

Active Life Expectancy for People over 65 Years Old in a Local City in the Northern Part of Tohoku District

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Abstract

Life expectancy does not necessarily match quality of life (QOL). A cohort study involving a population of 10,107 in a certain city of Japan was conducted to evaluate active life expectancy (ALE), which has a direct relationship with QOL. The ALE that took functional recovery rates into account was 17.20 and 19.08 years for males and females respectively, at the age of 65. These values increased by 2.98 and 3.87 years for men and women, respectively, compared with when functional recovery rates were not considered. ALE may serve as an indicator for the objective evaluation of various public health services provided by local governments.

Key words: active life expectancy, quality of life, activities of daily living, Kats index, the necessary period for nursing care

Introduction

Japan is a country where many people live until an advanced age. The life expectancy for people in 1995 was 76.70 and 83.22 years for men and women, respectively¹⁾. The age when the length of one's lifetime was directly associated with health has passed. Today, quality is more important than quantity, so quality of life (QOL) has been emphasized. Therefore, longevity does not necessarily mean a high QOL. With an aging population, people over 65 are predicted to account for 32.3% of the total Japanese population in 2050; this will be the highest ratio ever experienced. Japanese society will have to collaborate with its citizens to create an active though aging population. To that end, the primary prevention of strokes, osteoporosis, etc., the postponement of the development of dementia and bed-ridden events, and the presentation of objective indicators for evaluation of the effects of such efforts are needed. Such an indicator now attracting attention is active life expectancy (ALE). ALE is a new indicator for one's lifespan incorporating QOL-related aspects. It deals with "how long one can lead a self-reliant, healthy lifestyle" compared with the conventional life expectancy that has focused simply on "how long one can live." The big difference between life expectancy and

ALE is that the end point for life expectancy is physical death while that for ALE is the loss of activities of daily living (ADL). Katz²⁾ described ALE as the estimation through life tables of a self-reliant lifespan without the need for care. Studies on ALE include one conducted in a local city in the Tohoku area³⁾ and others conducted elsewhere⁴⁻⁶⁾. The situation is similar in the USA⁷⁻¹⁵⁾. The purpose of this study was to clarify the ALE for people in a city in Aomori Prefecture, which is the prefecture with the shortest lifespan in Japan.

Subjects and Methods

An individually recorded survey was conducted twice (Fig. 1). The first survey was conducted between October and December, 1998 and the second between October and December, 1999. The first survey included 31,090 of 31,674 people aged 65 or older who lived in the city of H. in Aomori Prefecture until August, 1998 excluding those who died, moved, or were of unknown address by October of the same year. Questionnaire sheets were mailed or handed out to each participant, who was asked to return the questionnaire answer sheet after completion. If a participant was found unable to do the task, a family member or a caregiver was asked to complete the questionnaire sheet on his or her behalf. Questionnaire sheets were handed out to those participants living in nursing homes and collected after completion. The recovery rate for the first survey was 58.4% (18,148 participants). Excluding 4,295 participants whose answer sheets were incomplete and 448 participants who died within one year, the second survey was conducted with 13,405 participants. The recovery rate for the

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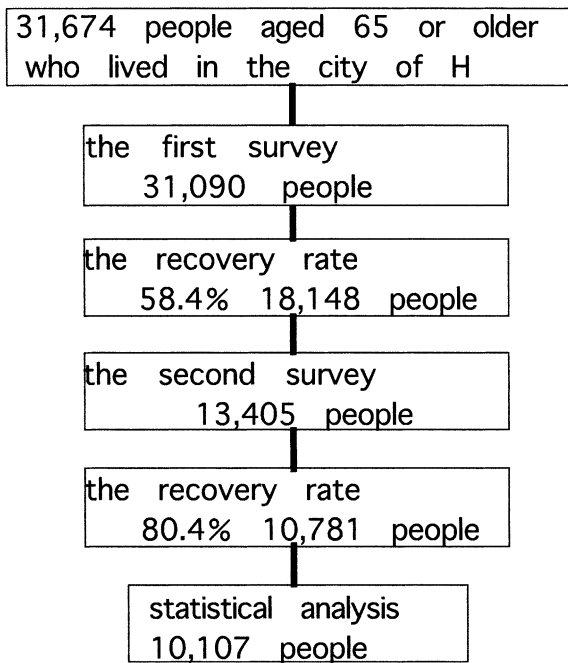


Fig. 1 The distribution of the number s of people

second survey was 80.4% (10,781 participants). Excluding 1,122 participants in the second survey whose answer sheets were

incomplete and the 448 participants who were alive during the first survey but had died during the second survey, statistical analysis was performed on 10,107 participants (Table 1).

These surveys focused mainly on the presence/absence of self-reliance with respect to ADL. The Katz index²⁾ was used to evaluate the four ADL items of taking a bath, putting on clothing, eating meals, and moving. A participant was considered self-reliant if he or she was self-reliant concerning all four of these items. ALE was calculated according to a life-table method by assuming the period when a participant was self-reliant as an active life period and through the transition probability from the state of self-reliance/care-dependence for the first and second surveys.

Results

The ratio of self-reliant persons and persons in need of care with respect to each of the four ADL items are shown in Table 2. There were no major differences in the first and second surveys. The item for which men had the highest rate of needing care was putting on clothes followed by taking baths, moving, and eating. The item for which women had the highest rate of needing care was taking baths followed by putting on clothes, moving, and eating. As shown in Fig. 2, the life expectancy calculated by the life-table method was 15.43, 8.74, and 4.04 years for men at ages 65, 75, and 85, respectively. The corresponding values for women

Table 1 Number of subjects

Gender	Age 65~69	Age 70~74	Age 75~79	Age 80~84	Age 85~	Total
Males	1,853	1,428	700	382	223	4,586
Females	1,851	1,470	953	662	585	5,521
Total	3,704	2,898	1,653	1,044	808	10,107

Table 2 Activities of daily living (ADL)

		1998						1999					
		Males	%	Females	%	Total	%	Males	%	Females	%	Total	%
bathing	No trouble performing function	4,325	94.3	4,963	89.9	9,288	91.9	4,150	95.1	4,766	90.0	8,916	92.3
	Trouble performing function	261	5.7	558	10.1	819	8.1	216	4.9	527	10.0	743	7.7
dressing	No trouble performing function	4,289	93.5	5,043	91.3	9,332	92.3	4,107	94.1	4,815	91.0	8,922	92.4
	Trouble performing function	297	6.5	478	8.7	775	7.7	259	5.9	478	9.0	737	7.6
eating	No trouble performing function	4,494	98.0	5,341	96.7	9,835	97.3	4,279	98.0	5,092	96.2	9,371	97.0
	Trouble performing function	92	2.0	180	3.3	272	2.7	87	2.0	201	3.8	288	3.0
moving	No trouble performing function	4,425	96.5	5,213	94.4	9,638	95.4	4,221	96.7	4,957	93.7	9,178	95.0
	Trouble performing function	161	3.5	308	5.6	469	4.6	145	3.3	336	6.3	481	5.0

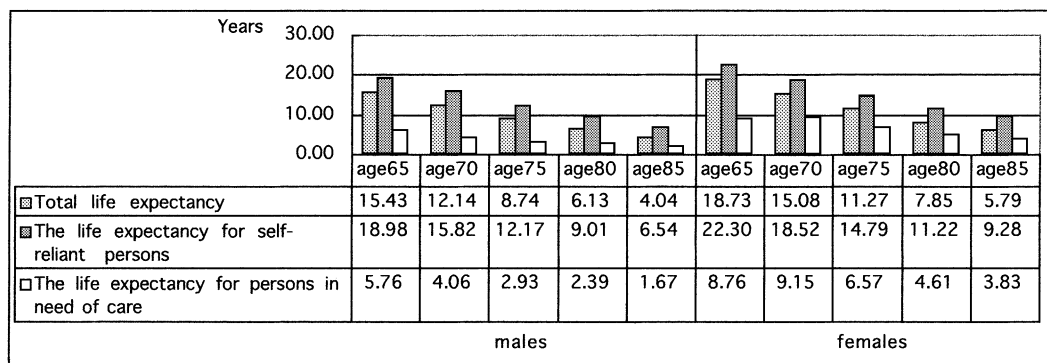
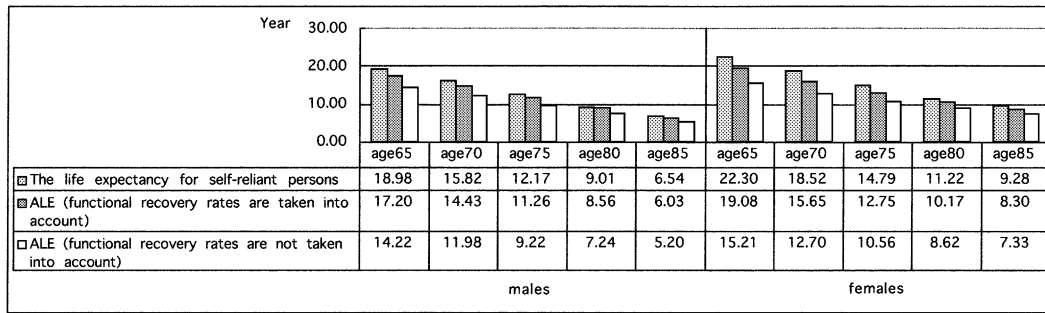


Fig. 2 The life expectancy for self-reliant persons and persons in need of care



ALE: active life expectancy

Fig. 3 The ALE as calculated by taking functional recovery rates into account or not

were all higher than these. The life expectancy for self-reliant persons and persons in need of care was then compared. The life expectancy of self-reliant persons was 18.98 years for 65-year-old men and 22.30 years for women of the same age and a longer life expectancy for women was consistent for all of the age groups. The life expectancy of persons in need of care was 5.76 years for 65-year-old men and 1.67 years for 85-year-old men. Women had a longer life expectancy regardless of age. The difference in the life expectancy for self-reliant persons and persons in need of care was 13.22 years for 65-year-old men and 13.54 years for 65-year-old women, which was almost equivalent. A similar trend was observed with other age groups. The ALE as calculated by taking functional recovery rates into account was 17.20 years for 65-year-old men and 19.08 years for 65-year-old women, as shown in Fig. 3, the functional recovery rate means the ratio of persons who had been in need of care during the first survey but that turned self-reliant by the second survey. The gender difference in ALE was not as large as that for life expectancy among self-reliant people. ALE was extended by the consideration of functional recovery rates by 2.98, 2.04, and 0.83 years for 65-, 75-, and 85-year-old men, respectively, and 3.87, 2.19, and 0.97 years for women, respectively. The difference in length for life expectancy and ALE among self-reliant people corresponded to a necessary period of nursing care. The necessary period of nursing care was estimated to be 1.78 years for 65-year-old men and 3.22 years for women; the period was twice as long for women in all age groups than for men, as shown in Fig. 4. Mortality among persons in need of care were significantly higher ($p < 0.01$) for men than for women (Table 3), but no significant differences were observed in the

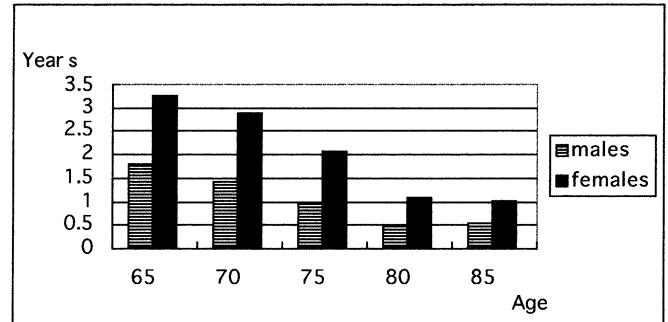


Fig. 4 The necessary period of nursing care

differences in the functional recovery rates, although mortality was significantly higher in general for men than for women at age groups of 70–74, 75–79, and over 85. The total functional recovery rate for men and women was 17.8%.

Discussion

The average life expectancy in Japan is the longest in the world, but as it continues to increase, an increasing number of older people requires care and become bed-ridden. Life expectancy is relatively short in Aomori Prefecture, but a prefecture where the average life expectancy is short does not necessarily mean having a short ALE. This study was conducted from this perspective. Since detailed calculation methods differed, however, it is not easy to compare the ALE for Aomori Prefecture with that for other prefectures. It has been revealed for the city of H. in

Table 3 Mortality and functional recovery rate among persons in need of care

	Age	persons in need of care	the person who recovered	recovery rate	death	mortality (%)
Total		1,016	181	17.8	216	21.3
Males		356	76	21.3	100	28.1
Females		660	105	15.9	116	17.6
Males	Age 65~69	72	24	33.3	8	11.1
Males	Age 70~74	80	19	23.8	17	21.3
Males	Age 75~79	69	17	24.6	22	31.9
Males	Age 80~84	65	10	15.4	20	30.8
Males	Age 85~	70	6	8.6	33	47.1
Females	Age 65~69	64	32	50.0	8	12.5
Females	Age 70~74	71	27	38.0	5	7.0
Females	Age 75~79	122	19	15.6	13	10.7
Females	Age 80~84	147	16	10.9	25	17.0
Females	Age 85~	256	11	4.3	65	25.4

chi-square test (* $p < 0.05$ ** $p < 0.01$)

Aomori Prefecture that the ALE was about 17 years for 65-year-old men and about 19 years for 65-year-old women, that is to say, they can live healthy for a further 17 and 19 years on average after they become 65 years old. This is also an important factor for the younger generation when considering their future life planning. ALE presented by Katz et al. appears to be more appropriate for use as an indicator of health than the average life expectancy⁵⁾. Katz studied a group of people who were self-reliant with respect to four types of activities of daily living: taking a bath, putting on clothes, moving, and eating. By counting people who were in need of care with respect to at least any one of these four types of activities or that died while not being self-reliant, he determined ALE using a life-table method. However, ALE is said to vary significantly depending on whether functional recovery rates are taken into account⁴⁾, so it is difficult to admit that his ALE estimation was correct since functional recovery rates were not considered in his study as in other studies conducted thus far in Japan. The present study was conducted to determine ALE using a life-table method by incorporating ADL recovery rates.

In this study, however, the rate for care needed by persons to move was lower than in other studies with Japanese subjects^{6,16,17)}. The criteria for self-reliance was whether or not a person was able to walk by themselves in the three studies cited, whereas Katz defined self-reliance as being able to get in and out of bed, sit in a chair, and stand up without the help of others. In a study in Nagano Prefecture¹⁸⁾ that used the Japanese version of the Katz index, as this study did, the rate of needing care was in descending order of bathing, clothing, movement, and eating. This was similar to the current study. Katz et al.¹⁹⁾ presumed the loss and recovery order for daily life functions as reflecting the hierarchical structure of the central nervous system. The life expectancy of self-reliant persons at age 65 was about 19 years for men and 22 years for women while that of persons in need of care was 6 years for men and 9 years for women. The difference in life expectancy in terms of self-reliance or dependence was 13 years for both genders. Although the average functional recovery rate is considered to be about 30%, a large part of the life expectancy of persons in need of care is when such persons are not self-reliant and thus in need of care. ALE was extended by 2.98 years for 65-year-old men and 3.87 years for women by taking functional recovery rates into account. Thus far in Japan, functional recovery rates have not been

used for the calculation of ALE but their use may provide more accurate estimates of ALE. As presented in Table 3, the necessary period for nursing care for women was twice as long as that for men regardless of the age group.

As described previously or above, the difference in the life expectancy and ALE of a self-reliant person was assumed to be the necessary period for nursing care. There are several reasons why the difference in the total life expectancy and ALE cannot be considered the necessary period of nursing care. Originally, the total life expectancy is the sum of life expectancies of self-reliant persons and persons in need of care. In our study, the life expectancy of 65-year-old men in the city of H. was 18.98 years for self-reliant persons and 5.76 years for persons in need of care. The average of these spans was 15.43 years, which represents the average life expectancy of all 65-year-old men. Considering ALE in a similar way, the ALE of 65-year-old men in the city of H. was 17.20 years in self-reliant persons. The ALE of persons in need of care is near zero since they are already in nursing care during the survey. The ALE of persons in need of care will be 0 years unless functional recovery rates are taken into consideration. Functional recovery rates are estimated to be 20 to 30%⁴⁾ so the ALE of persons in need of care should not be zero, although it must be fairly short. The total life expectancy of 15.43 years is shorter than the ALE of self-reliant persons (17.20 years) because the former involves the life expectancy of people receiving care like bedridden persons. The life expectancy of self-reliant persons was 18.98 years, which is longer than 17.20 years. Thus, one could say that ALE represents self-reliant persons since the ALE of persons in need of care is quite short. Thus, ALE should be compared with the life expectancy of self-reliant persons but not to the total life expectancy.

Although no significant difference was observed in the average functional recovery rate in men and women who were in need of care, mortality was higher for men than for women as can be expected from the fact that women have longer life spans; 47.1% of men receiving care at ages over 85 died within a year. The average functional recovery rate for men and women combined in the city of H. was 17.8%. This was rather low compared with that of 31% observed in Nagano Prefecture. The average active life ratio (the ratio of ALE to life expectancy) in the city of H. was higher for men than in the USA (65-year-old

Table 4 Comparison of ALE with overseas studies

Age 65 (Males)				
place	LE ^a (year)	ALE ^b (year)	ALE×100/LE (%)	the necessary period of nursing care (year)
East Boston	11.9	10.6	89.1	1.3
Iowa	15.3	12.3	80.4	3.0
New Heaven	12.6	10.4	82.5	2.2
North Carolina	12.6	11.2	88.9	1.4
H city	18.98	17.20	90.6	1.78
Age 65 (Females)				
place	LE (year)	ALE (year)	ALE×100/LE (%)	the necessary period of nursing care (year)
East Boston	16.3	14.4	88.3	1.9
Iowa	20.5	16.7	81.5	3.8
New Heaven	19.1	15.8	82.7	3.3
North Carolina	18.6	16.0	86.0	2.6
H city	22.30	19.08	85.6	3.22

a: LE: Life Expectancy b: ALE: Active Life Expectancy

men: 90.6%) and was 85.6% for women, compared with the USA (Table 4). The average life expectancy and ALE of men and women in the city of H. was longer than in the USA and their necessary periods for nursing care were comparable. The average necessary period for nursing care in the city of H. was the third longest of five cities consisting of four cities in the USA and the city of H. for both genders. However, the average active life period in the city of H. was longer than in the USA, so the average necessary period for nursing care was shorter than expected from the longer life spans for the city of H.

Research has specifically demonstrated that events where older people must receive nursing care after developing hemiplegia on account of strokes, having fractures due to osteoporosis, or developing other health problems substantially affect life expectancies. In Japan's aging society, an increase in the elderly population is inevitable, so further measures must be taken so that individuals can lead lives without disabilities.

Results also demonstrated that ALE might vary significantly depending on whether or not functional recovery rates were taken

into account. Increasing these functional recovery rates is as important as preventing a decline in ADL. There is a need, though it requires great effort on behalf of family members and helpers, for recovery of functions by means of rehabilitation facilities in order to improve ALE and lifespans. Since the extension of ALE leads to the improvement of QOL, ALE can be used as an indicator for evaluation of public health services provided by local governments. The World Health Organization (WHO) states that the administration must undertake the responsibility for "responsible administration and management" of the health care system and that it is necessary first to establish a health care policy; secondly to secure its efficacy; and thirdly to conduct an evaluation and collect and offer information required for achievement of the administration and management²⁰. Utilization of the results of the ALE evaluation as one of the sources of information for policy decisions in various regions will make it possible to act in accordance with the WHO concept of "responsible administration and management." Similar studies should be conducted in other countries to extend the applicability of ALE.

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