Sociodemographic and Health Profiles of the Oldest Old In China

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THE NUMBER OF oldest old persons in China, defined here as aged 80 and older, is calculated by the United Nations to climb from about 11.5 million in the year 2000 to 27 million in 2020, 39 million in 2030, 64 million in 2040, and 99 million in 2050.[1] Under the UN's medium fertility assumption,[2] the percent aged 65 and older is expected to increase from 6.9 in 2000 to 15.7 in 2030 and 22.7 in 2050, while the share of the oldest old which in 2000 is 13 percent of the elderly population will be some 30 percent in 2050. The main reason the number of oldest old will climb so quickly after 2030 is that China's "baby boomers," who were born in the 1950s and 1960s, will fall into the category of "oldest old" at that time.

During 2000–50 the population of the oldest old will grow faster than any other age group in China. This phenomenon is not limited to China. The average annual rates of increase of oldest old persons between 2000 and 2050 are expected to be around 4.3 percent in China, India, and Mexico and 2.2–2.8 percent in Canada, Japan, the United States, Germany, and France (UN 2001b). The rate of increase of the Chinese oldest old subpopulation is much faster (4.4 percent vs. 2.7 percent) than that of the entire elderly population aged 65 and older.

The oldest old are much more likely to need help in daily living than the younger elderly. The oldest old consume medical care and other services and benefits of government and private transfers far out of proportion to their numbers. As evidenced later in this article, the proportion of individuals leading active daily lives declines and the disability rate increases dramatically with age among the Chinese oldest old. Torrey (1992: 382) estimated that in the United States, the Medicare costs of those aged 80 and older are 77, 60, and 36 percent higher than those of the younger elderly aged 65–69, 70–74, and

75–79. Also according to Torrey, the cost of long-term care for the oldest old is 14.4 times higher than for the younger elderly aged 65–74 (ibid.). According to a German study, 2, 6, and 26 percent of the elderly aged 65–69, 75–79, and 85+ regularly need health care services (Schneekloth et al. 1996).

Because the oldest old subpopulation is growing much faster than any other age group and because they are the most likely group to need medical and social services, investigating the demographic, socioeconomic, and health status of the oldest old should command attention. In a few countries, notably the United States and a few European countries, efforts have been made to attract the attention of academics and policymakers to the circumstances of the oldest old (Suzman, Willis, and Manton 1992; Baltes and Mayer 1999; Vaupel and Lundstrom 1994; Vaupel et al. 1998). Elsewhere in the world, on the contrary, little attention has been paid to ensure statistically sufficient representation of the oldest old in national surveys, and most studies on the elderly include few or no subjects aged 80 and older (as discussed in Grundy, Bowling, and Farquhar 1996: 143–144). In almost all developing countries, published statistics are generally truncated at age 65 or 80; and limited surveys on the elderly have sample sizes that are too small for the proper evaluation of the oldest old. For example, 20,083 elderly persons aged 60 and older were interviewed under China's 1992 national survey on support systems for the elderly; but the subsample sizes for the age groups 85+ were only 85 rural and 78 urban for males and 175 rural and 132 urban for females; among all interviewees, only 84 were aged 90+. The minuscule subsample size makes meaningful analysis of the oldest old subpopulation impossible.

To fill in the data and knowledge gaps for scientific study and policy analysis, an international collaborative longitudinal survey research project on the oldest old in China was initiated in late 1997, with support from the US National Institute on Aging, Peking University, and the China National Research Center on Aging (Zeng et al. 2001). This article is based on data collected from the baseline survey, conducted in 1998. We present a current portrait of the demographic, socioeconomic, and health characteristics of oldest old persons in China.

Data source and assessment: The healthy longevity survey

Previous demographic surveys on aging proportionally sampled elderly persons aged 60 and older, which resulted in too-small subsample sizes of oldest old ages. The Chinese healthy longevity survey, the first large survey of the oldest old ever conducted in a developing country, was designed to overcome this limitation. The baseline survey was conducted in 1998 in 631 randomly selected counties and cities of the 22 provinces in which Han Chi-

nese are the overwhelming majority.[3] The 22 surveyed provinces are: Liaoning, Jilin, Heilongjiang, Hebei, Beijing, Tianjin, Shanxi, Shaanxi, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Sichuan, and Chongqing. The survey areas contained 985 million persons, some 85 percent of the total population of China. The 631 surveyed counties and cities are roughly half the total number of counties and cities of the 22 provinces. The sample consisted of the oldest old, aged 80 and above.

An enumerator and a doctor, a nurse, or a medical school student conducted an interview and performed a basic health examination at the interviewee's home. Extensive questionnaire data on demographic profile, socioeconomic characteristics, health status, and lifestyle were gathered. The information collected included data on family structure, living arrangements and proximity to children, activities of daily living (ADL), the capacity of physical performance, self-rated health, self-evaluation on life satisfaction, cognitive function, chronic disease, medical care, social activities, diet, smoking and drinking, psychological characteristics, economic resources, caregivers, and family support. Demographic, socioeconomic, and environmental data on the 631 sampled counties and cities were also collected.

The survey team tried to interview all centenarians who voluntarily agreed to participate in the study. For each centenarian, one nearby octogenarian (aged 80–89) and one nearby nonagenarian (aged 90–99) of predesignated age and sex were interviewed. "Nearby" is loosely defined: it could be in the same village or street if such an individual was available, or in the same town or in the same sampled county or city. The predesignated age and sex were used to ensure that approximately equal numbers of male and female nonagenarians and octogenarians were randomly selected, based on the code numbers of the centenarians.[4] The aim was to have more or less randomly selected comparable numbers of male and female octogenarians and nonagenarians at each age from 80 to 99. The total valid sample size of the data set used in this article is 8,805 elderly persons aged 80 to 105. Among them are 463 male and 1,811 female centenarians aged 100–105; 1,316 male and 1,719 female nonagenarians aged 90–99; and 1,768 male and 1,728 female octogenarians aged 80–89. (See the Appendix for detailed information about the age, sex, and rural–urban composition of the sample.) To avoid problems of too small a subsample size at more advanced ages, we did not follow a proportional sampling design, but instead interviewed all centenarians and oversampled the oldest old, especially males. Consequently, appropriate weights are used to compute the averages of age groups below age 100, but no weights are needed when computing the average of centenarians. The method for computing the age-sex–specific and rural-urban–specific weights is presented in Zeng et al. (2001: Appendix A).

Accurate age reporting is crucial in studies dealing with the elderly, especially the oldest old. Often, older persons in developing countries and in some subpopulations in Western countries such as African Americans in the United States are not able to report their age accurately (Elo and Preston 1992; Mosley and Gray 1993; Coale and Kisker 1986). Is the age reporting among the Chinese oldest old generally reliable? Our answer is affirmative, based on the following evidence.

Coale and Li (1991) concluded that the age reporting of Han Chinese elderly was as reliable as that of their counterparts in Western countries. Coale and Li's conclusion is partly based on analysis of their index for measuring the degree of digit preference for ages divisible by ten or five among old people, using the 1982 Chinese data of the census. Wang et al. (1998) computed such an index for Han Chinese aged 85–105 using the data of the 1990 census, and compared it to the same indexes for the populations of Sweden, Japan, France, Italy, and Germany. Sweden is considered to have the most accurate age data in the world, so the more accurate the age reporting, the closer the indexes are to the Swedish ones. The estimates show a reasonably close match of the Han Chinese indexes to the Swedish ones, as compared to the matches between the Swedish and Japanese, French, Italian, and German indexes, all of which have good data at oldest old ages (Wang et al. 1998: 133, Table 3).

Another way of addressing this issue is to imagine that if age exaggeration at very old ages is significant in a population, the reported proportion of very old persons among all elderly would be relatively large as compared with the proportion in other populations with accurate age reporting. Coale and Kisker (1986) found the proportion of those aged 95 and older among all elderly aged 70 and older in 23 countries with accurate data to be less than 6 per thousand. In 28 countries having poor data with age exaggeration by old persons, this proportion rises to as high as 10 percent (Coale and Kisker 1986: 398). The proportion of Han Chinese aged 95 and older among those aged 70 and older in 1990 is 0.76 per thousand for males and 2.18 per thousand for females, which is almost exactly the same as for their Swedish counterparts in the period 1985–94. The proportions of those aged 100 years and older among those aged 75 and older for Han Chinese in 1990 were 0.128 per thousand for males and 0.388 per thousand for females; the corresponding proportions for the Swedish population in 1985–94 were 0.127 and 0.386 per thousand.

Coale and Kisker (1986: 389–390) plotted the ratio of e_{70} (life expectation at age 70) against l_{70}/l_5 (conditional probability of survival from age 5 to age 70) for the female populations in countries or regions with good data.[5] A very close relation between e_{70} and l_{70}/l_5 is evident among countries and regions with good data, as shown by a third-degree polynomial curve fitted by least squares (Coale and Kisker 1986: 389, Figure 1). The plotting of e_{70}

against l_{70}/l_5 for female populations in countries with poor data[6] all lies far above the polynomial curve fitted to the data from the countries with good data (Coale and Kisker 1986: 390, Figure 2). We computed the ratio of e_{70} against l_{70}/l_5 for the Han Chinese female population in 1990. The Han Chinese ratio lies almost exactly on the third-degree polynomial curve fitted to the data of populations with good age reporting.

On the basis of this evidence the age reporting of the Han Chinese, who comprise 92 percent of the total population, is acceptably reliable. Han Chinese, even if illiterate, can supply a precise date of birth. Young and educated Han can supply their birth date according to the Western calendar. Old and illiterate Han can supply their birth date according to the traditional Chinese calendar year and the animal year of birth,[7] which can be easily translated to the Western calendar by the enumerators (Coale and Li 1991: 294).

Coale and Li demonstrated that reported ages of the elderly in Xinjiang, where Han Chinese constitute only 37.5 percent of the total population (the rest being minority groups who do not report ages accurately), were seriously exaggerated. For this reason the nine provinces of Xinjiang, Qinghai, Ningxia, Inner Mongolia, Tibet, Gansu, Yunnan, Guizhou, and Hainan, all of which have a high proportion of ethnic minorities, are not included in this study. While we are sure that the quality of age reporting is very poor in Xinjiang, it is not certain that the quality is bad for all other ethnic minority groups in the other eight provinces. We did not include them because we are not sure about the quality of age reporting of the ethnic minority groups in these provinces, we had no detailed age-ethnic–specific data with which to evaluate them, and we faced funding constraints.

How accurate is the age reporting in the 1998 baseline survey, which included some minority ethnic groups (about 7 percent of the sample) living in the 22 Han-dominated provinces? One way to answer this question is to evaluate the age distribution of the interviewed centenarians, including the Han and the minorities. We found that the age distribution of centenarians is remarkably similar to that of Swedish centenarians; the curves for the Chinese and Swedish male centenarians are almost identical (see Figure 1 in Zeng et al. 2001). This has led us to believe that age reporting in the 1998 survey is generally good.[8] The ethnic breakdown of the sample in the 1998 survey is: Han 92.8, Zhuang 4.4, Hui 1.3, Yao 0.7, Man 0.3, Korean 0.1, and Mongolian 0.03 percent. These seven ethnic groups account for 99.7 percent of the entire sample.[9]

Our conclusion is that the age reporting of the Chinese oldest old interviewees in the healthy longevity survey is generally reliable up to the age of 105. Because of suspicion about the reliability of age reporting by the so-called super-centenarians (aged 110+) and semi-super-centenarians (aged

106–109) and because of insufficient information for verification, we exclude from this article the 156 cases who self-reported an age of 106 and older.[10]

Careful evaluation of the 1998 baseline survey indicates that beyond the issue of age reporting overall data quality is also generally good. A detailed discussion of this topic is offered in Zeng et al. 2001. Some problems, however, were identified in the data set. For example, we found that the oldest old, especially centenarians, had far more difficulty answering personality-related questions than other types of questions. This is because some illiterate oldest old, especially centenarians, could not understand the questions about personality, which required them to compare themselves with a typical person of a specified disposition. Accordingly, we do not use data based on the personality-related questions, which were proven inadequate by the 1998 baseline survey. We subsequently revised these inadequate questions in our 2000 and 2002 follow-up surveys. Another weakness of the 1998 baseline survey and the 2000 follow-up survey was the lack of a comparative group of younger interviewees aged 65–79. Thus we cannot make comparisons between the oldest old and the younger elderly. We have fortunately received additional financial support from NIA, UNFPA, the China Social Science Foundation, and Peking University to include 5,000 younger interviewees aged 65–79 and 10,000 oldest old aged 80+ in our 2002 survey.

This article provides a descriptive analysis, based on the 1998 baseline survey, of the current status of the oldest old. The demographic and statistical analysis of the determinants of health dynamics, longevity, and mortality at oldest old ages will be presented in future articles using data collected in the 1998, 2000, and 2002 waves of the survey.

Demographic profile

Sex and marital status

The 1990 census data show many more oldest old females than males, and the sex ratio declines quickly after age 80. There are about 52 males per 100 females at ages 80–89, 31 at ages 90–99, and 21 at ages 100–105. A higher death rate among men than women has resulted in a highly unbalanced sex composition at oldest old ages.

Table 1 shows the percent distribution by marital status of male and female oldest old persons in rural and urban areas, according to the 1998 baseline survey. The percent of currently married female oldest old is much lower than that of males in both rural and urban areas. Thus 4.1 percent of female nonagenarians and 0.8 percent of female centenarians had a coresiding spouse, in contrast to 29.1 and 13.0 percent among their male counterparts. Urban male oldest old are much more likely to live with a spouse than their rural counterparts, and the rural–urban difference is statistically highly significant.[11] At ages 80–89, urban female oldest old were more likely

TABLE 1 Distribution of the oldest old persons in China according to marital status, by age, sex, and rural–urban residence (percent)

	Rural			Urban			Total		
	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Ages 80–89									
Currently married	49.0	13.9	31.6	55.8	18.3	37.2	52.0	15.9	34.1
Divorced	0.7	0.4	0.6	1.4	0.1	0.8	1.0	0.3	0.7
Widowed	47.7	85.2	66.3	40.2	81.1	60.4	44.3	83.3	63.6
Never married	2.6	0.4	1.5	2.7	0.5	1.6	2.6	0.5	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Currently married	26.9	4.1	14.0	32.8	4.2	16.5	29.1	4.1	15.0
Divorced	0.6	0.3	0.4	0.4	0.3	0.4	0.5	0.3	0.4
Widowed	70.8	95.6	84.8	63.9	94.2	81.2	68.2	95.1	83.4
Never married	1.7	0.1	0.8	2.9	1.3	2.0	2.1	0.5	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Currently married	10.3	0.8	2.7	18.9	0.6	4.7	13.0	0.8	3.3
Divorced	0.9	0.4	0.5	2.8	1.0	1.4	1.5	0.6	0.7
Widowed	86.9	98.7	96.4	76.9	96.9	92.4	83.8	98.2	95.3
Never married	1.9	0.1	0.4	1.4	1.4	1.4	1.7	0.4	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

to be married (18 percent) than their rural counterparts (14 percent), but the rural–urban difference in percentage of currently married females at ages 90–99 and 100–105 is trivial. Among nonmarried oldest old, the overwhelming majority consist of widows and widowers. The proportions of divorced male and female oldest old are extremely low (0.3–1.5 percent). The proportions of those who were never married among the male oldest old are very low: 1.7–2.6 percent; among female oldest old, the percentage is even lower, at 0.4–0.5 percent.

Four salient facts about the marital status distribution of the Chinese oldest old emerge. First, most of the oldest old, especially those at ages 90–99 and 100+, are widowed because of the high mortality of spouses at advanced ages. Second, female oldest old are much more likely to be widowed than male oldest old, mainly because of sex differentials in mortality. Third, the likelihood of being widowed is significantly higher in rural areas than in urban areas because of rural–urban differentials in mortality and remarriage rates. Fourth, the extremely low proportions of never married or divorced among the Chinese oldest old persons reflect the universal and stable marriage pattern in traditional China.

Living arrangements and parent–child proximity

Table 2 presents data on the living arrangements and parent–child proximity of the oldest old in the 22 surveyed provinces. A large majority of the oldest old women (68–88 percent) and men (59–83 percent) aged 80–105 live with their children (children include grandchildren hereafter). The higher the age, the higher the proportion of the oldest old living with their children. Female oldest old of all age groups are more likely to live with their children because they are more likely to be widowed and economically dependent. About half of the oldest old live in family households of three or more generations. In the cultural context of Chinese society, multigenerational family households are the dominant living arrangements for the oldest old.

The proportion of oldest old men who live with only their wife is 24 percent at ages 80–89 and declines quickly to slightly less than 4 percent at ages 100–105. In contrast, among women, 6.5 percent of octogenarians, 1.2 percent of nonagenarians, and 0.07 percent of centenarians live with only their husband. The proportion not living with a spouse (including those living with a child but without a spouse present) increases steeply with age because of high rates of widowhood at oldest old ages. Around 10 percent of Chinese oldest old men live alone; the corresponding figures for oldest old women are higher at ages 80–99, but almost the same after reaching age 100. Female octogenarians and nonagenarians are more likely to live alone than their male counterparts, even though oldest old Chinese women are economically more dependent. The greater disadvantages facing oldest old women as compared with oldest old men are in evidence with respect to living arrangements.

Table 2 also gives the percentages "with child close by," "no child close by," and "childless" for those oldest old who live with only a spouse or live alone. A few observations can be drawn from these data on parent–child proximity. The majority of those living with only a spouse or living alone did not have a child close by; this is the case especially for female oldest old. These figures have led us to conjecture that most of the oldest old persons who live with only a spouse or live alone do so because their children are far away, rather than because they prefer to live independently of their children. We have no detailed data on the causes affecting living arrangements, however; future research is needed. Oldest old persons living alone with no child close by are likely to encounter problems when they are sick, given that organized social services in China are not yet well developed. Since the proportion living alone with no child close by is higher among female oldest old than among males, the survey data signal that the female oldest old need more caregiving services. The proportion of oldest old living alone with no child close by decreases with age. Either elderly persons join their children when they become very old

TABLE 2 Distribution of the oldest old persons in China according to living arrangement and parent–child proximity, by age, sex, and rural–urban residence (percent)

	Rural			Urban			Total		
	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Ages 80–89									
With children	62.4	74.3	68.3	55.0	60.5	57.7	59.1	68.1	63.5
With spouse only, child close by	9.4	1.7	5.6	6.2	1.9	4.1	7.9	1.9	4.9
With spouse only, no child close by	12.8	3.2	8.0	17.6	4.9	11.3	15.0	4.0	9.5
With spouse only, childless	0.5	0.1	0.3	2.4	1.2	1.8	1.4	0.6	1.0
Alone, child close by	5.1	4.6	4.8	1.4	3.9	2.6	3.4	4.3	3.8
Alone, no child close by	3.9	10.7	7.3	4.6	8.3	6.4	4.2	9.6	6.8
Alone, childless	1.3	2.1	1.7	1.6	1.7	1.7	1.4	1.9	1.7
With others	0.9	1.1	1.0	1.4	2.6	2.0	1.1	1.8	1.4
In a nursing home	3.8	2.2	3.0	9.8	15.1	12.4	6.5	8.0	7.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
With children	73.8	82.7	78.8	65.1	76.4	71.5	70.6	80.3	76.1
With spouse only, child close by	3.6	0.3	1.7	3.3	0.0	1.4	3.5	0.2	1.6
With spouse only, no child close by	5.9	0.7	3.0	10.7	1.0	5.1	7.6	0.8	3.7
With spouse only, childless	0.7	0.0	0.3	1.0	0.6	0.8	0.9	0.2	0.5
Alone, child close by	4.1	5.2	4.7	2.1	1.9	2.0	3.4	4.0	3.7
Alone, no child close by	6.7	7.9	7.4	6.5	6.7	6.6	6.6	7.5	7.1
Alone, childless	1.1	0.6	0.8	0.6	1.6	1.2	0.9	0.9	0.9
With others	2.0	1.5	1.7	2.5	1.4	1.9	2.1	1.5	1.8
In a nursing home	2.0	1.2	1.6	8.2	10.5	9.5	4.4	4.6	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
With children	85.8	89.5	88.8	76.1	84.8	82.9	82.8	88.2	87.1
With spouse only, child close by	0.3	0.01	0.1	0.7	0.01	0.2	0.4	0.01	0.1
With spouse only, no child close by	2.5	0.05	0.5	4.2	0.07	1.0	3.1	0.06	0.6
With spouse only, childless	0.0	0.0	0.0	0.7	0.0	0.2	0.2	0.0	0.0
Alone, child close by	1.9	2.8	2.6	1.4	0.8	1.0	1.7	2.2	2.1
Alone, no child close by	3.5	4.1	4.0	2.8	2.3	2.4	3.3	3.6	3.5
Alone, childless	2.2	0.5	0.8	1.4	0.4	0.6	2.0	0.4	0.8
With others	2.5	2.4	2.4	2.1	4.1	3.7	2.4	2.8	2.8
In a nursing home	1.3	0.8	0.9	10.6	7.6	8.3	4.1	2.7	3.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

or the children join their extremely old parent(s). Such movements may need to be encouraged for the well-being of the oldest old. Finally, the proportions of the oldest old who live with only a spouse or live alone and have no living children are very low: 2.7 percent at ages 80–89, 1.4 percent at 90–99, and 0.8 percent at 100–105. Although the proportions are very low, this population deserves special attention.

As shown in Table 2, a very small proportion of the Chinese oldest old without children and without a spouse present live with other relatives or nonrelatives. Facilities for subsidized institutional care of the elderly are limited in China. Childlessness and disability are the major causes and prerequisites for application for institutionalization of elderly persons. The percentage of the institutionalized elderly is, therefore, quite low, especially in rural areas.

Oldest old men and women are far more likely to live with their children in rural areas than in urban areas. The proportion of rural oldest old who live in households of three or more generations is about 55 percent, in contrast to 42–48 percent for the oldest old in urban areas. This confirms that the multigenerational family household is more prevalent in rural than in urban areas in contemporary China.

A revealing finding is that urban oldest old are far more likely to live with daughters than are their rural counterparts. Among the oldest old aged 80+ who live with children in urban areas, the percentages of those living with a daughter are 27 for males and 29 for females, while the corresponding rural percentages are 12 for males and 10 for females (these data are not included in Table 2 owing to space limitations). Most of the oldest old live with adult sons; yet, a considerable portion live with adult daughters. The striking rural–urban differentials in the proportion living with daughters demonstrate that the traditional idea of relying on sons for old-age care is much less prevalent in urban areas than in rural areas. We have no nationwide statistics to analyze the changes in proportions living with adult sons versus adult daughters among the Chinese elderly over time.[12] But we believe, on the basis of our field observations, that the traditional idea of residing with an adult son for old-age care is changing with modernization, and living with an adult daughter and her husband in urban areas tends to be increasingly acceptable. The tradition of the son's continuing the family line becomes less important in the cities; moreover, daughters may be likely to provide better care to old parents than daughters-in-law. It seems plausible to assume that traditional son preference in China may change if urbanization is accompanied by appropriate social programs that promote equality between sons and daughters.

More oldest old men and women reside with only a spouse in urban areas than in rural areas. The proportions of the oldest old who live alone are, however, higher in rural areas than in urban areas. It has been suggested that the urban elderly are more likely to prefer privacy and indepen-

dent living arrangements, and thus are more likely to live alone than their rural counterparts. But the Chinese survey data do not support this assumption. Perhaps such other factors as higher widowhood rates, lower remarriage rates, and fewer long-term-care facilities in rural areas offset the effects of rural–urban attitude differences. Another possible explanation is that some oldest old in rural areas rotate their living arrangement with their children (e.g., rotate to eat with two or more children living close by), but reported themselves as living alone.[13]

The proportions of the oldest old living in nursing homes were several times higher in urban areas than in rural areas. This is not surprising, because far fewer institutional facilities for the elderly are available in the rural areas.

Socioeconomic status

Education

Table 3 shows that 78 percent of female oldest old aged 80–89, 87 percent aged 90–99, and 94 percent aged 100–105 had no schooling at all, in con-

TABLE 3 Distribution of the oldest old persons in China according to years of schooling, by age, sex, and rural–urban residence (percent)

	Rural			Urban			Total		
	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Ages 80–89									
No schooling	39.2	86.4	62.5	19.1	68.3	43.5	30.2	78.2	53.9
1–2 years schooling	15.7	5.8	10.8	12.6	8.5	10.6	14.3	7.0	10.7
3–6 years schooling	34.3	5.5	20.1	34.8	11.2	23.1	34.5	8.1	21.5
7+ years schooling	10.8	2.2	6.6	33.5	12.0	22.9	21.0	6.6	13.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
No schooling	44.5	91.8	71.2	27.0	79.4	56.7	38.1	87.3	65.9
1–2 years schooling	18.4	4.5	10.6	14.1	7.1	10.2	16.9	5.5	10.4
3–6 years schooling	28.2	2.8	13.8	33.3	9.4	19.7	30.1	5.2	16.0
7+ years schooling	8.9	0.8	4.3	25.6	4.1	13.4	15.0	2.0	7.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
No schooling	51.1	96.3	87.5	44.1	86.0	76.4	48.9	93.5	84.4
1–2 years schooling	18.0	1.8	5.0	16.8	3.7	6.7	17.6	2.3	5.5
3–6 years schooling	25.9	1.5	6.3	19.6	7.4	10.2	23.9	3.1	7.4
7+ years schooling	5.0	0.3	1.2	19.6	2.9	6.7	9.6	1.0	2.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

trast to 30, 38, and 49 percent for their male counterparts. The proportions of oldest old females who had 0–2 years of schooling range from 85 to 96 percent, and the corresponding range for the male oldest old is 45 to 67 percent. Table 3 also indicates that the rural oldest old had a substantially lower level of education than their urban counterparts; these rural–urban differences are highly significant. Clearly, most Chinese oldest old had very little or no education, especially those in rural areas. A large majority of the female oldest old had no education, and the differences by sex are very wide.

Main source of financial support

Among the urban male oldest old 70 percent aged 80–89, 58 percent aged 90–99, and 34 percent aged 100–105 rely on pensions as their main financial resource. In contrast, only 26 percent of females aged 80–89, 10 percent aged 90–99, and 4 percent aged 100–105 had pensions as their main source of financial support (see Table 4). A very low proportion (0.6–

TABLE 4 Distribution of the oldest old persons in China according to main source of financial support, by age, sex, and rural–urban residence (percent)

	Rural			Urban			Total		
	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Ages 80–89									
Pension	15.3	4.2	9.8	70.4	25.9	48.4	40.1	14.0	27.2
Spouse	1.2	2.0	1.6	0.5	6.4	3.4	0.9	4.0	2.4
Children	71.2	84.3	77.7	18.7	52.4	35.4	47.6	69.9	58.6
Other	12.3	9.5	10.9	10.3	15.3	12.8	11.4	12.1	11.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Pension	8.9	1.4	4.6	57.8	9.9	30.4	26.8	4.5	14.2
Spouse	1.0	1.1	1.0	0.2	1.1	0.7	0.7	1.1	0.9
Children	81.4	91.2	86.9	33.5	75.9	57.7	63.9	85.5	76.1
Other	8.7	6.3	7.4	8.5	13.1	11.2	8.7	8.8	8.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Pension	3.8	0.6	1.2	34.3	3.9	10.7	13.2	1.5	3.9
Spouse	0.3	0.8	0.7	0.0	0.2	0.2	0.2	0.7	0.6
Children	84.7	89.4	88.5	52.4	84.8	77.5	74.7	88.2	85.4
Other	11.3	9.1	9.5	13.3	11.2	11.7	11.9	9.7	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: "Other" includes support from other relatives, nonrelated persons, social welfare, and the like.

4.2 percent) of the rural female oldest old had pensions, and the pension rate was also very low among rural male oldest old.[14] The majority of Chinese oldest old (except urban males aged 80–89 and 90–99) rely mainly on their children for financial support. The differences by sex and rural–urban residence in main source of financial support are striking. The female oldest old in both rural and urban areas are much more disadvantaged in terms of pension support than their male counterparts. Nevertheless,

TABLE 5 Distribution of the oldest old persons in China according to main source of care during illness, by age, sex, and rural–urban residence (percent)

	Rural			Urban			Total		
	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Ages 80–89									
Spouse	28.5	7.2	17.9	39.6	9.3	24.5	33.5	8.1	20.9
Children	63.7	84.2	73.8	43.9	68.3	56.1	54.9	77.1	65.9
Other family member	2.4	2.2	2.3	1.3	2.4	1.9	1.9	2.3	2.1
Friends	0.2	0.8	0.5	0.8	0.8	0.8	0.4	0.8	0.6
Social service	3.9	2.6	3.3	9.4	15.1	12.2	6.4	8.2	7.3
Live-in caregiver	0.2	0.5	0.4	2.3	1.8	2.0	1.1	1.0	1.1
No one	1.0	2.4	1.7	2.7	2.3	2.5	1.8	2.4	2.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Spouse	10.6	0.8	5.1	18.7	0.6	8.4	13.6	0.8	6.3
Children	81.7	93.9	88.6	67.0	82.9	76.1	76.4	89.7	84.0
Other family member	3.4	2.2	2.7	1.7	1.9	1.8	2.8	2.0	2.4
Friends	0.0	0.5	0.3	0.6	0.9	0.8	0.2	0.6	0.5
Social service	3.0	2.1	2.5	8.6	11.0	10.0	5.0	5.4	5.2
Live-in caregiver	0.4	0.0	0.2	3.4	1.9	2.5	1.5	0.8	1.1
No one	1.0	0.5	0.7	0.0	0.8	0.4	0.6	0.6	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Spouse	2.8	0.5	0.9	11.2	0.0	2.5	5.4	0.3	1.4
Children	89.7	93.5	92.8	72.7	86.1	83.1	84.4	91.5	90.1
Other family member	3.4	2.6	2.8	2.1	2.7	2.5	3.0	2.6	2.7
Friends	0.9	0.5	0.6	0.7	0.8	0.8	0.9	0.6	0.6
Social service	1.3	1.8	1.7	9.8	6.7	7.4	3.9	3.2	3.3
Live-in caregiver	1.3	0.8	0.9	3.5	3.5	3.5	1.9	1.5	1.6
No one	0.6	0.4	0.4	0.0	0.2	0.2	0.4	0.3	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

both rural oldest old males and rural oldest old females had little pension support. It is evident that Chinese society needs to pay serious attention to the sweeping sex and rural–urban disparities in pension support for oldest old persons.

Main caregivers

Table 5 shows the main caregivers for the oldest old when they are sick. About 90 percent of the male oldest old aged 80–105 reported that their main caregiver during illness was a family member (a child, spouse, or other family member). The corresponding figures for female oldest old range from 88 to 94 percent. Clearly, the family is not only the main source of financial support, but also the main caregiver in Chinese society. The percent of female oldest old whose main caregiver during illness is a child is much higher than the percent of the male oldest old, because the latter are more likely to be able to rely on a spouse: a much smaller proportion of male than female oldest old are widowed.

About 10 percent of the urban oldest old reported that their main caregiver was a social service agency; the percentage is considerably lower among the rural oldest old. About 2–3 percent of the urban oldest old have a live-in caregiver; this arrangement accounts for less than 1 percent in rural areas.

Proxy of health status

Measurement of activities of daily living (ADL) is an indicator of an individual's functional capacity, a reasonable proxy of health status, and a key element in attempts to measure quality of life (e.g., Katz et al. 1983; Spitzer 1987; Wiener et al. 1990; Gillen et al. 1996; Muldoon et al. 1998). ADL is closely related to caregiving needs (e.g., Branch et al. 1988; Fredman, Droge, and Rabin 1992; Slivinske, Fitch, and Wingerson 1998), and it has implications for public policy concerning the health care use of older adults (Wolinsky et al. 1996).

Numerous studies have shown that self-rated health among elderly adults is a valid measure of the respondent's objective health status (e.g., Ferraro 1980; Fillenbaum 1979) and a strong independent predictor of healthy longevity, even after the major factors for mortality and disability are statistically controlled (e.g., Liang 1986; Manton 1988; Idler and Kasl 1991; Jagger, Spiers, and Clarke 1993; Lee 2000). Medical records and clinical diagnoses of diseases for Chinese oldest old—especially for the rural majority of the population—are grossly inadequate. We therefore treat ADL status and self-rated health as two major proxy indicators of the health status of the oldest old in China.

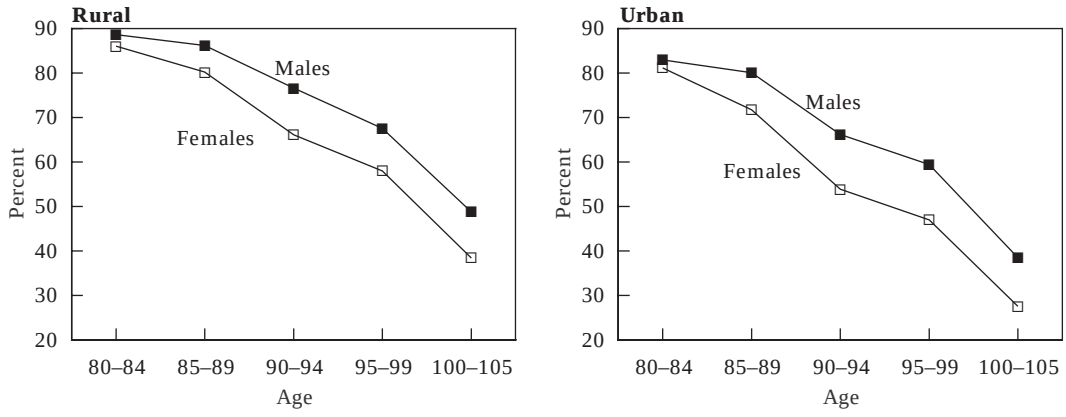
Activities of daily living

The ADL functional statuses with respect to eating, dressing, getting in and out of a bed or chair, using the toilet, bathing, and continence are used to measure the elderly's degree of independence in daily living.[15] In this study, if none of the six ADL activities is impaired, the individual is classified as "active"; if one or two activities are impaired, he or she is classified as "mildly disabled"; "severely disabled" refers to elderly who have three or more activities impaired.

In the ADL status depicted in Figure 1, three patterns are clear. First, the functional capacities in daily living decline rapidly from age 80 to age 105, especially after age 85. Our unique data set with a large sample size at extremely old ages quantitatively confirms that the individual aging process quickens and is accompanied by a substantial loss of functional capacity at advanced ages. Our data also demonstrate that the oldest old have a great need for help in daily living. Second, the ADL status of female oldest old is worse than that of their male counterparts at all advanced ages. The sex differentials are substantial in both rural and urban areas. Third, the rural oldest old, both males and females, have significantly better ADL scores at all advanced ages than their urban counterparts.

The data on proportions of mild and severe disability (not shown separately in Figure 1) also revealed the three patterns summarized above. Approximately 12 percent of oldest old males aged 80–89 living in rural areas and 19 percent of their urban counterparts are in mildly disabled and severely disabled statuses combined. The proportions of mildly disabled or severely disabled women aged 80–89 are 16 percent in rural areas and 22

FIGURE 1 Percent of Chinese oldest old classified as active according to ADL measures (no impairment in any of the six functional statuses), by age, sex, and rural–urban residence



percent in urban areas. A higher proportion in disability status, but similar patterns of rural–urban and sex differentials, are found for nonagenarians and centenarians.

Why are the oldest old in rural China more likely to be active in daily living than their urban counterparts? There are four possible explanations. First, poorer facilities may force the rural oldest old to perform daily activities by themselves; this frequent exercise may enable them to maintain their capacities for daily living longer than their urban counterparts can. This explanation may also help us to understand why the elderly in Indonesia, Malaysia, the Philippines, Singapore, and Thailand were found to be more active than the elderly in developed countries (Chen and Jones 1989; Lamb 1999: 3). A pilot study of our ongoing healthy longevity project found that the ADL functional capacity of centenarians in Beijing, Hangzhou, and Chendu was significantly greater than that of centenarians in Denmark (Wang 2001). Second, a large majority of the population in China's urban areas live in apartment buildings without elevators. It may be difficult for the oldest old who do not live on the ground floor to leave their apartments. This may reduce the amount of physical activity in which the urban oldest old engage, and thus limit their capacity for performing activities of daily living. On the other hand, almost all of the oldest old in rural areas of China live in houses with only one level. The rural oldest old are likely to continue to garden, to grow vegetables, or even to perform light labor in the fields, activities that may help them maintain their capacity for daily living. The third explanation is related to the physical environment, which is probably healthier in rural areas. Urban industrial pollution may lessen the capacity of the oldest old to manage the tasks of daily living; and the urban elderly are perhaps more likely to be sensitive to the physical environment. Fourth, the harder life and higher mortality at younger ages in rural areas may have resulted in a population of oldest old who are more selected for healthiness than their counterparts in cities and towns. As Chen and Jones (1989: 73) noted, in high-mortality populations the aged are those who have survived the high risks of infancy and childhood and the pervasive sicknesses of middle age. Selection, however, is not likely to be the major factor behind the higher ADL index of rural oldest old as compared to that of urban oldest old. Our 1998 baseline survey data show that physical performance, cognitive function, self-reported health, and life satisfaction of the rural oldest old do not differ significantly from (and may even be somewhat worse than) those of the urban oldest old, when sex, age, and education are controlled. Adaptation is perhaps the major factor in explaining the rural–urban differentials in ADL independence among the Chinese oldest old.

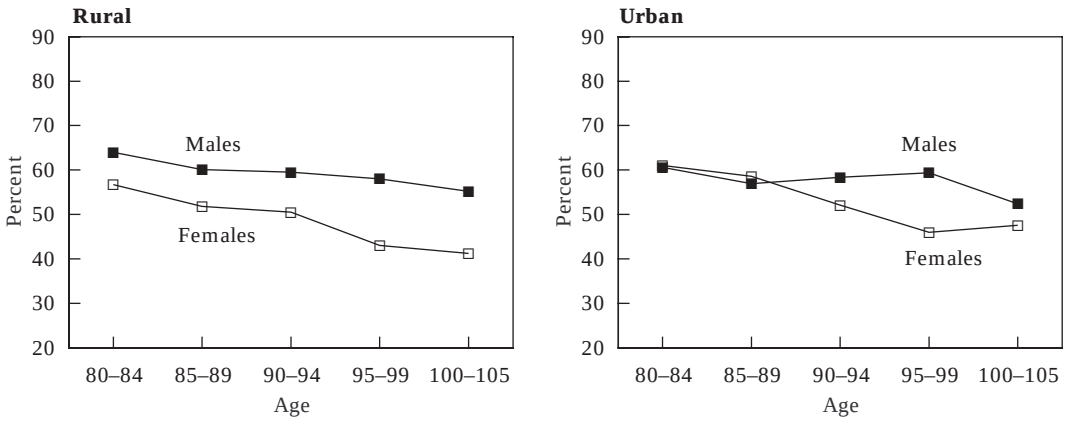
Why is the proportion of oldest old men in active status higher than that of oldest old women? Oldest old men are more likely to perform out-

door physical activities including gardening, farming, and fishing, while oldest old women are more likely to stay in the house. This gives men a better chance of maintaining their capacity for daily living. The higher socioeconomic status measured in terms of education, income, and pension and health support among Chinese oldest old males is another factor explaining the sex differentials in disability. Similar sex differentials in active status have been found in other studies as well. For example, on the basis of the data sets of the US Long Term Care Surveys (1982–94), Manton and Land (2000) found that, although women had a longer total life expectancy at age 80, men's active life expectancy at this age was 0.54 years longer. By age 85, males have a year more of active life expectancy than females. This male advantage continued to the highest age shown in the life tables.

Self-rated health

The question "How do you rate your health at present?" was addressed to each interviewee, and no proxy answers were allowed. Among males 62 percent of those aged 80–89, 59 percent of those aged 90–99, and 54 percent of those aged 100–105 (rural and urban combined) reported "good health." The corresponding percentages were 58, 50, and 43 for the female oldest old. Differences by sex among those self-reporting good health are statistically significant in rural areas; the rural female oldest old are clearly disadvantaged. In urban areas, almost the same proportion (60 percent) of male and female octogenarians self-reported good health, but the proportions self-reporting good health among male nonagenarians and male centenarians are higher than those of their female counterparts by 7.0 and 4.8 percentage points (see Figure 2). The male oldest old in China not only do better in activities of daily living, but also

FIGURE 2 Percent of Chinese oldest old self-reporting good health, by age, sex, and rural–urban residence



are more likely to report good health. The female disadvantage is clearly demonstrated in self-rated health.

The rural–urban differences in self-reported health are not statistically significant, except in the case of female centenarians. In contrast to the sharp decline in measures of ADL, the proportion of oldest old who reported good health declines slightly or moderately with increased age, especially among males, in both rural and urban areas. Analysis by Zeng and Vaupel (2002) based on the same data set has shown that the proportion reporting satisfaction with current life remains almost unchanged from ages 80–84 to 90–94 and then declines slightly thereafter. Our findings are consistent with other studies showing that the elderly tend to rate their health and life satisfaction positively (e.g., Ferraro 1980; Fillenbaum 1979; Myles 1978). Ferraro (1980) also found that the oldest old among those aged 75 years and older expressed an especially positive view of their own health. As discussed earlier, the uniqueness of our study is its large sample size for centenarians, nonagenarians, and octogenarians in a developing country; it confirms that exceptionally long-lived people are likely to consider their health to be good and view their life as satisfactory, relatively independently of their capacities to perform daily activities. These findings suggest that a positive view of one's health and current life is associated with longevity.

Concluding remarks

Based on the unique data set collected in the 1998 healthy longevity baseline survey, this study provides a demographic, socioeconomic, and health portrait of the oldest old in China, a subpopulation that is growing very quickly and is likely to need assistance from programs organized by government. As compared to their urban counterparts, the rural oldest old are disadvantaged in many respects: extremely limited pension support is available to them; they are far less educated; and they are more likely to be widowed and to rely on their children for support. Although fertility in China is higher in rural areas, aging problems will be more serious in rural China because of the continuing massive rural-to-urban migration in which young people predominate. The anticipated challenges of more serious aging problems in rural areas and the disadvantages of the rural oldest old in sociodemographic status, pension support, financial support, and health services deserve further careful studies for sound policy formulation.

The 1998 baseline survey data have shown that a large majority of the Chinese oldest old live with their children (including grandchildren). Given the Chinese cultural and socioeconomic context, the benefits of coresidence with children for the majority of the Chinese elderly include both financial

and material support and psychological satisfactions (Lin 1995: 141). Filiality has been one of the cornerstones of Chinese society for thousands of years and is still highly valued. Filiality entails not only respect for older generations but also the responsibility of children to care for their elderly parents. Families have played and should continue to play crucial roles in providing psychological and material support and in bearing the costs of caring for the elderly. At the same time, Chinese society needs to make the development of old-age insurance, social security, and various service programs for the elderly a priority in both rural and urban areas. Family support from offspring will shrink as a result of rapid fertility reduction and the increased mobility of children.

Our data demonstrate that, on average, the female oldest old in China are seriously disadvantaged in every respect save sheer survival itself. Oldest old women are much more likely to be widowed; they are economically more dependent and are less likely to use long-term-care facilities; and they are less educated and more likely to be disabled and in poor health status, as compared with their male counterparts. Other studies conducted in China (e.g., Yu et al. 1989; Woo et al. 1996; Wang et al. 2000) and elsewhere (e.g., Andersen-Ranberg et al. 1999; Pi, Olive, and Esteban 1994) have also demonstrated that elderly women are more likely than elderly men to be disabled. Any long-term-care service programs sponsored by China's government should take into account the disadvantaged status of elderly women, especially oldest old women. Careful attention should also be given to ensuring that any old-age insurance and service programs being developed or reformed benefit older women and men equally.

APPENDIX Distribution of the 1998 baseline healthy longevity survey by age, sex, and rural–urban residence

	Rural			Urban			Total		
Ages	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
80–84	516	492	1,008	464	451	915	980	943	1,923
85–89	456	457	913	332	328	660	788	785	1,573
90–94	461	542	1,003	298	323	621	759	865	1,624
95–99	374	539	913	183	315	498	557	854	1,411
100–105	320	1,318	1,638	143	493	636	463	1,811	2,274
Total	2,127	3,348	5,475	1,420	1,910	3,330	3,547	5,258	8,805

NOTE: There were 156 interviewed centenarians aged 106 and above and 112 interviewed elderly aged 78–79 in the survey. These were not included in the analysis reported in this article. The total sample size of the 1998 baseline survey was 9,073.

Notes

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1 This is calculated on the assumption that life expectancy in China (defined in the UN projections as including Taiwan but excluding Hong Kong and Macao) for both sexes combined will gradually increase from 70.5 years in 2000 to 79.0 at midcentury. This is a rather conservative assumption, given that life expectancy for both sexes combined in Japan in 2000 was already 81 years (United Nations 2001a).

2 Medium fertility assumes that the Chinese total fertility rate will gradually increase from about 1.8 births per woman in 2000 to 1.9 in 2050 (United Nations 2001a).

3 There are 31 provinces in total in China.

4 We obtained the lists of names and addresses of the centenarians through the Chinese local aging committees network and assigned a code number to each of them. For centenarians whose code number ended with 0, 1, 2, 3, …, 9, we tried to find a nearby octogenarian aged 80, 81, 82, 83, …, 89, and a nearby nonagenarian aged 90, 91, 92, 93, …, 99. The sex of the octogenarians and nonagenarians to be interviewed was randomly determined with a target of approximately equal numbers of males and females at each age from 80 to 99. If the enumerator could not find (through the urban neighborhood committee or village residents committee, which have household registration records) a subject with the predefined age and sex, an alternative subject of the same sex and in the same five-year age group (80–84, 85–89, 90–94, 95–99) was selected.

5 Coale and Kisker (1986) identified Austria, Belgium, Czechoslovakia, Denmark, England, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, New Zealand, Scotland, Sweden, Switzerland, and Taiwan as countries or regions with good data.

6 Coale and Kisker (1986) identified Bolivia, Costa Rica, El Salvador, Guatemala, Honduras, Malaysia, Mexico, Panama, Peru, Philippines, Sri Lanka, and Thailand as countries with poor data.

7 According to the Han Chinese cultural tradition, the precise date of birth is significant in making a decision on such important life events as marriage matchmaking, date of marriage, and date to start building a house.

8 Single-year age-specific death rates are about 0.5 at ages 100 and older. Such extremely high mortality rates have dominated the shaping of the age distribution of centenarians, which means that the effects of differences in cohort sizes are minor. Therefore, the age distributions of centenarians in European and Japanese populations, which have high data quality, look very much alike.

9 Indexes of the quality of age reporting for these seven groups, based on the 1982 and 1990 census data, all indicate "very good" quality according to the standard set up by the United Nations (see Zeng et al. 2001: Table 1).

10 The number of people aged 106 and older is small, and age misreporting for even a small number of persons can seriously distort the data at these exceptionally old ages. Using a hypothetical numerical example, Wang et al. (1998) illustrated why the tenuous validity of age reporting at age 106 and older may not be inconsistent with our conclusion that age reporting for Han Chinese centenarians aged 100–105 appears to be of good quality.

11 The terms "statistically significant" and "statistically highly significant" used in this article refer to Pearson Chi-square statistical tests

for sex and rural–urban differentials at the 5 percent ($p<0.05$) and 1 percent ($p<0.01$) significance level.

12 In the Chinese 1990 and 1982 censuses, householders' children and children's spouse were coded in one category, "children," making it impossible to distinguish between married sons and married daughters who live with their parents.

13 We thank Peng Xizhe (personal communication) for proposing this "rotation" explanation based on his field observation in rural areas.

14 In China, a pension system was introduced in 1952 but it supports only employees of state-owned enterprises in urban areas; its coverage now includes about 140 million persons (Poston and Duan 2000: 721). Farmers in rural areas do not have a retirement pension, but continue to work until their health fails. In general (with extent depending on location), the "Five Guarantees" of food, clothing, shelter, medical care, and a funeral are provided by the local community/government for elderly persons who are childless and who lack other close relatives to rely on (ibid.).

15 Based on the international standard of Katz's ADL index (e.g., Katz et al. 1970) and adoption to the Chinese cultural/social context and carefully tested by pilot studies/interviews, six questions about ADL functional statuses (can do it, or can do it but needs assistance, or cannot do it) were addressed to the oldest old or a close family member if the elderly individual was not able to answer the questions. "Eating" refers to feeding oneself; "dressing" refers to getting clothes and getting dressed, including tying shoes; "transferring" refers to getting in and out of bed and in and out of a chair; "using the toilet" refers to going to the toilet and cleaning oneself afterward; "bathing" refers to a sponge bath, shower, tub bath, or washing the body with a wet towel; "continence" refers to control of urination and bowel movement.

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