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SPATIAL-TEMPORAL CHANGES AND TRENDS OF AGEING IN CHINA

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ABSTRACT: This study focuses on the development stages of ageing and its regional differences in China based on examination of official statistics and documents. The development of ageing in China has experienced three major stages. Firstly, in the 1950s, low coefficient of elderly population (over 65 years) paced up to primary adult type. Secondly, there was a deeply drop of the elderly population because of natural disaster and political factors in the 1960s. Thirdly, from the 1970s to the end of 20th century, the constant increasing of elderly coefficient made China close to elderly society. With statistic data of population, Logistic model is used to simulate the future development of ageing, and two characteristics of development of ageing are presented. Firstly, as for ageing from 2005 to 2050, the elderly coefficient will grow up significantly from 8.48% to 16.30%. Secondly, after 2025, the increasing rate of elderly coefficient will slow down gradually. The regional differences of elderly population in China can be summarized as follows: 1) the eastern China possesses higher elderly coefficient and huger elder population than the western China; 2) about 47.4% of municipalities and provinces in the eastern China become elderly especially Shanghai, Zhejiang Province, Jiangsu Province, Beijing, Tianjin and Shandong Province; 3) ageing intensity is higher in rural area than urban area but getting close each other, and there are more elderly people in rural area than in urban area. Therefore, these will arose aged care problems, and it becomes important issue to establish the social security system in rural areas as soon as possible for elderly people.
KEY WORDS: ageing; ageing in rural area; China

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1 INTRODUCTION

Elderly population of China has been increasing rapidly since the 1990s (KWONG and CAI, 1992; WANG, 1993; BARTLETT and PHILLIPS, 1997; ESCAP, 2002). According to the Fifth National Census (ZHU, 2001), by the year 2000, the population of elderly aged 60 and over had reached 132×10^6, which was more than 10% of total population of China. It is shown that China has become an elderly country by international standard (10% of population being aged 60 and over), and the figure in this age group is roughly equivalent to 20% of the total elderly population of the world.

Rapidly ageing of population is severe challenge for China, which means not only the huge elderly population but also the economic development. Some developed countries in the world become elderly nations such as Switzerland, Japan, whose GDP per capita have exceeded US$10 000 but China only less than US$1000 (CHEN, 2002). This implies that population ageing in China has emerged so early and too rapidly under relative low socio-economic development, and China has become an elderly country before it becomes a developed country. The contradiction between economic development and an ageing society will bring even greater pressure to China.

In order to deal with ageing problem, a law was passed on 1 October 1996, which aimed to secure the legitimated rights and interests of elderly people, and many policies have been proposed in national level. But because China is a very large and rapidly varied country, national policy often has different expressions in local areas, especially ageing policy, which is fresh for policy makers and unaware for public. Therefore this paper focuses on the temporal change of ageing and its spatial distribution in China for better understanding the

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present state and future trend of ageing. Most researchers and policy makers paid more attention to ageing in urban areas but neglected ageing in rural areas, so the paper addresses care need for elderly in rural areas as well to provide preliminary countermeasures for policy making.

2 DATA AND METHODS

2.1 Data Collection

We used the population data from *China Population Statistical Yearbook* (National Bureau of Statistics of China, 1992, 1994, 1996, 1997, 1998, 1999, 2000, 2002), official statistics and documents (Ministry of Health of China, 1996, 1997, 1998, 1999, 2000). The elderly coefficient at the age of 65 and over, life expectancy, birth rate, total population at national scale and provincial level and other indicators were taken into account. Economic data were collected from those sources as well.

2.2 Geographic Information Systems (GIS)

All these data concerning population and economic development were enumerated in matching to different provinces, autonomous regions and municipalities. By using GIS software (Arcview GIS. Version 3.2a, ESRI Inc., 1992) and the vector data of 1:4 000 000 map of China①, the study on regional distribution of ageing in China was accomplished.

2.3 Simulation and Statistical Analysis

Analysis of the regional difference of ageing as well as the correlation between ageing and life span increasing, and birth rate decreasing was completed by DPS data processing system for practical statistics (TANG and FENG, 2002). Formula on temporal change of ageing (basing on continuous data from 1987 to 2001) was simulated by Logistic Model of Simple Nonlinear Regression methods (numerical method used in this study was nonlinear least-squares method) from DPS as well.

3 RESULTS

3.1 Temporal Change of Ageing in Past 50 Years

From the mid-20th century to its end, the development of ageing in China experienced three major stages (Table 1 and Fig.1).

3.1.1 First stage (1950s)

At the end of civil war and the founding of P.R. China in 1949, with national economic development and improvement of living standard, the population increased stably due to death rate decreasing and relative high birth rate. In this period low coefficient (elderly population at the age of 65 and over) at 4.10% in 1949 paced up to 4.41% in 1953 and then 4.90% in 1959 (Table 1), which showed that China was in a primary stage of adult society.

Table 1 Elderly coefficient of China in 1949–2001 (age≥65, %)

Year	Coefficient	Year	Coefficient	Year	Coefficient
1949	4.10	1987	5.48	1994	6.23
1953	4.41	1988	5.33	1995	6.70
1959	4.90	1989	5.79	1996	6.94
1964	3.54	1990	5.58	1997	7.04
1975	4.80	1991	5.99	1998	7.43
1978	4.80	1992	6.09	2000	6.96
1982	4.91	1993	6.15	2001	7.83

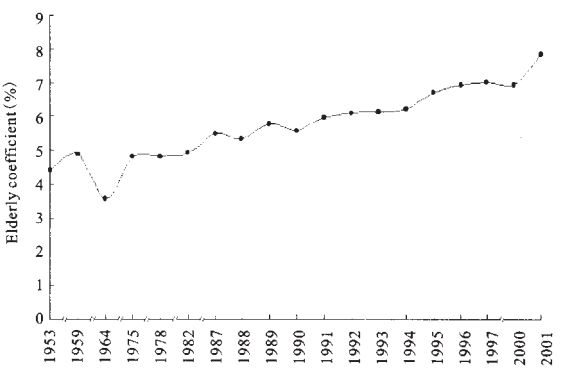

Fig.1 Ageing progress of China in 1953–2001

3.1.2 Second stage (1960s)

There was a deeply drop of the elderly population as the elderly coefficient from 4.90% in 1959 down to 3.54% in 1964 because of continued natural disaster and political factors. Economic decline and extensive hungry all over the country resulted in rapid reduction of population especially elderly population, so elderly coefficient was even much lower than it in 1949. About 1.36%, the great reduction of elderly coefficient, meant that China returned to youth type at 3.54%.

3.1.3 Third stage (1970s–2000)

Since the end of 1960s new birth peak appeared, policy makers realized it brought much pressure for economic development. Therefore, family planning policy, especially the one-child family policy was put forward extensively in the 1980s. On the other hand, the rapid improvement on living level by economic reform since the 1980s extended average life expectancy at birth. The constant increasing of elderly coefficient (6.96% in

① LREIS (State Key Laboratory of Resources & Environment Information System), 1996.

2000) made China pass on to adult type closing to elderly society.

3.2 Future Development of Ageing

With the population statistic data, $X=\frac{20.0571}{1+e^{(79.5213-0.039506t)}}$ (R^2=0.9220, F= 70.9094, p<0.001) can be used to simulate the future development of ageing and the elderly coefficients are shown in Fig. 2. According to the formula, two characteristics of the development of ageing will be presented. Firstly, from 2005 until 2050, the elderly coefficient will grow up significantly from 8.48% to 16.30%, which means that China is becoming the big elderly country in the world. Secondly, after 2025, the increasing rate of elderly coefficient will slow down gradually (Fig.2).

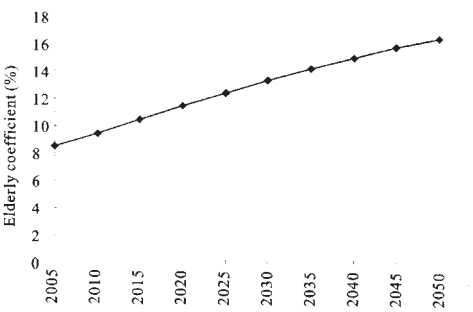

Fig.2 Development trend of elderly coefficient in China (age≥65, %)

3.3 Regional Distribution of Ageing

Using the data of elderly population in different provinces, autonomous regions and municipalities in 2000 (Table 2), and the results of the Fourth Census in 1990, 1% and 9.5% Population Sample Survey in 1995, 2000 for elderly population in urban and rural area respectively (Table 3), the regional differences of elderly population in China can be summarized (Fig.3).

Firstly, the eastern China possesses significant higher elderly coefficient (7.33% ±1.44%) than the western China (5.70% ±1.24%, t=3.244, p<0.01). It implies that not only the elderly coefficient difference but also elderly population quantity in the eastern China are more than those in the western China.

Secondly, 47.4% of municipalities and provinces in the eastern China become elderly (elderly coefficient >7%). Six municipalities and provinces such as Shanghai, Zhejiang Province, Jiangsu Province, Beijing, Tianjin and Shandong Province are in severe ageing states with high elderly coefficient above 8%, especially Shanghai (elderly coefficient=11.50%). On the other hand, the western China only has 25% of elderly provinces.

Table 2 Comparison of elderly coefficient between eastern and western China in 2000 (age≥65, %)

Eastern China	Elderly coefficient	Western China	Elderly coefficient
Heilongjiang	5.42	Qinghai	4.33
Jilin	5.85	Ningxia	4.47
Guangdong	6.05	Tibet	4.50
Jiangxi	6.11	Xinjiang	4.53
Hubei	6.31	Gansu	5.00
Fujian	6.54	Inner Mongolia	5.35
Hainan	6.58	Guizhou	5.79
Shanxi	6.20	Shaanxi	5.90
Hebei	6.86	Yunnan	6.00
Henan	6.96	Guangxi	7.12
Hunan	7.29	Sichuan	7.45
Anhui	7.45	Chongqing	7.90
Liaoning	7.83		
Shandong	8.03		
Tianjin	8.33		
Beijing	8.40		
Jiangsu	8.76		
Zhejiang	8.84		
Shanghai	11.50		
Mean	7.33±1.44	Mean	5.70±1.24

Sources: 1. http://www.stats.gov.cn/tjgb/rkpcgb/; 2. http://www.hebrkjsw.gov.cn/xinxi/news/2004524/2004524172803.htm
Note: The division of eastern and western areas is according to Office of Leading Group for Western Region Development of the State Council of the People's Republic of China, http://www.chinawest.gov.cn/

Table 3 Result of sample survey for elderly population in urban and rural areas

		1990	1995①	2000②
Urban area	Population③	11 466 799	177 383	1 930 730
	Coefficient	5.43	6.96	7.00
Rural area	Population④	47 878 051	590 105	5 802 488
	Coefficient	5.74	6.68	7.74

Notes: ① 1% Population Sample Survey in 1995; ② 9.5% Sample Survey in 2000; ③ Population in urban area—total population living in the districts of cities that are sub-divided into districts and those living in the street committees of cities that are not sub-divided into districts; ④ Population in rural area—total population that are not in the cities and not living in the neighborhood committees of towns under the jurisdiction of cities that are not sub-divided into districts and those living in the neighborhood committees of towns directly under country's jurisdiction.

Thirdly, the results in Table 3 indicated that both urban and rural areas had high elderly coefficient in 2000, however, the difference of the elderly coefficient between urban and rural areas changed from 0.31% in 1990 to 0.74% in 2000, which showed that ageing in rural areas was more severe than that in urban area. Furthermore, the constant increased elderly coefficient in ten years (1990–2000) as 2.00% (7.74%–5.74%=

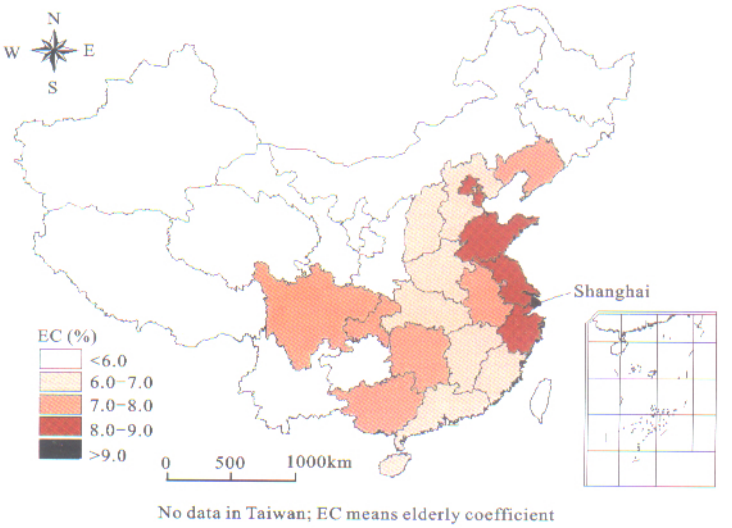

Fig. 3 Regional distribution sketch of ageing in China

2.00%) in rural than 1.57% (7.00% − 5.43% = 1.57%) in urban areas meant that the speed of ageing in rural area was faster than that in urban area. Additionally, huge elderly population in rural areas can be seen from Table 3 as well.

4 DISCUSSION

The population ageing in China resulted from two major factors: increasing life expectancy due to improvement in Chinese living quality (YUAN *et al*., 1992; HARBAUGH and WEST, 1993) and the reduced birth rate brought about the family planning policy especially one child family policy. The combination of population growth rate reduction and life expectancy increasing has inevitable impacts on the speed and scale of ageing. More elderly people need more help from not only their families but also the government, because family is still principal unit responsible for its members in China, thus elderly people will rely on family support materially. But one-child family will provide less available care and support for the older generation, a couple has to support four elderly people and raise one child at the same time (LIU *et al*., 1995). The occurrence of the so-called "4-2-1 family" (four grandparents, two parents and one child) extensively means that there will be more burdens on the one child in every family.

The rapid ageing and care of elderly people have very important policy implication for family planning. Some argued if China should remain the policy of family planning especially one-child family policy because of diametric contradiction on fertility reduction and population ageing. At present if China gives up population control, the huge population base will make population increase enormously and ruin the achievement of the low fertility, consequently aggravate more social economic burden. The proper option for China is to continue the family planning policy and adjust it reasonably according to population change and temporal development of ageing.

As China is a huge country with marked regional differences, the varied ageing coefficients in different provinces, autonomous regions and municipalities showed they are in different ageing types. In fact, high coefficient in Shanghai, Zhejiang Province, Jiangsu Province, Beijing, Tianjin and Shandong Province, presents the necessity to deal with ageing problem in eastern China. But their well-developed socio-economic level makes the social security system more efficient for elderly people. In addition the labor migration from western China and rural areas to the eastern and urban areas, the ageing progress in eastern China and cities will be decelerated. Taking the example of Beijing, 3×10^6 external people have postponed the ageing process for four years (Beijing Statistical Bureau, 2002). On the other hand, labor moving from western China especially countryside, for example, 66×10^6 young people left their hometown in countryside in 1995 and, 49.4% of them will stay at the working places for long period (CHEN, 2002), which would speed up the ageing process in rural areas.

Besides lack of pension and assistance for post-60 generation, rapid ageing makes care for elderly in rural area a more difficult problem (LIU and HUANG, 2004). Two main aspects of care for elderly people in countryside stand out. Firstly, smaller families are like-

ly to have to shoulder the increasing responsibilities for care of elderly people. At present, more than 60% of total elderly population live in family sustentation in rural area (WANG, 2002), and, it is impossible to change the style for farmers' families in coming short period. In the contrary case, one elder person is subsisted by 8 young farmers now will be changed to 2.5 young farmers by the year 2050. Additionally, families with less than three members will increase from 19.69% now to more in future, especially the so-called "Emptied Nest", which resulted from young generation migration, will aggravate the burden for supporting elderly people in rural areas.

Secondly, diseases such as infectious diseases, endemic diseases related to agricultural society are still the risk for elderly people in rural areas. For example, iodine deficient disorders prevalently in 1778 counties of China with 7×10^6 patients in countryside in 1996. And there are 43×10^6 dental fluorosis and 1.6×10^6 skeletal fluorosis patients in 1230 counties in 1996①. At the same time some diseases such as HIV and Ageing Alzheimer have diffused in rural areas. Moreover, varied potential diseases related to heavier physical work, intensive psychological pressure and contaminated condition for young people in mining and urban areas will occur in rural areas when they become old and return to their hometown (DUAN, 2003; JIANG, 2004). Consequently, illness for the coming elderly population will result in more serious health care problem in rural areas.

Until now, most farmers are not supported by medical insurance system due to their low incomes and the weakness of state supporting ability. The so-called "co-operative health care system" built in the 1960s was used to be effective for disease treatment and control in helping farmers to deal with deficiency of medical cost in rural areas. The system was a kind of medical foundation collected limited membership from individuals and the most from farmers' collective funds. When the medical cost was too much to be paid by the peasant himself, the foundation would cover it by using Chinese traditional herbal medicine. But with the privatization, the disintegrated system can not be re-built up, therefore it is necessary to establish new medical care system in rural areas as soon as possible.

At present, old-age insurance is a growing system. In the past, pensions were only provided for the government staffs and workers in state-owned enterprises, the old residents in rural areas could not be supported. Now in the cities, and old-age pension fund has been created for not only elderly people from government organization and institutions but also private enterprises. In the countryside, it is a very complicated issue to provide old-age insurance for 900×10^6 of rural residents. They have to be supported by their families, which is attributed to lower level of national economic situation and huge population. A new old-age insurance system for farmers is in experimentation, which collected mainly from individuals, subsidized by collective funds so as to help peasants to alleviate worries about their old age. But now only 10% rural residents are supported by insurance in more developing areas.

With rapid ageing, the conflicts between the needs of elder farmers and their poor ability to support themselves become more acute. Because this is too complicated to deal with easily, some studies only focus on the construction of social security system in urban areas or, re-organizing social welfare system for elderly people in rural internal (BARTLETT and PHILLIPS, 1997), neglect the policy performance for farmers in national level. The later we built social security system in rural area, the more passive we are in future. What we should do now at first is to establish a new insurance system in rural areas by state government and to encourage private investment from both domestic and abroad at the same time. Secondly, in order to lighten financial burden of farmers, it will be useful to exempt farmers from taxation to construct social insurance system.

5 CONCLUSIONS

In the first five decades of the 21th century, the elderly coefficient will grow up significantly from 8.48% to 16.30%, and after 2025, the increasing rate of elderly coefficient will slow down gradually. With life span increasing and birth rate reducing, there will be more elder in the coming future, which will bring more burdens on the one child family because the older generation mainly relies on family support. It is urgent to consider about establishing a well social security system and policy gradual transition for the rapid ageing.

The eastern China, especially Shanghai, Zhejiang Province, Jiangsu Province, Beijing, Tianjin and Shandong Province, possesses higher elderly coefficient and huger elderly population than the western China. Ageing degree in rural area is higher than urban area but getting close each other and, there are more elderly people in rural area than them in urban. Because of labor

① Ministry of Health of China, 1997. Annual Report of Endemic Diseases Prevention in China.

migration, the most left in rural are the elderly, children and weak women. This brings acute problem on essential security for elderly people in rural area.

Care for ageing population in rural area is more important and the social security system must be established as soon as possible.

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