Journal of Social Issues, Vol. 58, No. 4, 2002, pp. 733–748

Functional Capacity and Self-Evaluation of Health and Life of Oldest Old in China

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This study is based on survey data from a sample of 8,805 elders aged 80–105 in 22 provinces of China. Rural oldest old are significantly more active in daily living than urban oldest old; adaptation is perhaps the major explanation of this difference. Female oldest old are seriously disadvantaged in functional capacities and self-reported health as compared with their male counterparts. Percentages of being active in daily living, having good physical performance, normal cognitive function and well-being drop dramatically from age 80–84 to 100–105. Proportion reporting satisfaction in current life, however, remains almost constant from age 80–84 to 90–94 and declines slightly afterwards. This may suggest that being more positive in self-feeling of life is one of the secrets of longevity.

The population of China, the most populous country in the world with nearly 1.3 billion people in 2000, is aging at an extraordinarily rapid speed and to a large scale. The proportion of elderly aged 65 and above of the Chinese population was 5.6% in 1990 and 7.0% in 2000. However, this proportion will climb quickly to

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This article is based on data derived from the 1998 Chinese Healthy Longevity Survey, which was supported by NIA/NIH grant P01 AG 08761 awarded to Duke University and the Chinese matching resources of personnel costs and some local expenses. The Max Planck Institute for Demographic Research provided support for international training. We sincerely thank the strong support provided by Peking University, China National Research Center on Aging, and the Aging Committees Network. We are very grateful to all interviewers and interviewees who were involved in the project. Without their efforts and collaboration this nationwide project would never have been conducted. We thank Wang Zhenglian for her excellent research assistance. The authors' research reported in this article was supported by NIA grant P01 AG 08761.

about 16% and 23% in 2030 and 2050, respectively, under medium fertility and medium mortality assumptions (United Nations, 2001a, 2001b).

It is common knowledge worldwide that oldest old persons aged 80 and above are most likely to need help, and most of the younger elderly aged 65 to 79 are relatively healthy. Oldest old persons consume amounts of services, benefits, and transfers far out of proportion to their numbers. For example, in New York City, about a quarter of Medicare payments to hospitals were on behalf of the oldest old patients in 1988 (Suzman, Manton, & Willis, 1992: 6). According to a German study, 1.7%, 3.2%, 6.2%, 10.7%, and 26.3% of the elderly age 65–69, 70–74, 75–79, 80–84 and 85+, respectively, regularly need health care services (Schneekloth, Pottoff, Piekara, & Rosenbladt, 1996). Most oldest old persons are widows or widowers and need much support.

There were about 7.7 and 11.5 million oldest old in China in 1990 and 2000, but the number of oldest old will climb rapidly to about 27, 64, and more than 100 million in the years 2020, 2040, and 2050, respectively, under the medium mortality assumption. The average annual increase rate of the oldest old between 2000 and 2050 will be 4.4%, in contrast to 2.4% of the overall elderly population aged 65+, and 0.3% of the total population of China during the same period. The percent share of the oldest old among the elderly population in 2050 will be 2.3 times as high as that in 2000 (United Nations, 2001b). The demographic driving force of the extremely rapid increase of the oldest old in China is that baby boomers, those born in the 1950s and 1960s, will become the oldest old after 2030.

Note that China is not alone with respect to the extremely rapid increase of oldest old people. In almost all Western countries and in many other developing countries, the oldest old sub-population is growing much faster than any other age group. For example, according to the most recent United Nations population projection, the average annual increase rates of oldest old persons aged 80+ between 2000 and 2050 would be around 4.4% in China, India, and Mexico, and 2.2–2.8% in Canada, Japan, the United States, Germany, and France (United Nations, 2001). In contrast, the annual increase rate of the total elderly population age 65+ in the Western countries is around 1%, and between 2.1 to 2.7% in the above-mentioned developing countries.

Obviously, the oldest old sub-population is growing much faster than any other age group, and they are the most likely to need help. These factors suggest a need to investigate the factors affecting the health and well-being of the oldest old. However, this topic, and indeed more general study of the oldest old sub-population, has received little attention. In some countries, notably in the United States, efforts have been made to attract academic and policy attention to oldest old people (Suzman et al., 1992). Elsewhere in the world, however, little attention has been paid to ensure sufficient representation of the oldest old in national surveys (Grundy, Bowling, & Farquhar, 1996: 144). As summarized by Grundy et al. (1996: 143), most of the elderly studies in the developed countries include few or

no subjects aged 80 and over and few or no report results for the oldest old group. In almost all developing countries, very little is known about the oldest old, and all national surveys have not had a large enough sub-sample size to represent the oldest old population. For example, the largest Chinese survey on support systems for the elderly, conducted by China Research Center on Aging in 1992, interviewed 20,083 elderly persons aged 60+. Among them, only 470 persons were aged 85 and above. Obviously, the sub-sample size for the oldest old in the 1992 survey is insufficient for sound scientific analysis.

To fill in the data gap and gain a better understanding of demographic and socioeconomic conditions, the health status and caregiving needs of the oldest old population, a large longitudinal survey research project on determinants of healthy longevity of oldest old aged 80+ has been conducted in China since 1998. Based on relevant and unique data collected in the first wave of our healthy longevity survey conducted in 1998, this article intends to shed light on some important aspects of well-being and quality of life of the oldest old in China.

Method and Data

The World Health Organization reported in 1995 the completion of pilot work on a 100-question form on quality of life (WHOQOL), based on a broader conception of health as "a state of complete physical, mental, and social well-being, not merely the absence of disease." The WHOQOL consists of six main sections including physical health, psychological health, level of independence, social relations, environment, and spirituality (Orley, 1995). Kahneman, Diener, and Schwarz (1999) propose five conceptual levels as relevant for research on well-being: (a) External ("objective") conditions (e.g., income, neighborhood, housing), (b) Subjective well-being (e.g., self-reports of satisfaction/dissatisfaction), (c) Persistent mood level (e.g., optimism/pessimism), (d) Immediate pleasures/pains and transient emotional states (e.g., joy, anger), (e) Biochemical, neural bases of behavior. It is, however, impossible to collect all the information related to quality of life and well-being (as proposed in WHOQOL and Kahneman et al., 1999) in a single survey. We will thus be able to deal with only some main aspects of the well-being and quality of life of the oldest old in China through presenting a descriptive analysis on functional capacities and self reported health and life in this article. We wish to indicate that the phrase "well-being" used in this article is an approximation of the well-being and quality of life of the oldest old Chinese persons.

As mentioned earlier, previous large demographic survey studies on elderly proportionally sampled elderly persons age 60+, which resulted in a too small sub-sample size at oldest old ages, especially 90–99 and 100+. The first wave of the Chinese longitudinal survey on healthy longevity conducted in 1998, which is the main data resource of this article, tried to overcome these limitations. The

survey was conducted in a randomly selected half of the counties and cities of the 22 provinces where Han Chinese people are the overwhelming majority. The 22 provinces are: Liaoning, Jilin, Heilongjiang, Hebei, Beijing, Tianjing, Shanxi, Shaanxi, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shangdong, Henan, Hubei, Hunan, Guangdong, Guangxi, Sichuan, and Chongqing. The survey covered 985 million, 85.3%, of the total population in China.

The survey tried to include all centenarians who voluntarily agreed to participate in the survey in the randomly selected counties and cities of the 22 provinces. For each centenarian, the survey tried to match and interview one nearby octogenarian (aged 80–89) and one nearby nonagenarian (aged 90–99) with pre-designated age and sex, if possible. The idea was to have approximately equal numbers of male and female octogenarians and nonagenarians at each age from 80 to 99. The survey thus over-sampled extremely old persons and over-sampled male oldest old, given the fact that there are fewer persons at more advanced ages, and fewer males than females.

The sample analyzed in this article consists of 8,805 oldest old aged 80 to 105 living in private households (the largest majority) or institutional households (very small proportion). Among this total, there are 1,768 male and 1,728 female octogenarians age 80–89, 1,316 male and 1,719 female nonagenarians age 90–99, 463 male and 1,811 female centenarians age 100–105. We did not follow the procedure of proportional sampling in order to avoid a too small sub-sample size at more advanced ages, especially for males. Consequently, appropriate weights should be used to compute the overall average and the averages of the age groups (e.g., 80–89 and 90–99), but no weights are needed when computing average for the centenarians. The method for computing the age-sex and rural-urban specific weights and the discussions are presented in Appendix A of another article (Zeng, Vaupel, Xiao, Zhang, & Liu, 2001).

Extensive questionnaire (92 questions on 180 items) data including demographic, family households, activities of daily living (ADL), physical performance, Mini-Mental State Examination (MMSE), lifestyle, diet, psychological characteristics (disposition), economic resource, family support, and medical care services were collected.

Coale and Li (1991) concluded that the age reporting of oldest old persons in most provinces of China, where Han Chinese who know, precisely, their birth date constitute the majority, was as reliable as that in the developed countries. But in some regions where the majority or a significant proportion of the population belongs to other ethnic groups than Hans, the age reporting is inaccurate. This is exactly the reason why we restrict our survey to the 22 provinces where Han Chinese people are the overwhelming majority. A recent study focusing on age validation of Chinese Han centenarians through rigorous comparison of the demographic indices of the age reporting with Sweden, Japan, France, and Italy is consistent with Coale and Li's findings (Wang, Zeng, Jeune, & Vaupel, 1998).

A fairly close similarity of age distribution between centenarians interviewed in our 1998 survey and Swedish centenarians has been found (see Figure 1 in Zeng et al., 2001), and it leads us to believe that age reporting in our 1998 survey is generally good. A careful data quality evaluation (such as reliability coefficients, factor analysis, the rates of logically inconsistent answers, etc.), has shown that the data quality of our 1998 survey is generally good (see Zeng et al., 2001, for more detailed information).

Results

Activities of Daily Living

Based on the international standard of Katz' ADL index (e.g. Katz, Downs, Cash, & Grotz, 1970) and adaptation to the Chinese context, data on ADL functional statuses of eating, dressing, transferring, using the toilet, bathing, and continence were collected in the 1998 healthy longevity survey. "Eating" refers to feeding self; "dressing" refers to getting clothes and getting dressed, including tying shoes; "transferring" refers to getting in and out of bed as well as in and out of a chair; "using the toilet" refers to going to the toilet and cleaning afterwards; "bathing" refers to sponge bath, shower, tub bath, or washing the body with a wet towel; "continence" refers to control of urination and bowel movement. If none of the six ADL activities is impaired, the elder is classified as "active"; if one or two activities are impaired, the elder is classified as having "mild disability"; "severe disability" refers to those elders who have three or more activities impaired.

Proportional distributions of the active and disability status of the oldest old persons classified by sex, age, and rural-urban residence are presented in Table 1. Approximately 88.2%, 7.6%, and 4.3% of the oldest old men aged 80–89 living in rural areas are in active, mild disability and severe disability statuses, respectively. The corresponding figures for the urban male oldest old are 81.5%, 12.7%, and 5.8%. The proportion of active, mildly disabled, and severely disabled status for the women aged 80–89 living in rural areas is 84.5%, 9.1%, and 6.5%, respectively. The corresponding figures for their urban counterparts are 78.6%, 15.9%, and 5.5%.

A lower proportion of active status, but similar patterns of rural-urban and gender differentials, are found for the nonagenarians and centenarians. About 75.5% and 64.9% of the rural male and female oldest old aged 90–99, respectively, are in active status. The corresponding figures for male and female oldest old persons in urban areas are 65.4% and 52.9%. About 48.6% and 38.5% of the rural male and female centenarians aged 100–105, respectively, are in active status. The corresponding figures for urban male and female centenarians are 39.2% and 27.8%. The rural-urban differences are statistically significant for male and female oldest old aged 80–89, 90–99, and 100–105, all at a level of $p < 0.001$, except male

Table 1. The Percentage Distribution of Activities of Daily Living (ADL)

	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ages 80–89									
Active	81.45	78.56	79.67	88.17	84.45	85.87	85.65	82.24	83.55
Mild disability	12.73	15.92	14.69	7.55	9.07	8.49	9.49	11.64	10.82
Severe disability	5.81	5.52	5.64	4.28	6.48	5.64	4.86	6.12	5.64
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Ages 90–99									
Active	65.38	52.92	56.26	75.49	64.91	67.86	71.42	59.93	63.08
Mild disability	21.17	28.92	26.84	12.13	17.56	16.05	15.77	22.28	20.49
Severe disability	13.45	18.16	16.90	12.38	17.53	16.09	12.81	17.79	16.42
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Ages 100–105									
Active	39.24	27.77	29.99	48.62	38.51	41.42	45.67	33.81	36.77
Mild disability	30.86	31.60	31.46	22.35	22.05	22.13	25.03	26.23	25.93
Severe disability	29.91	40.62	38.55	29.03	39.45	36.45	29.31	39.96	37.31
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

centenarians at a level of $p < 0.063$. The gender differences are all statistically significant for rural and urban oldest old aged 80–89, 90–99, and 100–105, except the urban octogenarians (if no specification, the statistical significance level is at $p < 0.05$ in this article).

We depict, in Figure 1, the age pattern of percentage distribution of functional capacity and self-evaluation of health and life of oldest old classified by 5-year age groups. The percent of active status in daily living declines quickly after age 80, especially after ages 85–89. The four curves (not shown in the figure

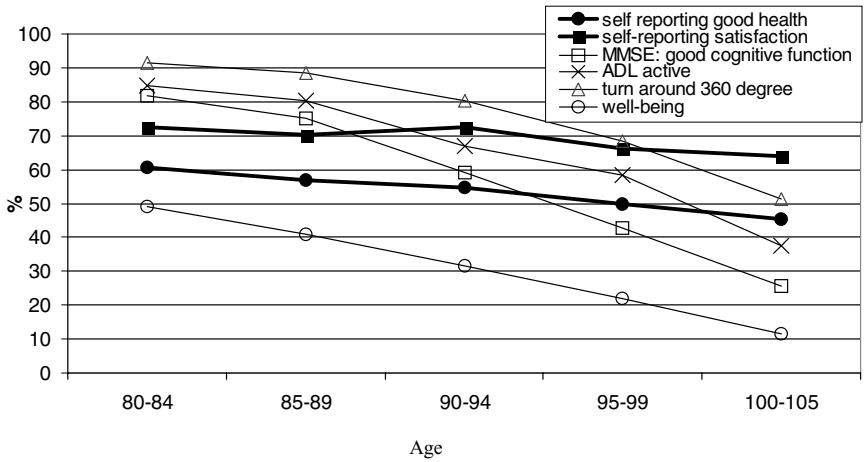

Fig. 1. Age pattern of functional capacity and self-evaluation of health and life of oldest old in China.

due to space limitations) of percent of rural-urban and male-female oldest old persons who are active in daily living are almost parallel, and the percent of rural oldest old is substantially higher than that of urban oldest old. The male curve for rural and urban areas combined is substantially above the female curves, except at age 80–84. It is interesting to note that the gender and rural-urban differences are larger for the nonagenarians and centenarians than for the octogenarians.

Physical Performance

The ADL functional statuses based on the questionnaire inquiries concerning eating, dressing, transferring, using the toilet, bathing, and continence are basically subjective measurements, which have been proven useful in measuring functional capacity in daily living and service needs by numerous previous studies. Some investigations even indicated that ADL is useful in predicting mortality (e.g., Scott, Macera, Cornman, & Sharpe, 1997). However, ADL may not always accurately measure oldest old persons' actual capacity in physical performance. As to be discussed later, for example, adaptation to poor service facilities in rural areas may result in better ADL capacity among rural oldest old than that of their urban counterparts, but the rural oldest old may not necessarily be stronger in physical health. Some oldest old people may feel ashamed to admit difficulties in some daily activities such as continence. Therefore, we conducted three objective examinations to measure oldest old subjects' physical performance: standing up from a chair; picking up a book from the floor; turning around 360° without help.

We found that oldest old men perform the objective examination of turning around 360° significantly better than the oldest old women did (see Table 2), and

Table 2. The Percentage Distribution of Turning Around 360°

	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ages 80–89									
Yes, <=10 steps	80.71	72.54	76.65	82.74	72.50	77.67	81.83	72.52	77.21
Yes, >10 steps	9.92	16.65	13.26	9.93	17.77	13.81	9.92	17.27	13.57
Not able	9.37	10.80	10.08	7.33	9.73	8.52	8.25	10.21	9.22
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Yes, <=10 steps	59.11	53.81	56.06	68.13	55.54	61.06	64.86	54.89	59.22
Yes, >10 steps	23.32	19.46	21.10	14.70	20.73	18.09	17.82	20.26	19.20
Not able	17.58	26.73	22.83	17.17	23.73	20.85	17.32	24.85	21.58
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Yes, <=10 steps	39.86	24.54	28.01	46.84	28.99	32.45	44.66	27.78	31.21
Yes, >10 steps	23.08	21.47	21.84	22.47	18.87	19.57	22.66	19.58	20.20
Not able	37.06	53.99	50.16	30.70	52.14	47.98	32.68	52.64	48.59
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

that the rural-urban differences are mostly minor and not statistically significant (see Table 2).

The urban oldest old persons tend to physically perform standing up from a chair without using hands and picking up a book from a floor slightly better than or almost the same as their rural counterparts do (figures not presented in Table 2 due to space limitations, but available upon request). The rural-urban differences in physical performance are mostly not statistically significant. Although urban oldest old have significantly worse ADL scores, their physical health may be at least as good as that of the rural oldest old, as shown by our objective examinations data.

Mini-Mental State Examination

The mental state of Chinese oldest old was screened by the Chinese version of Mini-Mental State Examination, which was culturally translated and adapted into the Chinese language based on the international standard of MMSE questionnaire, and carefully tested by our pilot survey interviews. The Chinese version of MMSE tries to meet the cultural and socioeconomic conditions among the oldest old persons in China to make the questions easily understandable and practically answerable if the subject's cognitive function is normal. For example, in the orientation part, we asked, "What is the animal year of this year?" This question is much better than asking what the Western calendar year is, since the non-educated oldest old persons living in rural areas may not know the Western calendar. Instead of asking the subjects to read and write a sentence, we asked the subjects to give the name of as many foods as they could. We also simplified the question on calculation. This is because the majority of Chinese oldest old have no education. The total score of MMSE is 30; the methods of determining the score for each item of the orientation, registration, attention, calculation, recall, and language are the same as the international standard. We also use the same cutoffs of the MMSE international standard to define a score of 24+ as "Good," 21–23 as "Moderate," and < 21 as "Poor" for measuring the cognitive function (see, e.g., Deb & Braganza 1999; Osterweil, Mulford, Syndulko, & Martin, 1994).

For the rural and urban sectors combined, about 85.8%, 69.0%, and 40.6% of male octogenarians, nonagenarians, and centenarians are in "good" cognitive functional status (MMSE score is 24 or above). In contrast, 73.8%, 46.5%, and 21.7% of female oldest old aged 80–89, 90–99, and 100–105 are in "good" cognitive functional status, respectively (see Table 3). Also, Table 3 shows that, when we look at rural and urban areas separately, proportions of male oldest old who have "good" cognitive function are substantially higher than those of the female oldest old at all age groups of 80–89, 90–99, and 100–105. The gender differences are, statistically, highly significant ($p < 0.001$) for octogenarians, nonagenarians, and centenarians in both rural and urban areas. The capacity of cognitive function of the Chinese oldest old persons declines quickly with increase of age. The

Table 3. The Percentage Distribution of Scores of Cognitive Function (Mini Mental State Examination)

	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ages 80–89									
Good (score 24+)	87.24	79.07	83.19	84.57	69.41	77.08	85.77	73.77	79.83
Moderate (score 21–23)	5.33	11.83	8.55	6.53	13.80	10.12	5.99	12.91	9.41
Poor (score < 21)	7.43	9.09	8.26	8.90	16.79	12.80	8.24	13.32	10.75
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Good (score 24+)	70.03	50.88	59.07	68.43	43.97	54.64	69.01	46.54	56.27
Moderate (score 21–23)	10.46	15.21	13.18	11.21	16.46	14.17	10.94	15.99	13.80
Poor (score < 21)	19.50	33.91	27.75	20.37	39.57	31.19	20.05	37.47	29.92
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Good (score 24+)	47.55	23.77	29.16	37.42	20.90	24.12	40.56	21.68	25.53
Moderate (score 21–23)	13.99	11.89	12.36	11.64	10.83	10.99	12.36	11.12	11.37
Poor (score < 21)	38.46	64.34	58.48	50.94	68.27	64.89	47.07	67.21	63.10
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

gender gap of cognitive function among the oldest old (rural and urban combined) becomes extremely large (about 20 percentage points) at and after ages 85–89. Urban oldest old tend to have a better cognitive functional status than their rural counterparts have, but the rural-urban differences are statistically significant only among female octogenarians, female nonagenarians, and male centenarians.

Self-Reported Health

Many previous studies have demonstrated that self-assessed health acts as a significant and independent predictor of functioning and mortality of older people (e.g., Lee, 2000). About 61.6%, 59.0%, and 54.3% of the male oldest old aged 80–89, 90–99, and 100–105 (rural and urban combined) reported "good health," respectively, in contrast to the corresponding percentages of 57.6, 50.1, and 42.9 for the female oldest old (see Table 4). The gender difference is statistically significant for nonagenarians and centenarians, but is not significant for the octogenarians. The gender differences of proportion of self-reporting good health are statistically significant in rural areas; the rural female is clearly in a disadvantaged status. In the urban areas, almost the same proportion (60%) of the male and female octogenarians self-reported good health, but the proportions of self-reporting good health among the male nonagenarians and male centenarians are higher than those of their female counterparts by 7.1 and 4.9 percentage points, respectively (see Table 4). The rural-urban differences in self-reported health are not statistically significant except in the case of female centenarians.

Table 4. The Percentage Distribution of Self-Reported Health

	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ages 80–89									
Good	59.72	60.31	60.01	63.11	55.30	59.25	61.59	57.56	59.59
Moderate	30.94	30.39	30.67	29.16	34.53	31.81	29.96	32.66	31.30
Bad	8.34	8.27	8.31	6.73	8.98	7.84	7.45	8.66	8.05
Unable to answer	0.99	1.03	1.01	1.00	1.19	1.10	1.00	1.12	1.06
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Good	58.31	51.21	54.26	59.33	49.47	53.77	58.96	50.11	53.95
Moderate	32.30	32.83	32.60	31.00	34.45	32.94	31.48	33.85	32.82
Bad	6.44	11.56	9.36	6.50	10.15	8.56	6.48	10.67	8.85
Unable to answer	2.95	4.40	3.78	3.16	5.94	4.73	3.09	5.37	4.38
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Good	52.45	47.55	48.66	55.17	41.20	43.93	54.33	42.92	45.25
Moderate	30.77	26.12	27.17	27.59	33.74	32.53	28.57	31.67	31.04
Bad	5.59	7.35	6.95	6.58	9.76	9.14	6.28	9.10	8.53
Unable to answer	11.19	18.98	17.22	10.66	15.31	14.40	10.82	16.30	15.19
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The male proportions of self-reporting good health decline slightly from ages 80–84 to 85–89, then remain constant up to ages 95–99, and then decline moderately. The female proportions decline moderately from age 80–84 to 95–99 and then remain constant. Figure 1 presents the overall (rural-urban and male-female combined) age pattern of proportions of oldest old who self-reported good health. It is clear that proportion self-reporting good health among Chinese oldest old does not decline quickly with the increase of age. This is different from the age pattern of ADL and MMSE.

Self-Reported Life Satisfaction

In addition to self-rated health, we also asked, "How do you rate your life at present?" The results on self-reported life satisfaction are listed in Table 5 and its age pattern is depicted in Figure 1. About 71.8%, 72.1%, and 67.3% of the male oldest old aged 80–89, 90–99 and 100–105, respectively, reported that they were satisfied with their current life. The corresponding figures for the female oldest old are 71.7%, 71.4%, and 63.2%, respectively. Unlike ADL, physical performance, and MMSE, the gender differences in self-reported life satisfaction among Chinese oldest old are mostly rather small and often not statistically significant. Urban oldest old tend to report better life satisfaction than their rural counterparts do, but the rural-urban difference is not substantive.

Figure 1 shows the very interesting phenomenon that the proportion of being satisfied with current life among Chinese oldest old persons does not decline or declines only slightly with the increase of age (see Figure 1).

Table 5. The Percentage Distribution of Self-Reported Life Satisfaction at Present Time

	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ages 80–89									
Good	74.34	77.44	75.88	69.76	66.91	68.35	71.82	71.66	71.74
Moderate	22.75	19.77	21.27	26.42	28.26	27.33	24.77	24.43	24.60
Bad	1.92	2.03	1.98	2.82	3.55	3.18	2.42	2.86	2.64
Unable to answer	0.99	0.76	0.88	1.00	1.28	1.14	1.00	1.05	1.02
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Good	74.62	73.94	74.23	70.68	69.89	70.23	72.12	71.39	71.71
Moderate	20.18	18.85	19.42	22.45	19.80	20.95	21.62	19.44	20.39
Bad	1.75	3.10	2.52	3.88	4.23	4.08	3.10	3.81	3.50
Unable to answer	3.45	4.11	3.83	2.99	6.08	4.73	3.16	5.35	4.40
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Good	67.83	69.39	69.04	66.98	60.86	62.05	67.25	63.18	64.00
Moderate	19.58	11.22	13.11	21.70	20.26	20.54	21.04	17.80	18.46
Bad	1.40	0.61	0.79	1.57	3.27	2.94	1.52	2.55	2.34
Unable to answer	11.19	18.78	17.06	9.75	15.61	14.47	10.20	16.47	15.19
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Well-Being

As discussed in the introduction, the concept of well-being is complicated; it may include six sections of WHOQOL (Orley, 1995) or five conceptual levels (Kahneman et al., 1999), but we deal with only some main aspects of the well-being in this article due to limitations of space and data availability. We have thus far discussed ADL, physical performance, MMSE, self-reported health, and life satisfaction. Although ADL is basically subjective and physical performance is objective, they both measure the capacity of daily living and are highly correlated, with a correlation coefficient of nearly 0.6. Self-reported health and self-reported life satisfaction deal with the same dimension of self-evaluation on current life quality, although with different focuses. Self-reported health and self-reported life satisfaction are also highly correlated with a correlation coefficient value of nearly 0.5. We, therefore, construct a variable of well-being by including ADL (rather than physical performance) to present capacity of daily living, MMSE to measure cognitive function, and self-reported health (rather than self-reported life satisfaction) to measure self-evaluation of life quality. An oldest old person is defined as experiencing "well-being" if he or she is active (i.e., no impairment in the six daily activities), has good cognitive functional capacity (score of MMSE is 24 or above), and self-reported very good or good health. Otherwise (i.e., impairment in at least one of the ADL, MMSE, or self-reported health), he or she is defined as experiencing "not well-being."

About 52.0%, 39.4%, and 21.2% of the male oldest old aged 80–90, 90–99, and 100–109, respectively (rural and urban combined), are in the status of well-being.

Table 6. The Percentage Distribution of Well-being

	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ages 80–89									
Well-being	48.95	44.18	46.59	54.47	39.75	47.20	51.99	41.75	46.92
Not well-being	51.05	55.82	53.41	45.53	60.25	52.80	48.01	58.25	53.08
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 90–99									
Well-being	36.64	21.03	27.75	40.98	24.14	31.48	39.40	22.99	30.11
Not well-being	63.36	78.97	72.25	59.02	75.86	68.52	60.60	77.01	69.89
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ages 100–105									
Well-being	17.48	7.74	9.94	22.88	9.49	12.10	21.21	9.01	11.50
Not well-being	82.52	92.26	90.06	77.12	90.51	87.90	78.79	90.99	88.50
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In contrast, the corresponding figures are 41.8%, 23.0%, and 9.0% for the female oldest old. The proportions of well-being status among male oldest old persons are substantially higher than those of their female counterparts at various age groups in both rural and urban areas; the gender differences are statistically significant (see Table 6). The rural-urban differences in well-being are not statistically significant. Figure 1 shows that proportion of well-being among Chinese oldest old persons declines remarkably with the increase of age.

Discussion

Why are the oldest old persons in rural China more likely active in daily living than the urban oldest old persons are? There are four potential explanations. First, facilities to assist oldest old persons in their daily life are less likely to be available in rural than in urban areas. This may force rural oldest old persons to perform daily activities by themselves, and this frequent exercise may enable them to maintain their capacities for daily life for a longer time than their urban counterparts can. This explanation may also help us to understand the fact that the elderly in Indonesia, Malaysia, the Philippines, Singapore, and Thailand were found to be more active than the elderly in developed countries (Ju & Jones, 1989; Lamb, 1999: 3). A pilot study of our ongoing healthy longevity project found that the ADL functional capacity of centenarians in Beijing, Hongzhou, and Chendu was significantly better than that of Danish centenarians (Wang, 2001). The second potential explanation for the rural-urban differentials found in this study is also related to the frequency with which daily activities are carried out. In Chinese urban areas, a large majority of the population lives in apartment buildings without elevators. It may not be easy for the oldest old who do not live on the ground floor to go out of their apartments. Very few urban residents in China have their own

yard or garden. These factors may reduce the amount of physical activity that the urban elderly engage in, and thus limit their capacity for daily living. On the other hand, almost all of the oldest old persons in the rural areas of China live in houses with only one story, and they all have access to gardens and agricultural fields. The oldest old in rural areas of China are likely to continue to perform garden work, to grow vegetables or even to perform some light labor in the fields, which may help them to maintain their capacity for daily living. The third explanation is related to the physical environment, which is likely better in rural areas. Industrial pollution in the cities may worsen the capacity of daily living of oldest old persons, who are likely to be sensitive to the physical environment. Fourth, the harder life and higher mortality at younger ages in rural areas have resulted in a population of oldest old persons who are more selected than those in cities and towns. In other words, those who survive to very advanced ages in rural areas are less likely to be frail and thus more likely to be active. As Chen and Jones (1989: 73) noted, in high-mortality populations, the aged are those who have survived the dangers of being born, the risks of infancy and childhood, and the sickness and accidents of middle age. Selection, however, is perhaps not the major factor to explain the better ADL of rural oldest old as compared to that of urban oldest old, given the fact that physical performance, cognitive function, self-reported health, and life satisfaction of rural oldest old do not differ significantly (or are somewhat worse) as compared to those of the urban oldest old, while controlling for gender, age, and education. Adaptation is perhaps the major factor in explaining the rural-urban differentials in ADL independence among Chinese oldest old persons.

Based on our unique data set with a large enough sub-sample size at extremely old ages, we are confident in concluding that the female oldest old in China are seriously disadvantaged in ADL, physical performance, MMSE, and self-reported health, as compared with their male counterparts. Other studies conducted in China (e.g., Yu et al., 1989; Woo, Ho, Yuen, Yu, & Lau, 1996; Wang et al., 2000) and elsewhere (e.g., Andersen-Ranberg et al., 1999; Pi, Olive, & Esteban, 1994) also demonstrated that although women have lower mortality and they are more disabled than men; this difference is more marked with advancing age. Analyses based on the Chinese census data presented by Zeng and George (2000) have shown that elderly women are much more likely to be widowed and are more likely live alone. Elderly women are economically more dependent and are less likely to use long-term care facilities. The disadvantages of older women are substantially more serious at oldest old ages. This is an important issue, which needs serious attention from society and government. Any kind of long-term care services sponsored by the government should take into account the disadvantaged status of elderly women, especially the oldest old women, and give them favorable policy. Very careful attention should be given to ensure that any old age insurance and service programs to be developed or reformed must benefit older women and men equally.

Figure 1 shows that the percent of being active in daily living, having good physical performance, normal cognitive function, and well-being decreases dramatically from ages 80–84 to 100–105. The proportion of reporting satisfaction in current life, however, remains almost unchanged from ages 80–84 to 90–94 and then declines slightly afterwards. A similar pattern is found also in the age pattern of self-reported health: The proportion of oldest old who reported good health declines slightly or moderately with the increase in age. Furthermore, the proportion of self-reporting satisfaction in current life among oldest old women, who are seriously disadvantaged in ADL, physical performance, MMSE, and self-reported health, is almost the same as that of the oldest old men (see Table 5).

The Spearman bivariate correlation coefficients between self-reported life satisfaction and ADL, standing up from a chair, picking up a book from the floor, turning around 360° and MMSE among the Chinese oldest old interviewees aged 80–105 are rather low—0.137, 0.168, 0.172, 0.196, and 0.244, respectively. This confirms the interesting pattern depicted in Figure 1, namely, long-lived people likely view their life as "satisfactory," relatively independent of their capacities in daily activities, physical performance, and cognitive function.

Quick decline in physical abilities with age was found also in a Danish twins and centenarian study (Andersen-Ranberg et al., 1999). A longitudinal study in Berkeley, California, found that life satisfaction mostly does not decrease until advanced old age (Field & Millsap, 1991: 305). Based on a survey of 3,998 elders aged 65+ in the United States, Blazer, Burchett, Service, and George (1991) indicated that the oldest old suffer fewer depressive symptoms when other confounding variables such as age, gender, income, physical disability, cognitive impairment, and social support are taken into account. Our present findings, based on an unprecedented large data set on the oldest old population in a developing country, are consistent with these previous studies.

These findings may suggest that being more positive in self-feeling of current life is one of the secrets of longevity. Long-lived people such as nonagenarians and centenarians more likely view their life as "satisfactory," although their capacities in daily activities, physical performance, and cognitive function may not be good. The reason why long-lived people more likely view their life as "satisfactory" is that they more likely look forward positively into the future and think optimistically. The old Chinese saying "Knowing satisfaction leads to constant happiness" (Zhi Zhu Chang Le) explains the connection between life satisfaction and happiness, which may lead to longevity.

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