can better express the internal relationship between variables. The Granger causal test is a statistical method for hypothesis testing whether one set of time series \( x \) is the reason for another series \( y \). It is based on the autoregressive model in the regression analysis. However, it should be noted that the conclusion of the Granger causality test is only a statistical estimate, not a causality in the real sense, and cannot be used as the basis for affirming or denying causality, and the actual causality should be judged according to experience. In this paper, we determine the stationary order of the data, construct a regression equation, determine the corresponding residual sequence, and check the cointegration relationship by checking the stationarity of the residual sequence [10–13]. If there is a cointegration relationship, then the corresponding error revision model is established to estimate the relationship between the variables. Later, the respective variables and dependent variables were tested by Granger, combined with reality, not only to determine the statistical causal relationship but also to find the causal relationship in real life [14].

2. Literature Review and Scholar's Ideas

In recent years, due to the acceleration of China's modernization process, the development of all aspects of society is in a new period of vigorous development. As the urban basic medical insurance is the most accepted social insurance project among the people, the expenditure of urban basic medical insurance after excluding the price factor can indicate whether the degree of social insurance is appropriate to some extent. Therefore, domestic scholars have made some research on the development status and development trend of the basic resident medical insurance or the basic worker medical insurance under the urban basic medical insurance system. On the current situation, problems and countermeasures of medical security for urban residents were studied.

A part of some scholars pointed out that there are mainly the following problems in the basic medical insurance for urban residents [15, 16].

Part 1: It is impossible to effectively distinguish whether residents are employed, when they are in employment, and when they are unemployed, resulting in the inability to clearly distinguish the objects of basic medical insurance for urban residents from those of basic medical insurance for urban workers [17].

Part 2: Due to the limited number of people suffering from serious diseases, only a small number of residents can enjoy basic medical insurance for urban residents, and the actual benefit rate is not high [18].

Part 3: As the actual benefit ratio of the insured is not high, the resulting sustainability of the insured is reduced. Ginseng in the medical insurance final settlement link can get part of the basic medical insurance compensation, but due to the actual process, some doctors did not put themselves according to patient family conditions, often open too high imported drugs, but go to this part of the insurance ego cost may be compared to the insurance way cost more high. So it is uncertain whether residents will continue to participate in the insurance in the future [19].

Part 4: The basic social insurance existing now mainly consists of three parts: basic medical insurance for urban residents, basic medical insurance for urban workers, and the new rural cooperative medical care system. Each part has a relatively mature and comprehensive operation mode. But there is no complete seamless connection between the three parts. With the gradual increase of population mobility, people move more frequently around the country, and the identity of the insured changes with the flow. People cannot decide which form of insurance to protect their rights and interests, which also affects the sustainability of the insured to a certain extent [20].

Part 5: Although the popularization of the basic medical insurance system for basic urban residents is high, most of the insured people do not understand the policy itself
thoroughly and do not realize the necessity of participation, so the lack of participation is not high [21].

For the contents of the above five parts, it is believed that the above five problems should be solved pertinently. First of all, the definition standard of the guarantee object should be made clear, and the types of insured should be divided according to the definition standard, so as to avoid the phenomenon of "kicking each other" due to inaccurate definition. Secondly, compulsory participation insurance policies can be appropriately adopted to ensure its continuity. Optimizing the structure of the guarantee and increasing the amount of guarantee are also effective means to ensure the actual proportion of benefits. Thirdly, the basic medical insurance for urban residents, the basic medical insurance for urban workers, and the new rural cooperative medical care system should strengthen the cooperation relationship, determine the guarantee method according to each standard, and ensure the initiative and effectiveness of the policy implementation. Finally, the policy publicity should be strengthened to let the residents realize the importance of participating in the basic medical insurance for urban residents. This study comprehensively analyzes the common problems existing in the basic medical insurance for urban residents today but ignores the loopholes existing in the hospital. For example, prescribing high-priced drugs in hospitals and arranging too many unnecessary examinations virtually increase the cost of medical treatment and reduce the benefit ratio to a certain extent.

The other scholars gave defensive strategic suggestions on this problem in the SWOT study of medical insurance for urban residents in Shanghai.

Part 1: We will strengthen the management of medical insurance contributions. We will strengthen the supervision of medical expenses and medical treatment, draw lessons from the concept of similar foreign private doctors, and handle them at different levels according to their conditions. That is, the small disease grass-roots small clinics and serious diseases go to the big hospital [22].

Part 2: We will improve the operation and management system. A comprehensive regulatory system should be established, and the government should set up a separate regulatory agency for effective management and check. In addition, a special social supervision system should be added, such as complaints and suggestions channels for the operation mechanism to be more transparent.

Part 3: We will improve medical ethics, avoid the occurrence of medical treatment such as expensive drugs and unnecessary examination items, and implement the assessment mechanism for hospitals, so as to improve the utilization rate of medical resources [23].

The above are some studies on the current development status of the basic medical insurance for urban residents [24, 25]. However, the above studies have made some analyses and suggestions on the most prominent problems of the basic medical insurance for urban residents and did not pay attention to the impact of the characteristics of population factors on the urban basic medical insurance system. With the gradual development of the economy and society, the characteristics of the population itself have gradually become an important factor affecting the development of all aspects. As the main body of consumption and enjoyment of urban basic medical insurance, the change of demographic factors in this system cannot be underestimated. In addition, with the increasing aging problem of the population in recent years, the opening of the two-child policy and the acceleration of the urbanization process, the parenting pressure of the younger generation increases sharply, and the characteristics of the demographic factors themselves are also changing. Therefore, studying the impact of demographic factors on the basic endowment insurance system for urban residents and predicting the future population structure has a certain reference significance for the development of the future residents’ medical insurance system.
3. Data Processing Is the Model Construction

3.1. Data Processing and Model Setting. In the process of research, in order to simplify each index, the dependent variable is the urban basic medical insurance expenditure, \( y \) representative is used, and the birth rate, total dependency ratio, urban population proportion, and illiterate rate are the independent variables \( x_1, x_2, x_3, x_4 \), respectively. ADF stationarity test was conducted for each variable, and the results show that the different orders are required for each variable to be stable. In Table 1, the results are not ideal. The independent variables \( y \) and the independent variables \( x_i \) are treated logarithmically and treated differently.

Table 1 shows that the logarithm form, \( \ln y \), of the dependent variable and the logarithm form, \( \ln x_1, x_2, x_3, \) and \( x_4 \), of the independent variable, \( x_i \), all meet the I(1) criteria. The JF consolidation test was tried to be used, but because the data year of each variable is short and the observation value is insufficient, the corresponding conditions are not met. Therefore, the EG two-step method was used to cointegrate the test, and the error revision model was established to test whether there is a long-term cointegration relationship among the variables [26].

3.2. Model Setting and Calculation. First, the regression analysis [27–35] was performed on \( \ln y, \ln x_1, \ln x_2, \ln x_3, \ln x_4 \), the residual sequence of the equation, named \( E \), was tested for unit root stationarity for \( E \), and the results are shown in Figure 2.

According to the results, the \( T \) statistic value of residue sequence \( E \) is \(-4.786\), less than \(-3.830\) at the 5% significance level, rejecting the null hypothesis, so \( \ln y \) has a long-term equilibrium relationship with \( \ln x_1, \ln x_2, \ln x_3, \) and \( \ln x_4 \). The test form is \((c, t, 0)\). Later, the error revision model was established to test whether the following equation:

\[
\Delta \ln Y = \beta_1 \Delta \ln x_1 + \beta_2 \Delta x_2 + \beta_3 \Delta x_3 + \beta_4 \Delta x_4 + c + E(-1). 
\]

(1)

Each variable was treated using \( E \) views, and the following equation was obtained after the final regression:

\[
\begin{align*}
\Delta \ln y & = 0.279 - 1.257 E(-1) - 1.068 \Delta \ln x_1 + 0.046 \Delta x_2 \\
& - 0.039 \Delta x_3 + 0.021 \Delta x_4, \\
\end{align*}
\]

(2)

\[
\begin{align*}
(2.162381)(-5.145341)(-3.286293)(-3.189868) \\
(-0.379910)(0.881231) \\
R^2 = 0.760790, \\
DW = 1.95,
\end{align*}
\]

(3)

where \( \Delta \) indicates the first-order differential treatment of the variables, reflecting the state of influence on the equilibrium in the short term.

A Granger’s causal test was performed between the respective variables and the dependent variables. The results are obtained as shown in Table 2.

From a statistical perspective, the previous change of \( \Delta \ln x_1, \Delta \ln x_3, \) and \( \Delta \ln x_4 \) variables can effectively explain the change of \( \Delta \ln y \) while the previous change of \( \Delta \ln y \) can effectively explain the change of \( \Delta x_2 \). However, according to practice, urban basic medical insurance, as a voluntary insured project, the demographic factor is a nonartificially controllable variable, so, in fact, the change of \( \Delta x_2 \) itself should affect the growth of \( \Delta \ln y \).

3.3. Results Analysis. According to the regression equation, the equation fits well and can well reflect the impact of demographic factors on the insurance fund expenditure in a short period of time. The increase in urban basic medical insurance fund expenditure was negatively associated with the birth rate. The more the birth rate falls, the more the corresponding urban basic medical insurance fund spending increases. In the implementation of the two-child policy, the birth rate should increase year by year, but in addition, the impact of the aging population has exceeded the two-child policy, and there are other more realistic factors leading to the decline in the birth rate. In today’s society, the cost of raising children is too high for many low-class people to afford. Moreover, many workers are busy and have too little leisure time to support their children, once the children have the cost of living. So the birth rate is still on a slow decline. This suggests that the faster the birth rate falls, the more the urban basic medical insurance fund spending increases accordingly. That is, because the elderly population is relatively large, individual children not only need to raise parents but also raise parents, in order to avoid unnecessary losses in the future, so choose a wide coverage, authoritative urban medical insurance. The independent variable \( x_2 \), namely the total dependency ratio, is positively correlated with the expenditure of urban basic medical insurance funds. The total dependency ratio can intuitively reflect the proportion of the nonworking population in the working population, that is, to reflect the living pressure of the population with labor force in the whole society. With the aging of the population and the implementation of the second child policy, the demand for the working population in today’s society will gradually increase in a short time, so the total dependency ratio will also gradually rise. Therefore, the corresponding social pressure also increases. After ensuring the safety of the elderly and children, social pressure becomes unbearable. Many working people have to pay basic medical insurance for non working people. Because of the age characteristics of nonworking population, it is more prone to accidents, so the expenditure of urban basic medical insurance funds also increases accordingly.

The independent variable \( x_3 \), namely, the proportion of the urban population, is negatively correlated with the expenditure of urban basic medical insurance funds. The proportion of urban population refers to the proportion of the urban population in the total population, directly reflecting the progress of urbanization. With the acceleration of China’s modernization process, the pace of township poverty alleviation and prosperity has gradually accelerated the improvement of education level and the rapid
development of population urbanization, so the proportion of the urban population is gradually increasing. But the new era of the urban population has made a qualitative leap in consciousness over the last century just like the pursuit of contemporary life from the initial food and clothing to the present pursuit of spiritual and material. At the same time, population urbanization also reflects the rise in people’s consumption level, and the awareness of self-safety and prevention in the bud is gradually increasing. For towns with a generally higher income than rural areas, basic medical insurance is no longer enough to meet individual requirements, so it turns to more personalized, more comprehensive insurance types and institutions.

The independent variable \( x_4 \) is the decrease of the illiteracy rate and the increase in the expenditure of the urban basic medical insurance fund. With the gradual increase in educational level and educational coverage in recent years, the illiteracy rate has decreased significantly in recent years. The decline in the illiteracy rate means an increase in the education penetration rate, so it shows that with the improvement of the education level of the population, the expenditure of urban basic medical insurance fund is also gradually increased, and the improvement of people’s education level is a positive influencing factor on the whole. Therefore, we improve the will of people as insured and realize the importance and necessity of insured. Therefore, the participation rate will rise significantly, and the corresponding urban basic medical insurance fund will spend more.

The \( E(-1) \) coefficient is equal to \(-1.257\), reflecting the strength of adjustment deviation from long-term equilibrium. When short-term fluctuations deviate from long-term equilibrium, the imbalance will turn back to equilibrium with an adjustment strength of \(-1.257\).

### 3.4. Discussion.

From the perspective of urbanization, in the future urbanization process, in order to cooperate with the rapidly developing economy, humanized medical insurance can be gradually implemented. In the future security system, insurance types and insurance proportions should be refined, and different standards of medical security systems should be implemented for different income groups. However, in the process of rural urbanization, we should pay attention to the connection of rural areas to towns, and the transition should be permeated from all aspects. Research shows that farmers’ desire for urbanization is not strong, and the main crux is from land. It is difficult for farmers to obtain the capital to make a living in cities and towns. The expansion of cities and towns is too extensive, and only hardware measures are pursued. There are often no commercial supporting facilities and inconvenient transportation in marginal areas. Farmers cannot afford to buy a house with their savings, even with all their savings. In addition, the innovation ability of the town is not enough, the pursuit of speed and giving up quality, commercial concentration areas have more similar characteristics and no own characteristic industrial chain, so the prosperity is inevitably determined by the location. In view of the above problems, in order to speed up the pace of urbanization, we should take the government as the leading role, connect towns and surrounding farmers, build a characteristic ecological supply chain, tap local advantages, increase the flow of business circles, and enhance farmers’ urbanization aspirations. The government should strengthen farmers’ own employability, enhance farmers’ willingness to work in cities from the source, and provide corresponding employment channels and help for farmers in cities. Let the rural population strengthen their awareness of urbanization itself and their desire for urbanization, so that the rural population can truly recognize the changes and benefits brought about by urbanization from the heart. The real realization of “urbanization” in the consciousness is the embodiment of the improvement of the quality of life.

From the perspective of education level, the higher the education level, the larger the amount of urban basic medical insurance fund expenditure, which is also a positive influencing factor for medical security. Therefore, in order to expand the level of education, we should improve the “software” and "hardware" as the auxiliary idea. Based on the existing requirements of volunteer teaching in mountainous areas, one-to-one local support agencies and regulatory agencies should also be set up to ensure that the required donations are implemented to key recipients to avoid corruption. In terms of teaching, teachers teaching methods are old, which do not combine the characteristics of the youth of the times and cannot combine practice with theory well, which leads to too low interest in the teaching process and

### Table 1: Unit root test results.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Test form</th>
<th>ADF statistics</th>
<th>5% critical value</th>
<th>Whether stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Y )</td>
<td>(c,0,2)</td>
<td>-3.856234</td>
<td>-3.11991</td>
<td>Stationarity</td>
</tr>
<tr>
<td>( x_1 )</td>
<td>(0,0,2)</td>
<td>-3.335038</td>
<td>-1.970978</td>
<td>Stationarity</td>
</tr>
<tr>
<td>( x_2 )</td>
<td>(c,t,1)</td>
<td>-5.205592</td>
<td>-1.96843</td>
<td>Stationarity</td>
</tr>
<tr>
<td>( x_3 )</td>
<td>(c,0,1)</td>
<td>-3.20079</td>
<td>-3.081002</td>
<td>Stationarity</td>
</tr>
<tr>
<td>( x_4 )</td>
<td>(0,0,1)</td>
<td>-3.435425</td>
<td>-1.96627</td>
<td>Stationarity</td>
</tr>
<tr>
<td>Ln( y )</td>
<td>(c,0,1)</td>
<td>-4.688307</td>
<td>-3.081002</td>
<td>Stationarity</td>
</tr>
<tr>
<td>ln( x_1 )</td>
<td>(0,0,1)</td>
<td>-3.08381</td>
<td>-1.96843</td>
<td>Stationarity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.785832</td>
<td>0.0117</td>
</tr>
</tbody>
</table>

### Figure 2: Root of the unit test of \( E \).

### Table 2: Granger’s causal test for the respective and dependent variables.

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>F statistics</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta lnx_1 ) does not Granger cause ( \Delta ln y )</td>
<td>7.9697</td>
<td>0.0102</td>
</tr>
<tr>
<td>( \Delta ln y ) does not Granger cause ( \Delta x_2 )</td>
<td>3.7839</td>
<td>0.0442</td>
</tr>
<tr>
<td>( \Delta x_2 ) does not Granger cause ( \Delta ln y )</td>
<td>3.85204</td>
<td>0.0319</td>
</tr>
<tr>
<td>( \Delta x_4 ) does not Granger cause ( \Delta ln y )</td>
<td>1.64914</td>
<td>0.0355</td>
</tr>
</tbody>
</table>
low students’ acceptance of knowledge. Therefore, we should follow the trend of the times, and teachers of all ages should regularly learn novel teaching methods, so that it is easier for students to receive knowledge, so as to deal with the prominent situation of “more water” and give up some of the students with weak self-control. In addition, literacy classes are indispensable for “waiting” people. However, the popularity of literacy classes is not high, the main reason is attributed to the low culture people’s desire for knowledge and life change, and there is no corresponding mandatory measure, resulting in the low popularity of literacy classes. In addition, most of the literacy classes existing on the market are civil enterprises, charging, and teaching.

4. Conclusion

The phenomenon that the expenditure of urban basic medical insurance funds increases year by year is fundamentally the manifestation of the gradual improvement of the social security system, which shows that the people’s awareness of participating in the insurance payment increases, the quality of the people improves as a whole, and the citizens have the initiative and enthusiasm to participate in the national medical security. Therefore, in order to fundamentally solve the problem that some poor people have difficulty in getting medical treatment and no money for medical treatment, we should strengthen the intensity and depth of targeted poverty alleviation. Only the poor people have savings, which can spare money on a “rainy day” to pay for basic medical insurance. Therefore, grassroots cadres should take responsibility, door to door to understand the situation, and truly achieve targeted poverty alleviation and targeted to help families who lack labor force. In addition, for the poor families with farming labor force but suffering from product sales, we should actively help the people to open up the sales, create the farmers’ own characteristics, and drive the development of the industrial chain. With the improvement of consumption level, the sales of agricultural products will naturally improve.

In view of the demographic influencing factors studied in this paper, from the perspective of fertility, the two-child policy can be improved to promote the growth of the birth rate. Since the cost of raising children is too high in today’s society, some families choose to drink or give up one child to avoid unbearable expenses. Therefore, appropriate encouraging policies can be adopted to promote the idea of the family raising a second child. For example, appropriate subsidies are given during pregnancy. A series of criteria were set up for eligible families to receive appropriate subsidies during their children’s growth, aiming to reduce the burden on low-income families to increase the birth rate, increase the scope of urban medical insurance, and improve the level of welfare. From the perspective of dependency ratio, as the total dependency ratio and the expenditure of basic medical insurance fund for urban residents rise in recent years, the increase of insurance fund expenditure caused by the increase of total dependency ratio increases, this increase is the increase of “negative effect,” because excessive aging itself is a negative phenomenon. So the solution is mainly from the perspective of birth rate. In addition, the reimbursement ratio can be appropriately differentiated according to the number of elderly people and their illness. For the elderly with serious illness, huge expenses, and general family conditions, the reimbursement proportion should be increased according to the actual situation when they go to the hospital for settlement; for the elderly with mild illness and good family conditions, the normal reimbursement proportion should be adopted. However, it is important to note that the growth of the birth rate should not be excessively stimulated; otherwise, a more serious aging trend will appear in more than a decade.

Data Availability

The dataset can be accessed upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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