Regional aging and longevity characteristics in China

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ABSTRACT

The factors that influence the length of human life are complex and longevity remains a controversial topic, particularly in China. This paper demonstrates the spatial patterns and changes of the elderly group (65 years old and over), the oldest old (80 years old and over) and the centenarians in China in the last decade, analyzes the influence of economic development on aging, and in the end, using a case study, explores the characteristics of the centenarians' behavior. The results indicate that high elderly and the oldest old proportions are more common in regions with higher socio-economic development and that have a favorable climate. Centenarian distribution pattern is less influenced by economic but only for few regions. Lifestyle factors, such as sufficient sleep, positive mental state and a light diet are also largely found among the centenarian group.

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1. Introduction

Life expectancy in China has increased significantly over the last three decades, with the national average rising from 69 in 1980 to 74.8 in 2010. Since 2000 China has been an aging society, with 10.33% of the population aged 60 and over. According to the China's sixth national population census in 2010 (China statistical yearbook, 2000, 2010), there were 178 million people aged 60 and over, accounting for 13.26% of the whole population, and 119 million people aged 65 and over, accounting for 8.87% of the whole population. The proportions of the two groups have increased by 2.93% and 1.91% since 2000. By 2050, China's elderly population (65+) will likely increase to 330 million, around a quarter of its total population. In addition to overall population aging, the annual growth rates of the oldest old (80 years and over) and centenarians have also increased by 6% and 10% since 2000 (WHO, 2011). These demographic changes reflect the dramatic social and economic development that has taken place in China since the reform and open-up, along with enhanced medical services and improved nutrition. This period has been free of famine, war and political upheavals that lowered life expectancy in earlier periods of China's history, and poverty and the diseases associated with it have declined rapidly. Although there was a slight uptick since 1995, many fatal and debilitating infectious diseases were eliminated or effectively controlled, including plague, polio and smallpox, which were eradicated as early as the 1960s. The overall infectious disease mortality rate dropped from 66 cases per million in 1975 to 5 cases per million in 1995 (Zhang & Wilson, 2012), and by 2004, 59% of deaths were from non-communicable diseases (Banister, Bloom, & Rosenberg, 2010). Along with the decline in maternal and child health problems, this marked a rapid epidemiological transition (Yang et al., 2013). In the meanwhile, rapid economic growth also provided both material and spiritual satisfaction, which largely contributed to the life expectancy.

Longevity is the ultimate symbol of health and happiness, but the factors that contribute to a healthy old age are complex. Researchers have shown that longevity is not only affected by genetic factors (WHO, 2011), but also by physiological, psychological, socio-economic, and natural factors, among others (Lv et al., 2011a,b; WHO, 2011; Robine et al., 2012). Facing the rapid aging in China, which will bring new challenges for society, an understanding on the regional variations of aging and the determinants that contribute to longevity is urgently needed in order to design policies to support healthy aging in different contexts. In this paper we firstly display the spatial distribution and changes of the aging

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population and longevity groups across China at prefecture-level in 2000 and 2010. Then Pearson Correlation and Geographically Weighted Regression (GWR) are used to explore the economics' influence on the aging. In the end, a case focusing on centenarians in Hainan province is used to explain the structure and behavior features of centenarians. The major objectives of this paper are: 1) to demonstrate the spatial distribution of aging and its change in China; 3) to explore the possible influence of economic development on aging; 2) and to identify the behavior characteristics of centenarians under the hypothesis of individual factors associating with longevity in China. The research findings provide entry-points for social and policy on developing healthy aging strategies.

2. Methods

In this paper, the elderly are defined as those aged 65 and over (65+), the oldest old is composed of people aged 80 and over (80+), and centenarians are those aged 100 and over (100+). Aging data were obtained from the demographic database of the fifth and sixth national population censuses of China, which were carried out in 2000 and 2010 respectively (China statistical yearbook, 2000, 2010). In order to explore the possible influence of economic status to aging, we conducted Pearson Correlation using SPSS 19.0. Geographically Weighted Regression was conducted through centenarian proportion against per Capita GDP in 2010 to explore the spatial correlation between economic growth and centenarian proportion at local level (Wang et al., 2014). Geographic Information Systems (ArcGIS 10.0) was used to display the distribution maps of the elderly, the oldest old and the centenarians at Prefecture-level. Origin 8.0 was used to draw the figures for the case study.

In order to explore the characteristic of the longevity, we choose Hainan province, which has the highest proportion of centenarians in China, as a case study area. Hainan province is one of the provinces with highest life expectancy of 76.3 in China in 2010, and is recognized by the International Expert Committee on Population Aging and Longevity as a World Longevity Island on August 27, 2014 for its highest percentage of centenarians (18.75/100,000) in China (China NBS, 2011). There were totally 1600 registered centenarians in the HUKOU system in total 18 administrative divisions (county or city level) in Hainan province in 2012. From February 2012 to September 2012, we collected 10 questionnaires from each administrative division in the beginning, and then based on the proportion of the centenarians to the total population in each administrative division, another 43 questionnaires were collected. In the end, 223 questionnaires were collected covering all the 18 administrative divisions in Hainan province. We filled the questionnaires by face to face interview, or with the help of their caregivers. All the questionnaires were geographic evenly collected from each administrative division. The questionnaire was self-designed based on the SF-36 health survey: manual and interpretation guide (Ware, Snow, Kosinski, & Gandek, 1993). The methods were carried out in accordance the approved guidelines and regulations of the Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Science, and the study was approved by the Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Science, and Hainan Government. Informed consents were obtained from all the participants for the study. The information from the questionnaire can be summarized as Table 1.

3. Results

3.1. Demographic characteristics and their geographical distribution

In 2010, an estimated 524 million people were aged 65+, accounting for 8% of the world's population, and by 2050, this proportion was expected to double to 16% (WHO, 2011). The depth and speed of aging varies considerably among countries and regions. Most developed countries already have aged populations, while aging is just taking off in developing countries, and it is predicted that the aging will proceed much more rapidly in developing countries now than in the developed countries, for example 26 years for China, compared with 115 years for France and 85 years for Sweden (Kinsella & Phillips, 2005). The consequence is that the trend in the number of older persons in the world is dominated by the accelerated growth of the older population in the less developed regions, and even though two thirds of the world's older persons are located in developing countries presently, this ratio will continue growing in 2050. In particular, China will see an increase of 15.7 percentage points in the proportion of the elderly people, reaching 28.1% in 2050 (United Nations, 2013). Unlike the aging distribution, around 69% of the centenarians live in developed countries, and it is predicted that the vast majority of the centenarians will still be located in developed countries by 2050 (United Nations, 2013).

Fig. 1a–e show the distributions of people aged 65+ (2000 and 2010), 80+ (2000 and 2010), and 100+ at the prefecture city level using data from the fifth and sixth national census. The geographical distribution of the elderly, oldest old and centenarians groups in China is characterized by regional clustering in both 2000 and 2010. The proportions of the elderly and the oldest old among the total population increased dramatically from 2000 to 2010. The proportion of the elderly people increased from 6.96% to 8.87% in total. Although with obvious increase, the spatial distribution patterns of the elderly proportions in 2000 and 2010 are similar, with the higher ratios located in the Yangtze River Delta, the Sichuan-Jiangsu region, and the Bohai region. Natong

Table 1
Parameters included in the questionnaire.

Questions	Details
Name	–
Age	–
Gender	Male/female
Address	County/town/street
Marital status	Single/married
Living condition	Along/with partner/with heirs
Medical consultation	Less than 1 time/1 time/2 times/more
Sleeping hour	Less than 8 h/9 h/10 h/11 h/more
Self-assessment on sleeping quality	Very good/good/no clue/not good/bad
The most common attitude during daily life	Let it be/happy/nervous(fear)/feel alone
Staple food	Rice/noodle/crop/grains/mixed/other
Food habit	Light/slightly salty/slightly spicy/sweet