A Demographic and Health Profile of Centenarians in China

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Introduction

It is more and more important for human beings to understand the demographic patterns and health status of centenarians because populations in most countries are aging. China's population, in particular, is aging at an extraordinarily rapid pace (Banister 1990; Ogawa 1988; Zeng and Vaupel 1989). Centenarians used to be exceedingly rare. They are still highly unusual, but the population of centenarians is doubling every decade or so. For example, from the 1970s to 1980s the average annual growth rates in the number of people attaining age 100 were 10.2, 9.2 and 9.1 % in Japan, Switzerland, and West Germany, respectively (Vaupel and Jeune 1995, p. 112). If current rates of mortality improvement persist, then it will be as likely for a child today to reach age 100 as it was for a child eight decades ago to reach age 80 (Vaupel and Gowan 1986).

China offers an unparalleled opportunity for studies of centenarians in a developing country for two key reasons. First, the Chinese population is so huge, now totalling more than 1.25 billion, that despite high mortality in the past there are large numbers of elderly Chinese. The 1990 census counted 6,681 centenarians,[1] 64,532 persons aged 95 or over, 416,134 persons aged 90 or over, and 2.32 million persons aged 85 or over. The annual growth rate of centenarians in China between 1982 and 1990 was 7.1 %. Second, age reporting in China appears to be generally reliable. In some minority subpopulations age exaggeration inflates counts of the very old. For the Han population of China, which accounts for 92 % of the total population, age reports are generally accurate, because Han Chinese, even if illiterate, can supply a precise date of birth (Coale and Li 1991, pp. 294). This is important because misreports of age distort demographic analyses of the very old in most developing countries as well as in the United States and some other developed countries.

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[1] Twenty-four percent of the 6681 reported centenarians are minority nationalities who may have overstated their ages, as will be discussed later.

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To our knowledge, there have been very few centenarian studies, limited to certain local areas, and no detailed studies of centenarians on a national scale in China so far. Based on the most recent Chinese census data and the centenarian surveys conducted in Hangzhou and Beijing by Wang Zhenglian, this paper intends to provide a profile of demographic characteristics and self-reported health status of Chinese centenarians, including data quality, age, sex and regional distributions, education, occupation, living arrangements, smoking and alcohol consumption, self-reported health status, etc.

Data Quality of Chinese Centenarians

Coale and Li (1991) analyzed the data quality at advanced ages from the 1982 Chinese census, with the Han and the ethnic minority populations combined and age 100 and above combined, because the detailed tabulations by single years of age of Han and minority nationalities were not available when they conducted the study. Nevertheless, by studying Xinjiang province, where Weiwuer and other ethnic groups consist of about 60 % of the province, they discovered that the elderly of minority populations seriously overstated their ages. In 1982, the reported numbers of centenarians in Xinjiang consisted of 22.5 % of the total number of centenarians in China as a whole, whereas the total population of Xinjiang consisted of only 1.3 % of the total population of China. As discovered by Coale and Li (1991), there were 144 males listed as over 110 years of age in China in 1982; 121 were in Xinjiang and another 15 were in four other provinces with the highest proportion of minorities whose cultures were not related closely to the Han Chinese. The five provinces with the highest fraction of these minorities (Xinjiang, Guanxi, Qinghai, Ningxia, and Yunnan) contained less than 9 % of the population of China but 94.4 % of males listed as being over 110. The centenarian data and the death rates in 1982 were seriously distorted if the data for all China including Xinjiang were used, but they escaped such distortion if the data from Xinjiang were omitted (Coale and Li 1991, pp. 298–300).

Fortunately we have the 1990 census data set on centenarians with detailed information of single year of age and ethnic grouping. Again, the reported minority Chinese centenarians account for about 24 % of the total number of centenarians in China, but the minority population consists of only slightly less than 8 % of the total population. For the males listed over age 110, 85.4 % belong to the minority groups. As was observed by Coale and Li (1991), the demographic indexes for measuring age misreporting also clearly show that the reports of minority Chinese centenarians are mostly not true, because they seriously overstated their age.

On the other hand, Han Chinese, whatever their education level, know their birth dates precisely. Young and educated people can supply their birth dates according to the Western calendar; the old and illiterate can supply their birth dates according to the traditional Chinese calendar. The Chinese calendar consists of a simple version of a cycle of 12 animal years, such as chicken, rat, tiger,

etc., as well as a more complicated version of a cycle of 60 years, with 12 animals and each animals five different qualities. According to the Han Chinese traditions,[2] the precise date of birth is significant in making decisions on important life events such as marriage matching, date of marriage, date to start to build a house, and date of travelling, etc. It is widely recognized that age reporting of Han Chinese elderly is highly accurate in general (see, for example, Coale and Li 1991; Vaupel et al., in preparation), but we did not have enough knowledge about the accuracy of the data of Han Chinese centenarians before the detailed data became available for this study. Therefore, an evaluation of data quality of Han Chinese centenarians follows.

The population sizes and sex ratios of Han Chinese elderly aged 80 and above appear reasonable, as compared with those of Japan and Sweden (see Table 1). Table 2 presents an index for measuring the accuracy of age reporting between ages 65 and 105. The index was proposed by Coale and Li (1991), and it is computed as a mean of the ratios of the number at each age to a two-stage moving average (the five-term average of a five-term average) from age 65 to 105. Sweden is considered to be the country with the best data accuracy in the world so, the more accurate the age reporting, the closer the mean indexes are to the Swedish ones. Table 1 shows a very close match of the Han Chinese indexes to the Swedish indexes.

The above analysis demonstrated that there is no serious age heaping and that age reporting is of high quality in general in the Han Chinese elderly population, although it is still not as good as in Sweden. However, the absence of significant digit preference at ages divisible by ten or five is not necessarily proof of data accuracy, since other kinds of errors of age reporting may also distort the data quality. Do any kinds of systematic age misreporting other than heaping, such as exaggeration of age for seniority honour, exist in the Han Chinese elderly population? One way of addressing this question is to imagine that, if age exaggeration at very old ages is serious, the reported total number of very old persons must be relatively large as compared with the reported total number including younger persons, and the ratio of life expectancy at very old age to the conditional survival probability at middle age should be relatively large. As shown by Coale and Kisker (1986, p. 398), the ratios of those aged 95 years or over to those aged 70 or over in the 23 countries with accurate data quality were all less than six per thousand, whereas the ratios for the 28 countries with poor data clearly showed the exaggeration of very old persons aged 95 or over, extending from 1 % to 10 %. This ratio for male and female Han Chinese in 1990 is 0.76 per thousand and 2.18 per thousand, respectively, which is almost exactly the same as their Swedish counterparts in the period from 1985–1994. Coale and Kisker calculated

[2] It is important to ask for the date of birth and to compute age by subtracting from the date of the census or survey (if respondents supply the Chinese calendar, conversion to the Western calendar is needed). If the questionnaire asks the individual's age, the Chinese system of reckoning nominal age makes the response ambiguous, because a person may be counted as one-year-old on the day of birth and one year older with each new year according to the Chinese tradition.

Table 1. Male and female population, sex ratio (SR) at advanced ages for Han Chinese (1990), Japanese (1985–1990) and Swedes (1985–1994)

Age	Han Chinese			Japanese			Swedes		
	Male	Female	SR	Male	Female	SR	Male	Female	SR
80– 84	1845877	3155219	58.50	3109384	5067146	61.36	759811	1237222	61.41
85– 89	555217	1227726	45.22	1297711	2520394	51.49	329311	676627	48.67
90– 94	82920	240949	34.41	323315	765460	42.24	93760	241729	38.79
95– 99	10303	28606	26.69	44.289	128484	34.47	15495	49493	31.31
100–104	779	3611	21.56	2803	11106	25.24	1291	5109	25.27
105–109	94	447	21.11	86	466	18.45	48	246	19.51

the ratio of T_{100}/T_{70} (ratio of total person-years above age 100 to the total person-years above age 70) for various countries relative to T_{100}/T_{70} for Sweden in 1980. The ratios in the countries with accurate data were mostly below 1, with the lowest value being 0.04 for Finland in 1950, and a few cases exceeding 1 but not more than 1.28. The ratios in the countries with poor data ranged from 7.92 (Mauritius) to 82.1 (Dominican Republic), which shows clearly the overstatement of age over 100 years in these countries. The ratio of T_{100}/T_{70} for Han Chinese in 1990 relative to T_{100}/T_{70} for Sweden in 1980 is 0.13, which demonstrates again that the Han Chinese are among the populations with accurate data quality for old people.

Although we trust that the age reporting of Han centenarians is accurate in general, we also found that the super-centenarians' age reporting is questionable. The ratio of persons aged 105 or over to persons aged 100 to 104 is 0.14 for Han Chinese, but 0.04–0.05 for 13 European countries and Japan combined. Is this due to age exaggeration at age 105 and over or are death rates of Han Chinese super-centenarians lower because of much higher selection at ages 105 and over? We think that both factors may play a role. Note that the population size of super-centenarians aged 105 and above is very small, and age overstatement even by a small number of people can seriously distort the data quality of this age group. The super-centenarians account for only a small portion of the total centenarian population, so that its questionable number may not negate our conclusion that the data quality of Han Chinese centenarians is generally good.

The field observations in the centenarian surveys in Hangzhou and Beijing by Wang Zhenglian[3] also confirm that the age reporting of Chinese centenarians

[3] As part of her Ph. D research, Wang Zhenglian just completed the field work of the centenarian surveys in Hangzhou and Beijing municipalities in China. Hangzhou municipality has a total population of 5.92 million and is located in the southeastern part of the country. Beijing is the capital city of China with a total population of 11.4 million and is located in the northern part of China. Wang Zhenglian has personally visited 83 (40 in Hangzhou and 43 in Beijing) centenarians and done health examinations with the help of one medical doctor. As the second stage of her field survey work, Wang will conduct centenarian surveys in Chendu municipality and its surrounding rural areas, located in the southwestern part of China. The Chendu data are not included in this paper since the surveys were not completed when this paper was written.

Table 2. A comparison of the mean ratios of the number at each age to a two-stage moving average (the five-term average of a five-term average) from age 65 to 105 in China (1990) and Sweden (1985–1994)

	Male			Female			Both sexes		
	China	Sweden	Difference (%)	China	Sweden	Difference (%)	China	Sweden	Difference (%)
Survivors	0.853	0.884	−3.5	0.884	0.908	−2.7	0.875	0.902	−3.0
Deaths	0.891	0.916	−2.7	0.925	0.937	−1.2	0.916	0.934	−1.8

is generally good. During Wang's field surveys, she went through the following steps to validate the centenarians' age: 1) looking up the centenarians' household registration records and official certificate of elderly; 2) visiting the centenarians' neighbours; 3) checking with the ageing committee;[4] 4) asking each centenarian to personally provide his/her Chinese animal year at birth. All centenarians interviewed (all Han Chinese) could remember his/her animal year at birth clearly; 5) asking about some important historical events that occurred at the beginning of this century; and 6) asking about some demographic events that occurred in the centenarians' life, such as age of first marriage, ages at first and last child's birth, ages of centenarians' surviving and dead children, and age of the centenarians' surviving spouse or year in which his or her spouse died. Wang found one lady who reported her birth year as 1897, but it was misprinted as 1881 in her household registration. Wang found only one among the 83 Han Chinese interviewees who exaggerated her age by 10 years, and her correct age is probably 98 instead of the reported 108. According to Wang's filed observation, the main reason she overstated her age was that she wanted to show that her and her dead husband's Tai Ji Chinese exercise was good for longevity.

Since the Han Chinese centenarians' age reporting is generally reliable but the reported ethnic minority persons aged 100 or above in China are most likely not true centenarians, we will exclude the minority groups in the subsequent analyses in this paper.

Analysis Based on the 1990 Census Data

The following analyses are based on the 1990 census data for Han centenarians in China. Since the detailed tabulations and the raw data set for Han Chinese centenarians from the 1982 census are not available, we are not able to compare the demographic profiles of the centenarians in 1982.

[4] Ageing committees for helping elderly people and related administrative work were established in the middle 1980s in China at the national, provincial, municipal, district, county, township, and street neighbourhood committee levels.

Age and Sex Distribution

Table 3 presents the single year of age distribution and sex ratios of Han Chinese centenarians. Nearly 60 % of Han Chinese centenarians are just 100 or 101 years old. The percent shares reduce quickly after age 101, and persons of age 105 and over comprise 12.5 % of the total number of centenarians. The sharp decline of percent share after age 101 and the small proportion over age 105 are due to high mortality rates at extremely high ages. There is about one male Han centenarian per five female Han centenarians or 21 %. The sex ratio at ages 105–109 is 21.1 for Han Chinese, and it is 18.5 and 19.5 for Japan and Sweden, respectively. The sex ratio at age 110 and over is substantially higher than at the other ages (38.2 %), which may be due to random fluctuation resulting from the very small number or because more males overstated their age as being over 110. As discussed before, we think that the Han Chinese data quality at ages 105 and over is questionable. As in some other European countries with generally accurate population data, the Han Chinese data for extremely high ages, such as 105 and over, must be used with great caution.

Education

Table 4 presents the education distribution of Han Chinese centenarians. About 71 % of male centenarians and 93 % of female centenarians in the Han Chinese population in 1990 had no education. The percentage having a primary school education was 23 % for males and 2 % for females. There were 3 % and 2 % of male Han Chinese centenarians who had middle and high school educations, respectively. Among a total of 3977 female Han centenarians, only 13 had a mid-

Table 3. Age distribution of Han Chinese centenarians

Age	Male Number	Percent	Female Number	Percent	Both sexes Number	Percent	Sex ratio (100 × M/F)
100	311	36.85	1464	36.81	1775	36.82	21.2
101	189	22.39	874	21.98	1063	22.05	21.6
102	115	13.63	571	14.36	686	14.23	20.1
103	63	7.46	338	8.50	401	8.32	18.6
104	57	6.75	238	5.98	295	6.12	23.9
105	31	3.67	163	4.10	194	4.02	19.0
106	23	2.73	105	2.64	128	2.66	21.9
107	15	1.78	74	1.86	89	1.85	20.3
108	11	1.30	52	1.31	63	1.31	21.2
109	9	1.07	37	0.93	46	0.95	24.3
110	7	0.83	27	0.68	34	0.71	25.9
>110	13	1.54	34	0.85	47	0.97	38.2
Total	844	100.00	3977	100.00	4821	100.00	21.2

Table 4. Education of Han Chinese centenarians in China (1990)

	Male		Female		Total	
	#	%	#	%	#	%
No education	596	70.62	3867	97.23	4463	92.57
Primary school	195	23.10	97	2.44	292	6.06
Middle school	29	3.44	7	0.18	36	0.75
High school	18	2.13	2	0.05	20	0.41
University or higher	6	0.71	4	0.11	10	0.20
Total	844	100	3977	100	4821	100

dle school or higher education level. The very low education level among the Chinese centenarians, especially among the females, is mainly due to the very rare educational facilities and opportunities available about 90 years ago, when today's centenarians were children. The even much lower education level among the female centenarians as compared to the males reveals the low status of women in the old China, when the son preference was so strong that extremely few girls had an opportunity to go to school. It should be noted that we are not able to study the relationship between education level and longevity since we do not have education information for those who were born in the same years as the surviving centenarians but who died before 1990, when the census was conducted.

Regional Distribution

Table 5 present the regional distribution of centenarians among the Han Chinese population in China. It is interesting to note that the density of centenarians among Han Chinese is higher in the southern parts of China such as Guangxi, Guangdong, Hainan and Sichuan.[5] The less developed, northwestern parts of China, including Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, Shanxi, Shaanxi, and Tibet, have the lowest density of Han Chinese centenarians. Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, and Tibet are also the regions where the ethnic minority populations are concentrated, but we do not know the density of the minority centenarians since their age reporting is not reliable. The province with the highest density of Han centenarians is Guangxi, but it is not a region with advanced socio-economic development. Guangdong, which is one of the most economically developed provinces, has the second highest centenarian density. The three mostly urbanized municipalities of Beijing, Shanghai and

[5] The percentages of super centenarians aged 105 or over among total persons aged 100 or over are 12.9, 1.8, 9.5 and 13.8 in Guangxi, Guangdong, Hainan, and Sichuan, respectively. The sex ratios at ages 100 to 104 are 17.1, 10.4, 21.3, and 21.1 in Guangxi, Guangdong, Hainan, and Sichuan, respectively. The sex ratios at ages 105 or above are 21.2, 9.8, 0, and 33.8 in Guangxi, Guangdong, Hainan, and Sichuan, respectively. These data do not indicate a serious age overstatement in these four provinces with the highest density of centenarians.

Table 5. Regional distribution of centenarians (persons/million) among the Han Chinese population in China

Province	Male	Female	Total	Sex ratio (100 male/female)	Persons/million
Beijing	3	37	40	8.1	3.82
Tianjing	4	22	26	18.2	3.02
Hebei	13	81	94	16.0	1.56
Shanxi	9	38	47	23.7	1.64
Inner Mongolia	9	7	16	128.6	0.88
Liaoning	41	89	130	46.1	3.59
Jining	51	49	100	104.1	4.42
Heilongjiang	24	52	76	46.2	2.27
Shanghai	7	71	78	9.9	5.87
Jiangsu	41	223	264	18.4	3.94
Zhejiang	40	128	168	31.3	4.07
Anhui	50	258	308	19.4	5.51
Fujian	16	117	133	13.7	4.47
Jiangxi	23	88	111	26.1	2.94
Shandong	46	216	262	21.3	3.12
Henan	55	305	360	18.0	4.26
Hubei	40	133	173	30.1	3.33
Hunan	28	131	159	21.4	2.73
Guangdong	65	628	693	10.4	11.49
Guangxi	73	414	487	17.6	18.74
Hainan	10	53	63	18.9	10.44
Sichuan	137	602	739	22.8	7.16
Guizhou	21	86	107	24.4	4.47
Yunnan	14	64	78	21.9	3.09
Tibet	0	0	0		0.00
Shaanxi	17	53	70	32.1	2.14
Gansu	4	18	22	22.2	1.07
Qinghai	0	3	3	0	1.12
Ningxia	1	5	6	20.0	1.91
Xinjiang	2	6	8	33.3	1.31
China (whole)	844	3977	4821	21.2	4.64

Tianjing have the highest proportion of elderly aged 65 or above, but their densities of centenarians are not among the highest. No clear association between the density of centenarians and socio-economic development level is evident in China. What the socio-economic and environmental factors affecting people's longevity are remains an open question that deserves much more research.

The sex ratios of Han centenarians in all provinces seem reasonable except in Inner Mongolia, Jining, Liaoning, and Heilongjiang, the areas along the north boundary with the coldest weather in China. The high sex ratios in these four northern provinces, especially in Inner Mongolia and Jining, are probably due to some males who are less than 100 years old overstating their ages. The centenar-

ian data from these provinces should be used with great caution, and further study of the data quality in these areas is needed.

Analysis Based on the Hangzhou and Beijing Centenarian Surveys

This section is based on data collected in two regional surveys of centenarians in Hangzhou and Beijing municipalities. Unlike the data presented in the previous section, which used the census data for China as a whole, the data and discussion in this section can only be interpreted as two case studies because they cannot represent the country as a whole.[6]

Occupation

Table 6 provides the occupation distribution of centenarians before age 65. For the male centenarians interviewed, the majority were engaged in non-agricultural work; only 17.6 % were farmers. However, only 14.6 % of the female centenarians were industrial, commercial or technical workers; 57.6 % were housewives plus 28.8 % worked in the farming fields. This is further evidence showing the low social and economic status of women in the old China.

Marital Status and Living Arrangements

Among the 83 interviewed centenarians in Hangzhou and Beijing, there are no currently divorced persons, there was one man and one woman who were never married, there are only four currently married men, and the rest are all widowed.

Table 6. Occupations of the surveyed centenarians in Hangzhou and Beijing before age 65

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Agricultural work	3	66.7	11	32.4	0	0	8	25.0	3	17.6	19	28.8
Industry worker	3	33.3	3	8.8	1	9.1	1	3.1	4	23.5	4	6.1
Commercial	0	0	2	5.9	2	18.2	0	0	2	11.8	2	3.0
Technical staff	0	0	0	0	6	54.5	3	9.4	6	35.3	3	4.5
Government officer	0	0	0	0	2	18.2	0	0	2	11.8	0	0
Housewife			18	52.9			20	62.5			38	57.6
Total	6	100	34	100	11	100	32	100	17	100	66	100

[6] Another caution that should be kept in mind is that, in some categories, the sample size is too small (e.g., only one or two observations) and no statistically significant tests are presented. This is because the main purpose of this paper is to provide a general picture of the demographic and health characteristics of the surveyed centenarians; the detailed statistical analyses will be conducted later.

Table 7. Living arrangements of the surveyed centenarians at the time of interview, in Hangzhou and Beijing

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Spouse	0	0	0	0	4	36.4	0	0	4	23.5	0	0
Children	5	83.3	32	94.1	6	54.5	29	90.6	11	64.7	61	92.4
Other relatives	0	0	1	2.9	0	0	1	3.1	0	0	2	3.0
Nursing home	1	16.7	0	0	0	0	1	3.1	1	5.9	1	1.5
Alone	0	0	1	2.9	1	9.1	1	3.1	1	5.9	2	3.0
Total	6	100	34	100	11	100	32	100	17	100	66	100

Table 7 presents the living arrangements of the centenarians in Hangzhou and Beijing. The majority of centenarians in Hangzhou and Beijing live with children and/or grandchildren, especially the female centenarians. Only two centenarians live in an elderly nursing home, and three centenarians (3.6 % of the total) live alone. Three of the four male centenarians living only with their wives are either high-ranking officers or famous specialists who have a higher economic status and better housing conditions which may enable them to not rely on children's support. Most of the other three centenarians living alone or with spouse only have no children at all. It is clear that a large majority of the centenarians in Hangzhou and Beijing live with their children, which is due to the Chinese tradition requiring children to pay respect to and provide care for old parents, and due to the fact that elderly nursing home facilities are not yet commonly available.

Smoking and Alcohol

Half of the male centenarians and 12 % of the female centenarians in Hangzhou are smokers, but the fractions of smokers were 0 and 6 % among male and female centenarians, respectively, in Beijing (see Table 8). Slightly more than a third of the centenarians in Hangzhou drink alcohol, but this number was less than 5 % in Beijing (see Table 9). The reason there are many more smokers and alcohol drinkers among centenarians in Hangzhou than in Beijing is that 72 % of the centenarians in Hangzhou live in rural areas versus 16 % of their counterparts in Beijing, and smoking and alcohol drinking are more popular in rural areas than in urban areas. Another factor that may be useful in interpreting why there are many more alcohol drinkers in Hangzhou is that a famous Chinese Yellow wine (not strong) is produced and is popular in Hangzhou and its surrounding areas.

Table 8. Number and distribution of those smoking at the time of interview in Hangzhou and Beijing centenarian populations

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Smoking	3	50.0	4	11.8	0	0	2	6.3	3	17.6	6	9.1
Not smoking	3	50.0	29	85.3	11	100	30	93.8	14	82.4	59	89.4
No information			1	2.9							1	1.5
Total	6	100	34	100	11	100	32	100	17	100	66	100

Table 9. Number and distribution of those drinking alcohol at the time of interview in Hangzhou and Beijing centenarian population

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Drinking alcohol	2	33.3	12	35.3	1	9.1	1	3.1	3	17.6	13	19.7
Not drinking alcohol	4	66.7	21	61.8	10	90.9	31	96.9	14	82.4	52	78.8
No information			1	2.9							1	1.5
Total	6	100	34	100	11	100	32	100	17	100	66	100

Reported Health Status

The majority (about 80 %) of the centenarians in Hangzhou reported that they never had a serious disease in their lives. By contrast, the majority (about 80 %) of centenarians in Beijing reported that they have suffered serious disease (see Table 10). Indeed, one may draw a conclusion that the health of centenarians in Hangzhou is much better than of those in Beijing if one only looks at Table 10. However, the percentages of those bedridden in Hangzhou and Beijing are almost the same (see Table 11). The differences in percents of those able to count numbers and do simple computation, to draw a simple picture, to use chopsticks, or to pick up a coin from the floor are not large between Hangzhou and Beijing. How to interpret the contradictory information revealed in Tables 10, 11 and 12? Our explanation is that the real health status of centenarians in Hangzhou and Beijing may not differ too much, but the perception of a "serious disease" may differ substantially between these two regions. In Hangzhou, 72 % of centenarians live in rural areas and do not have access to modern medical facilities to check out a disease they may have. Some rural centenarians even reported that they had never had their blood pressure measured and did not know what high blood pressure disease was. It is natural for those rural centenarians to report that they had no serious disease if they did not know the disease existed.

Table 11 shows that more than two thirds of the centenarians did not need help for mobility. About one third of the centenarians could count numbers, do

Table 10. Number and distribution of those who ever suffered from serious disease (SD) in Hangzhou and Beijing centenarian populations

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Ever suffered SD	1	16.7	8	23.5	9	81.8	25	78.1	10	58.8	33	50.0
Never had SD	5	83.3	25	73.5	2	18.2	7	21.9	7	41.2	32	48.5
No information			1	2.9							1	1.5
Total	6	100	34	100	11	100	32	100	17	100	66	100

Table 11. Percentage distribution of centenarians needing help for mobility or if bedridden at the time of interview in Hangzhou and Beijing

	Hangzhou		Beijing		Total	
	Male	Female	Male	Female	Male	Female
	#	%	#	%	#	%
Bedridden	5	12.5	6	14.0	11	13.2
Mobility needs help	4	10.0	12	27.9	16	19.3
Mobility needs no help	31	77.5	25	58.1	56	67.5
Total	40	100	43	100	83	100

a simple computation, and pick up a coin from the floor. The data shown in Tables 11 and 12, plus the rich and concrete first-hand information obtained in the one-on-one personal interviews by Wang Zhenglian, confirm that the health status of centenarians in Hangzhou and Beijing is generally good.

About one third of Danish centenarians do not need help for mobility and 27.5 % of them can pick up a coin from the floor, according to an ongoing study supervised by Bernard Jeune, while the respective figures for the Han Chinese counterparts are 57.5 % and 35.6 %. Is the health status of Han Chinese centenarians better than that of the Danish? Our answer is, not necessarily, since the above figures are not based on sophisticated medical examination and they may be influenced by other socio-economic or cultural factors. For example, the much better facilities for assisting very old people in Denmark may lead more centenarians to rely on help for mobility, whereas most Chinese centenarians have to try their best to manage for themselves because no facilities are available. What the differences are in health status between Chinese and Western centenarians and what factors caused these differences are still open questions and much more research is needed.

Table 12. Percentage of centenarians able to perform some activities, in Hangzhou and Beijing

	Hangzhou		Beijing		Total	
	Male	Female	Male	Female	Male	Female
	#	%	#	%	#	%
Count numbers/computing	13	32.5	13	30.2	26	31.3
Draw a simple picture	4	10.0	9	20.9	13	15.7
Use chopsticks	40	100.0	30	70.0	70	84.3
Pick up a coin from the floor	12	30.0	12	27.9	24	35.6

Conclusions

Analyses presented in this paper confirm that the data quality of Han Chinese centenarians is generally good, but the Chinese ethnic minority populations seriously overstate their ages. Although generally accurate age reporting is evident among the Han Chinese centenarians, the data at extremely high ages, such as over age 105, must be used with great caution, as in some other developed countries with good data. The Han centenarian census data in Inner Mongolia and Jining appear not to be reasonable and to deserve further investigation.

There is about one male Han centenarian per five female Han centenarians, which reveals the significantly longer life span for females than males. That a large majority (71 % of the males and 93 % of the females) of Han centenarians are illiterate is mainly due to the lack of educational facilities nine decades ago. Among the female centenarians, 57.6 % were housewives plus 28.8 % worked in the farming fields, which again shows the very low social and economic status of women in the old China. The density of centenarians among Han Chinese is higher in the southern parts of China, such as Guangxi, Guangdong, Hainan and Sichuan. The less developed northwestern parts of China, including Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, Shanxi, Shaanxi, and Tibet, have the lowest density of Han Chinese centenarians. There is no clear evidence to show an established association between the density of centenarians and socioeconomic development level, and this area deserves much more research.

Data collected in the Hangzhou and Beijing centenarian surveys show clearly that a large majority of the centenarians in Hangzhou and Beijing live with their children, which is due to the Chinese tradition requiring children to pay respect to and provide care for old parents, and due to the fact that elderly nursing home facilities are not yet commonly available. More than two thirds of the centenarians do not need help for mobility. About one third of the centenarians can count numbers, do a simple computation, and pick up a coin from the floor. The Hangzhou and Beijing centenarian surveys show that the health status of centenarians in Hangzhou and Beijing is generally good, but the differences in health status between Han Chinese and Western centenarians and their causal factors are still open questions and need much more research.

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To our knowledge, there have been very few centenarian studies, limited to certain local areas, and no detailed studies of centenarians on a national scale in China so far. Based on the most recent Chinese census data and the centenarian surveys conducted in Hangzhou and Beijing by Wang Zhenglian, this paper intends to provide a profile of demographic characteristics and self-reported health status of Chinese centenarians, including data quality, age, sex and regional distributions, education, occupation, living arrangements, smoking and alcohol consumption, self-reported health status, etc.

Data Quality of Chinese Centenarians

Coale and Li (1991) analyzed the data quality at advanced ages from the 1982 Chinese census, with the Han and the ethnic minority populations combined and age 100 and above combined, because the detailed tabulations by single years of age of Han and minority nationalities were not available when they conducted the study. Nevertheless, by studying Xinjiang province, where Weiwuer and other ethnic groups consist of about 60 % of the province, they discovered that the elderly of minority populations seriously overstated their ages. In 1982, the reported numbers of centenarians in Xinjiang consisted of 22.5 % of the total number of centenarians in China as a whole, whereas the total population of Xinjiang consisted of only 1.3 % of the total population of China. As discovered by Coale and Li (1991), there were 144 males listed as over 110 years of age in China in 1982; 121 were in Xinjiang and another 15 were in four other provinces with the highest proportion of minorities whose cultures were not related closely to the Han Chinese. The five provinces with the highest fraction of these minorities (Xinjiang, Guanxi, Qinghai, Ningxia, and Yunnan) contained less than 9 % of the population of China but 94.4 % of males listed as being over 110. The centenarian data and the death rates in 1982 were seriously distorted if the data for all China including Xinjiang were used, but they escaped such distortion if the data from Xinjiang were omitted (Coale and Li 1991, pp. 298–300).

Fortunately we have the 1990 census data set on centenarians with detailed information of single year of age and ethnic grouping. Again, the reported minority Chinese centenarians account for about 24 % of the total number of centenarians in China, but the minority population consists of only slightly less than 8 % of the total population. For the males listed over age 110, 85.4 % belong to the minority groups. As was observed by Coale and Li (1991), the demographic indexes for measuring age misreporting also clearly show that the reports of minority Chinese centenarians are mostly not true, because they seriously overstated their age.

On the other hand, Han Chinese, whatever their education level, know their birth dates precisely. Young and educated people can supply their birth dates according to the Western calendar; the old and illiterate can supply their birth dates according to the traditional Chinese calendar. The Chinese calendar consists of a simple version of a cycle of 12 animal years, such as chicken, rat, tiger,

etc., as well as a more complicated version of a cycle of 60 years, with 12 animals and each animals five different qualities. According to the Han Chinese traditions,[2] the precise date of birth is significant in making decisions on important life events such as marriage matching, date of marriage, date to start to build a house, and date of travelling, etc. It is widely recognized that age reporting of Han Chinese elderly is highly accurate in general (see, for example, Coale and Li 1991; Vaupel et al., in preparation), but we did not have enough knowledge about the accuracy of the data of Han Chinese centenarians before the detailed data became available for this study. Therefore, an evaluation of data quality of Han Chinese centenarians follows.

The population sizes and sex ratios of Han Chinese elderly aged 80 and above appear reasonable, as compared with those of Japan and Sweden (see Table 1). Table 2 presents an index for measuring the accuracy of age reporting between ages 65 and 105. The index was proposed by Coale and Li (1991), and it is computed as a mean of the ratios of the number at each age to a two-stage moving average (the five-term average of a five-term average) from age 65 to 105. Sweden is considered to be the country with the best data accuracy in the world so, the more accurate the age reporting, the closer the mean indexes are to the Swedish ones. Table 1 shows a very close match of the Han Chinese indexes to the Swedish indexes.

The above analysis demonstrated that there is no serious age heaping and that age reporting is of high quality in general in the Han Chinese elderly population, although it is still not as good as in Sweden. However, the absence of significant digit preference at ages divisible by ten or five is not necessarily proof of data accuracy, since other kinds of errors of age reporting may also distort the data quality. Do any kinds of systematic age misreporting other than heaping, such as exaggeration of age for seniority honour, exist in the Han Chinese elderly population? One way of addressing this question is to imagine that, if age exaggeration at very old ages is serious, the reported total number of very old persons must be relatively large as compared with the reported total number including younger persons, and the ratio of life expectancy at very old age to the conditional survival probability at middle age should be relatively large. As shown by Coale and Kisker (1986, p. 398), the ratios of those aged 95 years or over to those aged 70 or over in the 23 countries with accurate data quality were all less than six per thousand, whereas the ratios for the 28 countries with poor data clearly showed the exaggeration of very old persons aged 95 or over, extending from 1 % to 10 %. This ratio for male and female Han Chinese in 1990 is 0.76 per thousand and 2.18 per thousand, respectively, which is almost exactly the same as their Swedish counterparts in the period from 1985–1994. Coale and Kisker calculated

[2] It is important to ask for the date of birth and to compute age by subtracting from the date of the census or survey (if respondents supply the Chinese calendar, conversion to the Western calendar is needed). If the questionnaire asks the individual's age, the Chinese system of reckoning nominal age makes the response ambiguous, because a person may be counted as one-year-old on the day of birth and one year older with each new year according to the Chinese tradition.

Table 1. Male and female population, sex ratio (SR) at advanced ages for Han Chinese (1990), Japanese (1985–1990) and Swedes (1985–1994)

Age	Han Chinese			Japanese			Swedes		
	Male	Female	SR	Male	Female	SR	Male	Female	SR
80– 84	1845877	3155219	58.50	3109384	5067146	61.36	759811	1237222	61.41
85– 89	555217	1227726	45.22	1297711	2520394	51.49	329311	676627	48.67
90– 94	82920	240949	34.41	323315	765460	42.24	93760	241729	38.79
95– 99	10303	28606	26.69	44.289	128484	34.47	15495	49493	31.31
100–104	779	3611	21.56	2803	11106	25.24	1291	5109	25.27
105–109	94	447	21.11	86	466	18.45	48	246	19.51

the ratio of T_{100}/T_{70} (ratio of total person-years above age 100 to the total person-years above age 70) for various countries relative to T_{100}/T_{70} for Sweden in 1980. The ratios in the countries with accurate data were mostly below 1, with the lowest value being 0.04 for Finland in 1950, and a few cases exceeding 1 but not more than 1.28. The ratios in the countries with poor data ranged from 7.92 (Mauritius) to 82.1 (Dominican Republic), which shows clearly the overstatement of age over 100 years in these countries. The ratio of T_{100}/T_{70} for Han Chinese in 1990 relative to T_{100}/T_{70} for Sweden in 1980 is 0.13, which demonstrates again that the Han Chinese are among the populations with accurate data quality for old people.

Although we trust that the age reporting of Han centenarians is accurate in general, we also found that the super-centenarians' age reporting is questionable. The ratio of persons aged 105 or over to persons aged 100 to 104 is 0.14 for Han Chinese, but 0.04–0.05 for 13 European countries and Japan combined. Is this due to age exaggeration at age 105 and over or are death rates of Han Chinese super-centenarians lower because of much higher selection at ages 105 and over? We think that both factors may play a role. Note that the population size of super-centenarians aged 105 and above is very small, and age overstatement even by a small number of people can seriously distort the data quality of this age group. The super-centenarians account for only a small portion of the total centenarian population, so that its questionable number may not negate our conclusion that the data quality of Han Chinese centenarians is generally good.

The field observations in the centenarian surveys in Hangzhou and Beijing by Wang Zhenglian[3] also confirm that the age reporting of Chinese centenarians

[3] As part of her Ph. D research, Wang Zhenglian just completed the field work of the centenarian surveys in Hangzhou and Beijing municipalities in China. Hangzhou municipality has a total population of 5.92 million and is located in the southeastern part of the country. Beijing is the capital city of China with a total population of 11.4 million and is located in the northern part of China. Wang Zhenglian has personally visited 83 (40 in Hangzhou and 43 in Beijing) centenarians and done health examinations with the help of one medical doctor. As the second stage of her field survey work, Wang will conduct centenarian surveys in Chendu municipality and its surrounding rural areas, located in the southwestern part of China. The Chendu data are not included in this paper since the surveys were not completed when this paper was written.

Table 2. A comparison of the mean ratios of the number at each age to a two-stage moving average (the five-term average of a five-term average) from age 65 to 105 in China (1990) and Sweden (1985–1994)

	Male			Female			Both sexes		
	China	Sweden	Difference (%)	China	Sweden	Difference (%)	China	Sweden	Difference (%)
Survivors	0.853	0.884	−3.5	0.884	0.908	−2.7	0.875	0.902	−3.0
Deaths	0.891	0.916	−2.7	0.925	0.937	−1.2	0.916	0.934	−1.8

is generally good. During Wang's field surveys, she went through the following steps to validate the centenarians' age: 1) looking up the centenarians' household registration records and official certificate of elderly; 2) visiting the centenarians' neighbours; 3) checking with the ageing committee;[4] 4) asking each centenarian to personally provide his/her Chinese animal year at birth. All centenarians interviewed (all Han Chinese) could remember his/her animal year at birth clearly; 5) asking about some important historical events that occurred at the beginning of this century; and 6) asking about some demographic events that occurred in the centenarians' life, such as age of first marriage, ages at first and last child's birth, ages of centenarians' surviving and dead children, and age of the centenarians' surviving spouse or year in which his or her spouse died. Wang found one lady who reported her birth year as 1897, but it was misprinted as 1881 in her household registration. Wang found only one among the 83 Han Chinese interviewees who exaggerated her age by 10 years, and her correct age is probably 98 instead of the reported 108. According to Wang's filed observation, the main reason she overstated her age was that she wanted to show that her and her dead husband's Tai Ji Chinese exercise was good for longevity.

Since the Han Chinese centenarians' age reporting is generally reliable but the reported ethnic minority persons aged 100 or above in China are most likely not true centenarians, we will exclude the minority groups in the subsequent analyses in this paper.

Analysis Based on the 1990 Census Data

The following analyses are based on the 1990 census data for Han centenarians in China. Since the detailed tabulations and the raw data set for Han Chinese centenarians from the 1982 census are not available, we are not able to compare the demographic profiles of the centenarians in 1982.

[4] Ageing committees for helping elderly people and related administrative work were established in the middle 1980s in China at the national, provincial, municipal, district, county, township, and street neighbourhood committee levels.

Age and Sex Distribution

Table 3 presents the single year of age distribution and sex ratios of Han Chinese centenarians. Nearly 60 % of Han Chinese centenarians are just 100 or 101 years old. The percent shares reduce quickly after age 101, and persons of age 105 and over comprise 12.5 % of the total number of centenarians. The sharp decline of percent share after age 101 and the small proportion over age 105 are due to high mortality rates at extremely high ages. There is about one male Han centenarian per five female Han centenarians or 21 %. The sex ratio at ages 105–109 is 21.1 for Han Chinese, and it is 18.5 and 19.5 for Japan and Sweden, respectively. The sex ratio at age 110 and over is substantially higher than at the other ages (38.2 %), which may be due to random fluctuation resulting from the very small number or because more males overstated their age as being over 110. As discussed before, we think that the Han Chinese data quality at ages 105 and over is questionable. As in some other European countries with generally accurate population data, the Han Chinese data for extremely high ages, such as 105 and over, must be used with great caution.

Education

Table 4 presents the education distribution of Han Chinese centenarians. About 71 % of male centenarians and 93 % of female centenarians in the Han Chinese population in 1990 had no education. The percentage having a primary school education was 23 % for males and 2 % for females. There were 3 % and 2 % of male Han Chinese centenarians who had middle and high school educations, respectively. Among a total of 3977 female Han centenarians, only 13 had a mid-

Table 3. Age distribution of Han Chinese centenarians

Age	Male Number	Percent	Female Number	Percent	Both sexes Number	Percent	Sex ratio (100 × M/F)
100	311	36.85	1464	36.81	1775	36.82	21.2
101	189	22.39	874	21.98	1063	22.05	21.6
102	115	13.63	571	14.36	686	14.23	20.1
103	63	7.46	338	8.50	401	8.32	18.6
104	57	6.75	238	5.98	295	6.12	23.9
105	31	3.67	163	4.10	194	4.02	19.0
106	23	2.73	105	2.64	128	2.66	21.9
107	15	1.78	74	1.86	89	1.85	20.3
108	11	1.30	52	1.31	63	1.31	21.2
109	9	1.07	37	0.93	46	0.95	24.3
110	7	0.83	27	0.68	34	0.71	25.9
>110	13	1.54	34	0.85	47	0.97	38.2
Total	844	100.00	3977	100.00	4821	100.00	21.2

Table 4. Education of Han Chinese centenarians in China (1990)

	Male		Female		Total	
	#	%	#	%	#	%
No education	596	70.62	3867	97.23	4463	92.57
Primary school	195	23.10	97	2.44	292	6.06
Middle school	29	3.44	7	0.18	36	0.75
High school	18	2.13	2	0.05	20	0.41
University or higher	6	0.71	4	0.11	10	0.20
Total	844	100	3977	100	4821	100

dle school or higher education level. The very low education level among the Chinese centenarians, especially among the females, is mainly due to the very rare educational facilities and opportunities available about 90 years ago, when today's centenarians were children. The even much lower education level among the female centenarians as compared to the males reveals the low status of women in the old China, when the son preference was so strong that extremely few girls had an opportunity to go to school. It should be noted that we are not able to study the relationship between education level and longevity since we do not have education information for those who were born in the same years as the surviving centenarians but who died before 1990, when the census was conducted.

Regional Distribution

Table 5 present the regional distribution of centenarians among the Han Chinese population in China. It is interesting to note that the density of centenarians among Han Chinese is higher in the southern parts of China such as Guangxi, Guangdong, Hainan and Sichuan.[5] The less developed, northwestern parts of China, including Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, Shanxi, Shaanxi, and Tibet, have the lowest density of Han Chinese centenarians. Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, and Tibet are also the regions where the ethnic minority populations are concentrated, but we do not know the density of the minority centenarians since their age reporting is not reliable. The province with the highest density of Han centenarians is Guangxi, but it is not a region with advanced socio-economic development. Guangdong, which is one of the most economically developed provinces, has the second highest centenarian density. The three mostly urbanized municipalities of Beijing, Shanghai and

[5] The percentages of super centenarians aged 105 or over among total persons aged 100 or over are 12.9, 1.8, 9.5 and 13.8 in Guangxi, Guangdong, Hainan, and Sichuan, respectively. The sex ratios at ages 100 to 104 are 17.1, 10.4, 21.3, and 21.1 in Guangxi, Guangdong, Hainan, and Sichuan, respectively. The sex ratios at ages 105 or above are 21.2, 9.8, 0, and 33.8 in Guangxi, Guangdong, Hainan, and Sichuan, respectively. These data do not indicate a serious age overstatement in these four provinces with the highest density of centenarians.

Table 5. Regional distribution of centenarians (persons/million) among the Han Chinese population in China

Province	Male	Female	Total	Sex ratio (100 male/female)	Persons/million
Beijing	3	37	40	8.1	3.82
Tianjing	4	22	26	18.2	3.02
Hebei	13	81	94	16.0	1.56
Shanxi	9	38	47	23.7	1.64
Inner Mongolia	9	7	16	128.6	0.88
Liaoning	41	89	130	46.1	3.59
Jining	51	49	100	104.1	4.42
Heilongjiang	24	52	76	46.2	2.27
Shanghai	7	71	78	9.9	5.87
Jiangsu	41	223	264	18.4	3.94
Zhejiang	40	128	168	31.3	4.07
Anhui	50	258	308	19.4	5.51
Fujian	16	117	133	13.7	4.47
Jiangxi	23	88	111	26.1	2.94
Shandong	46	216	262	21.3	3.12
Henan	55	305	360	18.0	4.26
Hubei	40	133	173	30.1	3.33
Hunan	28	131	159	21.4	2.73
Guangdong	65	628	693	10.4	11.49
Guangxi	73	414	487	17.6	18.74
Hainan	10	53	63	18.9	10.44
Sichuan	137	602	739	22.8	7.16
Guizhou	21	86	107	24.4	4.47
Yunnan	14	64	78	21.9	3.09
Tibet	0	0	0		0.00
Shaanxi	17	53	70	32.1	2.14
Gansu	4	18	22	22.2	1.07
Qinghai	0	3	3	0	1.12
Ningxia	1	5	6	20.0	1.91
Xinjiang	2	6	8	33.3	1.31
China (whole)	844	3977	4821	21.2	4.64

Tianjing have the highest proportion of elderly aged 65 or above, but their densities of centenarians are not among the highest. No clear association between the density of centenarians and socio-economic development level is evident in China. What the socio-economic and environmental factors affecting people's longevity are remains an open question that deserves much more research.

The sex ratios of Han centenarians in all provinces seem reasonable except in Inner Mongolia, Jining, Liaoning, and Heilongjiang, the areas along the north boundary with the coldest weather in China. The high sex ratios in these four northern provinces, especially in Inner Mongolia and Jining, are probably due to some males who are less than 100 years old overstating their ages. The centenar-

ian data from these provinces should be used with great caution, and further study of the data quality in these areas is needed.

Analysis Based on the Hangzhou and Beijing Centenarian Surveys

This section is based on data collected in two regional surveys of centenarians in Hangzhou and Beijing municipalities. Unlike the data presented in the previous section, which used the census data for China as a whole, the data and discussion in this section can only be interpreted as two case studies because they cannot represent the country as a whole.[6]

Occupation

Table 6 provides the occupation distribution of centenarians before age 65. For the male centenarians interviewed, the majority were engaged in non-agricultural work; only 17.6 % were farmers. However, only 14.6 % of the female centenarians were industrial, commercial or technical workers; 57.6 % were housewives plus 28.8 % worked in the farming fields. This is further evidence showing the low social and economic status of women in the old China.

Marital Status and Living Arrangements

Among the 83 interviewed centenarians in Hangzhou and Beijing, there are no currently divorced persons, there was one man and one woman who were never married, there are only four currently married men, and the rest are all widowed.

Table 6. Occupations of the surveyed centenarians in Hangzhou and Beijing before age 65

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Agricultural work	3	66.7	11	32.4	0	0	8	25.0	3	17.6	19	28.8
Industry worker	3	33.3	3	8.8	1	9.1	1	3.1	4	23.5	4	6.1
Commercial	0	0	2	5.9	2	18.2	0	0	2	11.8	2	3.0
Technical staff	0	0	0	0	6	54.5	3	9.4	6	35.3	3	4.5
Government officer	0	0	0	0	2	18.2	0	0	2	11.8	0	0
Housewife			18	52.9			20	62.5			38	57.6
Total	6	100	34	100	11	100	32	100	17	100	66	100

[6] Another caution that should be kept in mind is that, in some categories, the sample size is too small (e.g., only one or two observations) and no statistically significant tests are presented. This is because the main purpose of this paper is to provide a general picture of the demographic and health characteristics of the surveyed centenarians; the detailed statistical analyses will be conducted later.

Table 7. Living arrangements of the surveyed centenarians at the time of interview, in Hangzhou and Beijing

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Spouse	0	0	0	0	4	36.4	0	0	4	23.5	0	0
Children	5	83.3	32	94.1	6	54.5	29	90.6	11	64.7	61	92.4
Other relatives	0	0	1	2.9	0	0	1	3.1	0	0	2	3.0
Nursing home	1	16.7	0	0	0	0	1	3.1	1	5.9	1	1.5
Alone	0	0	1	2.9	1	9.1	1	3.1	1	5.9	2	3.0
Total	6	100	34	100	11	100	32	100	17	100	66	100

Table 7 presents the living arrangements of the centenarians in Hangzhou and Beijing. The majority of centenarians in Hangzhou and Beijing live with children and/or grandchildren, especially the female centenarians. Only two centenarians live in an elderly nursing home, and three centenarians (3.6 % of the total) live alone. Three of the four male centenarians living only with their wives are either high-ranking officers or famous specialists who have a higher economic status and better housing conditions which may enable them to not rely on children's support. Most of the other three centenarians living alone or with spouse only have no children at all. It is clear that a large majority of the centenarians in Hangzhou and Beijing live with their children, which is due to the Chinese tradition requiring children to pay respect to and provide care for old parents, and due to the fact that elderly nursing home facilities are not yet commonly available.

Smoking and Alcohol

Half of the male centenarians and 12 % of the female centenarians in Hangzhou are smokers, but the fractions of smokers were 0 and 6 % among male and female centenarians, respectively, in Beijing (see Table 8). Slightly more than a third of the centenarians in Hangzhou drink alcohol, but this number was less than 5 % in Beijing (see Table 9). The reason there are many more smokers and alcohol drinkers among centenarians in Hangzhou than in Beijing is that 72 % of the centenarians in Hangzhou live in rural areas versus 16 % of their counterparts in Beijing, and smoking and alcohol drinking are more popular in rural areas than in urban areas. Another factor that may be useful in interpreting why there are many more alcohol drinkers in Hangzhou is that a famous Chinese Yellow wine (not strong) is produced and is popular in Hangzhou and its surrounding areas.

Table 8. Number and distribution of those smoking at the time of interview in Hangzhou and Beijing centenarian populations

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Smoking	3	50.0	4	11.8	0	0	2	6.3	3	17.6	6	9.1
Not smoking	3	50.0	29	85.3	11	100	30	93.8	14	82.4	59	89.4
No information			1	2.9							1	1.5
Total	6	100	34	100	11	100	32	100	17	100	66	100

Table 9. Number and distribution of those drinking alcohol at the time of interview in Hangzhou and Beijing centenarian population

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Drinking alcohol	2	33.3	12	35.3	1	9.1	1	3.1	3	17.6	13	19.7
Not drinking alcohol	4	66.7	21	61.8	10	90.9	31	96.9	14	82.4	52	78.8
No information			1	2.9							1	1.5
Total	6	100	34	100	11	100	32	100	17	100	66	100

Reported Health Status

The majority (about 80 %) of the centenarians in Hangzhou reported that they never had a serious disease in their lives. By contrast, the majority (about 80 %) of centenarians in Beijing reported that they have suffered serious disease (see Table 10). Indeed, one may draw a conclusion that the health of centenarians in Hangzhou is much better than of those in Beijing if one only looks at Table 10. However, the percentages of those bedridden in Hangzhou and Beijing are almost the same (see Table 11). The differences in percents of those able to count numbers and do simple computation, to draw a simple picture, to use chopsticks, or to pick up a coin from the floor are not large between Hangzhou and Beijing. How to interpret the contradictory information revealed in Tables 10, 11 and 12? Our explanation is that the real health status of centenarians in Hangzhou and Beijing may not differ too much, but the perception of a "serious disease" may differ substantially between these two regions. In Hangzhou, 72 % of centenarians live in rural areas and do not have access to modern medical facilities to check out a disease they may have. Some rural centenarians even reported that they had never had their blood pressure measured and did not know what high blood pressure disease was. It is natural for those rural centenarians to report that they had no serious disease if they did not know the disease existed.

Table 11 shows that more than two thirds of the centenarians did not need help for mobility. About one third of the centenarians could count numbers, do

Table 10. Number and distribution of those who ever suffered from serious disease (SD) in Hangzhou and Beijing centenarian populations

	Hangzhou				Beijing				Total			
	Male		Female		Male		Female		Male		Female	
	#	%	#	%	#	%	#	%	#	%	#	%
Ever suffered SD	1	16.7	8	23.5	9	81.8	25	78.1	10	58.8	33	50.0
Never had SD	5	83.3	25	73.5	2	18.2	7	21.9	7	41.2	32	48.5
No information			1	2.9							1	1.5
Total	6	100	34	100	11	100	32	100	17	100	66	100

Table 11. Percentage distribution of centenarians needing help for mobility or if bedridden at the time of interview in Hangzhou and Beijing

	Hangzhou		Beijing		Total	
	Male	Female	Male	Female	Male	Female
	#	%	#	%	#	%
Bedridden	5	12.5	6	14.0	11	13.2
Mobility needs help	4	10.0	12	27.9	16	19.3
Mobility needs no help	31	77.5	25	58.1	56	67.5
Total	40	100	43	100	83	100

a simple computation, and pick up a coin from the floor. The data shown in Tables 11 and 12, plus the rich and concrete first-hand information obtained in the one-on-one personal interviews by Wang Zhenglian, confirm that the health status of centenarians in Hangzhou and Beijing is generally good.

About one third of Danish centenarians do not need help for mobility and 27.5 % of them can pick up a coin from the floor, according to an ongoing study supervised by Bernard Jeune, while the respective figures for the Han Chinese counterparts are 57.5 % and 35.6 %. Is the health status of Han Chinese centenarians better than that of the Danish? Our answer is, not necessarily, since the above figures are not based on sophisticated medical examination and they may be influenced by other socio-economic or cultural factors. For example, the much better facilities for assisting very old people in Denmark may lead more centenarians to rely on help for mobility, whereas most Chinese centenarians have to try their best to manage for themselves because no facilities are available. What the differences are in health status between Chinese and Western centenarians and what factors caused these differences are still open questions and much more research is needed.

Table 12. Percentage of centenarians able to perform some activities, in Hangzhou and Beijing

	Hangzhou		Beijing		Total	
	Male	Female	Male	Female	Male	Female
	#	%	#	%	#	%
Count numbers/computing	13	32.5	13	30.2	26	31.3
Draw a simple picture	4	10.0	9	20.9	13	15.7
Use chopsticks	40	100.0	30	70.0	70	84.3
Pick up a coin from the floor	12	30.0	12	27.9	24	35.6

Conclusions

Analyses presented in this paper confirm that the data quality of Han Chinese centenarians is generally good, but the Chinese ethnic minority populations seriously overstate their ages. Although generally accurate age reporting is evident among the Han Chinese centenarians, the data at extremely high ages, such as over age 105, must be used with great caution, as in some other developed countries with good data. The Han centenarian census data in Inner Mongolia and Jining appear not to be reasonable and to deserve further investigation.

There is about one male Han centenarian per five female Han centenarians, which reveals the significantly longer life span for females than males. That a large majority (71 % of the males and 93 % of the females) of Han centenarians are illiterate is mainly due to the lack of educational facilities nine decades ago. Among the female centenarians, 57.6 % were housewives plus 28.8 % worked in the farming fields, which again shows the very low social and economic status of women in the old China. The density of centenarians among Han Chinese is higher in the southern parts of China, such as Guangxi, Guangdong, Hainan and Sichuan. The less developed northwestern parts of China, including Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, Shanxi, Shaanxi, and Tibet, have the lowest density of Han Chinese centenarians. There is no clear evidence to show an established association between the density of centenarians and socioeconomic development level, and this area deserves much more research.

Data collected in the Hangzhou and Beijing centenarian surveys show clearly that a large majority of the centenarians in Hangzhou and Beijing live with their children, which is due to the Chinese tradition requiring children to pay respect to and provide care for old parents, and due to the fact that elderly nursing home facilities are not yet commonly available. More than two thirds of the centenarians do not need help for mobility. About one third of the centenarians can count numbers, do a simple computation, and pick up a coin from the floor. The Hangzhou and Beijing centenarian surveys show that the health status of centenarians in Hangzhou and Beijing is generally good, but the differences in health status between Han Chinese and Western centenarians and their causal factors are still open questions and need much more research.

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