Healthy Life Expectancy Calculation Guidelines

(Tentative translation)

2012 Health and Labor Sciences Research Grant

Study group on future predictions of healthy life expectancy and cost-effectiveness of measures to prevent lifestyle-related diseases, part of an integrated research project on measures to prevent cardiovascular disease, diabetes mellitus, and other lifestyle-related diseases

1. Introduction

The aim of the Healthy Life Expectancy Calculation Guidelines (“Guidelines”) is to present a standard method of calculating healthy life expectancy that can be applied in the planning and assessment of healthcare and welfare measures. Such planning and assessment are done in the light of prefectural and municipal health promotion plans under “the second term of National Health Promotion Movement in the 21st Century, ” (Health Japan 21 (the second term)).

Healthy life expectancy is a generic term that is generally used for the average time people can be expected to live in a given state of health, or indices of measuring it. In Health Japan 21 (the second term), healthy life expectancy is defined as length of life that an individual lives without limitation in daily activities due to health problems. Here we look at the indices of “average period of time spent without limitation in daily activities,” “average period of time individuals consider themselves as healthy,” and “average period of time spent independent in daily activities.”

In calculating the index of healthy life expectancy it is important to clarify the purpose. The definition of a healthy state and clarification of the subject year, population, and age is the basis on which the index is calculated. It is also essential that the basic data and calculation method be used properly. Several other points should also be borne in mind when performing the calculations and interpretations.

The “Healthy life expectancy calculation program” is a simple program to calculate the indices of healthy life expectancy from basic data. It is made publicly available on the assumption that it will be used together with these Guidelines.

The Guidelines explain how healthy life expectancy is calculated (including how to use the “Healthy life expectancy calculation program”). The subject years for the calculations are taken to be 2010 and later. The subject populations are prefectures in the “average period of time spent without limitation (in daily activities)” and “average period of time individuals consider themselves as healthy,” and prefectures and municipalities in “average period of time spent independent in daily activities.” The Appendix gives results of calculations for the three indices, results of trial calculations of accuracy, and detailed calculation methods.

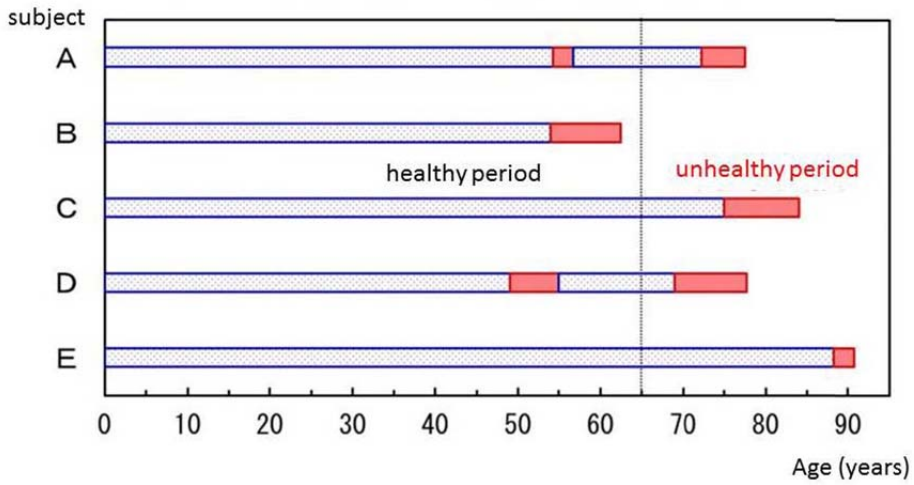
2. Healthy life expectancy and its indices

Healthy life expectancy is a generic term that generally indicates the average time people can be expected to live in a given state of health, or indices for measuring it. Life expectancy is currently divided into periods of health and periods of poor health, and the average number of years of health in all individuals in a population is obtained as an indicator of healthy life expectancy.

The periods of health and poor health of five individuals, A–E, are shown in Figure

2-1. Individual A went from a healthy state to an unhealthy state with the occurrence of a health problem at age 54 years 3 months. He then recovered from that unhealthy state to a healthy state at the age of 56 years 9 months. Later, his health became poor again at age 72 years 3 months and he died at age 77 years 6 months. Individual A's total period of health was 69 years and 9 months, from age 0 to 54 years 3 months (54 years and 3 months), and from age 56 years 9 months to 72 years, 3 months (15 years and 6 months). Individual A's total period of poor health was 7 years and 9 months, from age 54 years 3 months to age 56 years 9 months (2 years and 6 months) and from age 72 years 3 months to 77 years 6 months (5 years and 3 months). His survival time (life expectancy) was from age 0 years to 77 years 6 months, of which the proportion of healthy time was 90% (69 years 9 months/77 years 6 months).

Figure 2-1. Imaginary example of healthy period and unhealthy period



In this group the average period of health was 70.0 years and the average period of poor health was 8.5 years. These figures were obtained by averaging the periods of health and ill health for the five individuals, A–E. Average life expectancy (sum of the

two periods) was 78.5 years, of which the average period of health accounted for 89%. The periods of health and poor health from the age of 65 years and beyond were averaged for four of the individuals (Individual B, who died before the age of 65 years, was excluded), and the average period of health was found to be 11.1 years and the average period of poor health was found to be 6.4 years. Average remaining life expectancy was 17.5 years, of which the average years of health accounted for 63%.

To obtain periods of health and poor health, peoples' lives need to be followed until the end. Directly obtaining the average periods of health and poor health would therefore require follow-up data for more than 100 years, but this is not practical as an index of healthcare and welfare. Therefore, the measure of healthy life expectancy, described in the following, is calculated based on data obtained at the present time under uniform assumptions.

The indicator of healthy life expectancy is normally defined by how a state of health is determined conceptually (conceptual definition), how a state of health is measured in individuals (measurement method), and how the value of the index is calculated from the results of those measurements (calculation method). The conceptual definition of a healthy state is divided broadly as objective and subjective, and the measurement method as self-reported and other.

The conceptual definition of health and the measurement method is objective and self-reported, respectively, for "average period of time spent without limitation (in daily activities)"; subjective and self-reported for "average period of time individuals consider themselves as healthy"; and objective and other (care need level in long-term care insurance) for "average period of time spent independent in daily activities." The conceptual definition and measurement method are explained in detail below. The

calculation method is the same in the three indices, and the concept is described in “4. Healthy life expectancy calculation method.” It should be noted here that dividing health into either healthy or unhealthy states has been criticized on the basis that health is essentially a continuum that cannot be rigidly dichotomized as either healthy or unhealthy.

(1) “Average period of time spent without limitation (in daily activities)”

Health is taken to mean having no restrictions in daily life. A response of “No” to question 1 on the questionnaire (Table 2-1) indicates health, while a response of “Yes” indicates poor health. Question 2 asks whether or not the person is restricted in performing individual activities (not used in calculating the index). From the content of the activities, this index is related to the development of an active life based on health promotion, together with the effects from prevention of serious disease and the need for care.

Table 2-1. Questions on “Average period of time spent without limitation (in daily activities)”

Question 1. Do health problems currently affect your daily life in some way?
(1) Yes (2) No
Question 2. What kinds of effects are they?
Circle the numbers of all that apply.
(1) Activities of daily living (rising, dressing, eating, bathing, etc.) (2) Going out

(restrictions from time or amount of effort, etc.) (3) Work, housework, school (restrictions from time or amount of effort, etc.) (4) Exercise (including sports) (5) Other

(2) Average period of time individuals consider themselves as healthy

A healthy state is defined as when an individual feels he or she is healthy. Subjects respond to the questions by selecting one of the five options. Selection of “(1) Good,” “(2) Fairly good,” or “(3) Average” is taken to indicate a healthy state, and selection of “(4) Not very good” or “(5) Not good” is taken to indicate an unhealthy state.

Table 2-2. Questions for average period of time individuals consider themselves as healthy

Question. How is your health at present? Circle the number that applies.
(1) Good (2) Fairly good (3) Ordinary (4) Not very good (5) Not good

(3) Average period of time spent independent in daily activities

A healthy state is taken to be independence in activities of daily living. Care need levels of 2–5 in the long-term care insurance system are taken to be an unhealthy state (need for care), and everything else is taken to be a healthy (independent) state.

The reasons for determining the unhealthy (need for care) state based on care need level in the long-term care insurance were that the care need level in the long-term care insurance system is judged using uniform criteria nationwide, and that care insurance data can be obtained equally in all parts of the country. The reasons that support need

levels 1 and 2 and care need level 1 were not included in the unhealthy (need for care) state were that in the care insurance system support need levels 1 and 2 do not indicate the need for care and are not targeted for care need prevention, and that care need level 1 indicates about the same level of functioning in daily life as support need level 2. Although this method of determining health state may be debated, it does have a certain degree of validity.

The care need levels in the long-term care insurance system are for people aged 65 years and older. For ages 40–64 years the system covers only patients who have diseases that develop with the mental and physical changes that occur with age. Ages 0–39 years are excluded. Hence, for subjects beyond the age of 65 it is more natural to use "average period of time spent independent in daily activities" at age 65. When calculating indices from the age of 0 years, it is assumed that all people aged 0–39 years and nearly all people aged 40–64 years (other than those with diseases that have developed with the mental and physical changes that occur with age) are in a healthy (independent) state.

This index is also called "average number of years of independence."

3. The aim of calculating healthy life expectancy

In planning and assessing healthcare and welfare activities, it is important to apply indices that accurately express the goals. The goals may be broadly divided into things directly related to the efforts, things related to the final results (outcomes), and things related to intermediate states. Indices are determined with consideration of suitability to each goal, ease of calculation, and other matters.

The index of healthy life expectancy combines survival, death, and status of health or

poor health. It is related to final outcomes in the field of healthcare and welfare, and its application to the planning and assessment of efforts is of considerable significance. At the same time, the factors that determine healthy life expectancy are diverse and demonstrative data associated with these factors have not been sufficiently identified. Hence, in the planning and assessment of healthcare measures it is better to apply and interpret not only the index of healthy life expectancy but also indices that are indirectly related to the measures and individual outcome indices (such as the mortality rate from cerebrovascular disease or ischemic heart disease).

“Average period of time spend without limitation in daily activities” is taken up in Health Japan 21 (the second term) with the aim of extending health life expectancy, while “average period of time individuals consider themselves as healthy” is positioned as an index to note in the achievement of that goal. A characteristic of “average period of time spent independent in daily activities” is that it can be calculated in all municipalities nationwide without conducting a special survey, since a healthy state is based on the care need level in the long-term care insurance system. It is important to choose indices after considering their position relative to others and their characteristics.

As will be described in “6. Points to remember in interpreting healthy life expectancy,” the healthy life expectancy index is not interpreted strictly as an absolute value; rather, it is thought to be more practical to view it relatively. One way to look at it relatively is, for example, to compare different years in the subject population (such as 2010 and 2015 in prefectures). This is important to keep in mind when applying this to planning and assessment of healthcare and welfare measures.

The basic approach when applying the index of healthy life expectancy is to confirm the purpose of the calculations while considering the goals in planning and assessment

of healthcare and welfare measures.

4. Method of calculating healthy life expectancy

The three indices of healthy life expectancy share a common framework in their calculation methods. The concepts of basic items, basic data, and calculation method in that framework are described below together with an explanation of how to use the "healthy life expectancy calculation program."

(1) Basic items

Confirmation of this conceptual definition of health status and clarification of the subject year, age, and population are fundamental. In these Guidelines, the subject year is assumed to be 2010 or later. The subject age is 0 years for boys and girls separately, but for "average period of time spent independent in daily activities" age 65 is more natural. The subject population is assumed to be prefectures for "average period of time spent without limitation in daily life" and "average period of time individuals consider themselves as healthy," and prefectures and municipalities for "average period of time spend independent in daily activities." With small study populations there are certain items that should be noted in the calculation method (5. Points to remember in calculating healthy life expectancy).

2) Basic data

Mortality rate and poor health ratio by sex and age group are used in calculating healthy life expectancy. Age groups are set at 0–4 years, 5–9 years, …, 85 years and older. The basic data for mortality rate are population and number of deaths. The

population is taken to be the Japanese population (or total population) at mid-year (or as of October 1), and is obtained from the national census, projected population, or population register. The number of deaths is basically obtained from the vital statistics of Japan for the year in question. The poor health ratio differs with the index, the details of which are shown in “5. Points to remember in calculating healthy life expectancy.” Also used are the national population in the same year as the subject population and number of deaths (obtained in the same way as for the subject population), the number of survivors in abridged life tables, and the static population (accumulated; in life tables normally expressed as T). These data are publicly available at the Portal Site of Official Statistics of Japan (http://www.e-stat.go.jp/).

(3) Concept for the calculation method

The standard Chiang life table and Sullivan method are used to calculate healthy life expectancy, and average number of years of health, average number of years of poor health, and their approximate 95% confidence intervals are obtained. The calculation method is shown in detail in “9. Appendix (5) Details of the method of calculating healthy life expectancy.”

(4) Calculation program

The “Healthy life expectancy calculation program” is a simple program in Excel format. It is expected that it will be downloaded from the website and used in calculating healthy life expectancy. When this program is read by Excel, a “readme” sheet (Fig. 4-1) is shown on the screen. This gives a very simple explanation of each sheet. The “Healthy life expectancy calculation table” sheet is the calculation program.

The sheet entitled “Notes on using the calculation table” gives some things to be aware of in using the calculation program, and it outlines the explanations for the present chapter and the next chapter. The “National basic data” sheet is basic data for the entire country that is used in the calculation program. The prefectural basic data sheet and the “Healthy life expectancy calculation table that uses life tables for the subject group” sheet are explained in “9. Appendix.”

When the “Healthy life expectancy calculation table” sheet is read, the screens shown in Figures 4-2 and 4-3 are displayed. The top half of the screens has input cells (white section) for basic data. The basic data are population size of the subject population,

Figure 4-1. "Readme" sheet of the "healthy life expectancy calculation program"

2012. 9

Healthy life expectancy calculation program

Sheet	Contents
Healthy life expectancy calculation table	When you input data of target population and national basic deta, then healthy life expectancy of the target population will be calculated.
Notes on using the calculation table	Some things to be aware of in using the calculation program, e.g. difference of basic data by index.
National basic data	National basic data (in 2010) (cited from some data)
Population and mortality number by prefecture	Population and mortality number by prefecture (in 2010) (cited from the same data of the national basic data)
Unhealthy proportion 1 by prefecture	Denominator and numerator of "proportion with limitation in daily activities" by prefecture (in 2010) (estimated number by the Comprehensive Survey of Living Conditions)
Unhealthy proportion 2 by prefecture	Denominator and numerator of "proportion of individuals who consider as unhealthy" by prefecture (in 2010) (estimated number by the Comprehensive Survey of Living Conditions)
Unhealthy proportion 3 by prefecture	Denominator and numerator of "proportion of dependent in daily activities" by prefecture (in 2010) (estimated number of people with certification of care needs by the Long-term Care Insulance)
Healthy life expectancy calculation table using life talbe of the target population	When you input data of the life table in the target population (e.g. life table of municipalities) and other basic deta, then healthy life expectancy of the target population will be calculated.

See "Healthy Life Expectancy Calculation Guidelines"
http://toukei.umin.jp/kenkoujyumyou/ (in Japanese)

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number of deaths, and numerator and denominator for the poor health ratio, plus the national population, number of deaths, and life tables (number of survivors and static population (accumulated; in life tables normally expressed as T). The data are for both sexes and all age groups (0–4 years, 5–9 years, …, 85 years and older).

Initially, hypothetical data (assuming “average period of time spent independent in daily activities” for prefectures) are entered in the basic data input cells for the subject population. This will be replaced with the calculated subject population data. National 2010 data is entered in the input cells for national basic data. The data explanation is confirmed on the “National basic data” sheet and the data in the national basic data input cells are changed if necessary. If the target year is 2010, it is not necessary to

Figure 4-2. "Helathy life expectancy calculation table" of the "healthy life expectancy calculation program"

Helathy life expectancy calculation table

Input basic data in the target population (white cells) Input national basic data (white cells)

Sex	Target population					National data (in the same year as the target population data)					
	Age category (years)	Population (people)	Mortality (people)	Denominator of proportion of unhealthy (people)	Numerator of proportion of unhealthy (people)	Age category (years)	Population (people)	Mortality (people)	Age x	Number of survival l_x	Stationary population T_x
Male	0 - 4	53256	29	53256	0	0 - 4	2689162	1873	0	100000	7963518
	5 - 9	56543	6	56543	0	5 - 9	2841813	261	5	99661	7464920
	10 - 14	59297	6	59297	0	10 - 14	3013782	350	10	99614	6966743
	15 - 19	57170	19	57170	0	15 - 19	3096387	941	15	99557	6468797
	20 - 24	53284	38	53284	0	20 - 24	3228469	1962	20	99403	5971330
	25 - 29	67089	45	67089	0	25 - 29	3642952	2412	25	99118	5474998
	30 - 34	77585	60	77585	0	30 - 34	4180032	3177	30	98795	4980198
	35 - 39	90947	86	90947	0	35 - 39	4926663	4867	35	98421	4487127
	40 - 44	80663	114	80663	0	40 - 44	4381848	6629	40	97925	3996178
	45 - 49	76008	158	76008	102	45 - 49	4015388	9566	45	97174	3508304
	50 - 54	76376	284	76376	102	50 - 54	3807362	14638	50	96004	3025136
	55 - 59	87172	522	87172	205	55 - 59	4296539	27134	55	94164	2549369
	60 - 64	98927	833	98927	617	60 - 64	4936772	46155	60	91282	2085238
	65 - 69	78932	1124	78795	1255	65 - 69	3933785	57468	65	86929	1639074
	70 - 74	65484	1425	65368	2136	70 - 74	3235341	73470	70	80842	1218817
	75 - 79	53661	2072	53275	3346	75 - 79	2593169	102673	75	72127	835000
	80 - 84	37102	2590	36836	4172	80 - 84	1700191	119801	80	58934	505129
	85 -	23337	3432	23171	5579	85 -	1052072	159813	85	41062	253559
Fe-male	0 - 4	50998	32	50998	0	0 - 4	2565299	1509	0	100000	8638891
	5 - 9	53248	2	53248	0	5 - 9	2708194	219	5	99709	8140093
	10 - 14	56334	5	56334	0	10 - 14	2870493	203	10	99671	7641653
	15 - 19	53954	9	53954	0	15 - 19	2932213	481	15	99634	7143382
	20 - 24	51365	11	51365	0	20 - 24	3076411	791	20	99554	6645388
	25 - 29	62301	16	62301	0	25 - 29	3511714	1025	25	99431	6147923
	30 - 34	72633	31	72633	0	30 - 34	4033928	1660	30	99286	5651111
	35 - 39	85951	46	85951	0	35 - 39	4761382	2688	35	99084	5155164
	40 - 44	77333	53	77333	0	40 - 44	4268754	3533	40	98801	4660406
	45 - 49	74348	91	74348	80	45 - 49	3950745	4966	45	98385	4167367
	50 - 54	76109	147	76109	80	50 - 54	3800955	7376	50	97757	3676902
	55 - 59	87858	235	87858	160	55 - 59	4359516	12192	55	96820	3190334
	60 - 64	101741	403	101741	481	60 - 64	5117803	19941	60	95500	2709350
	65 - 69	85861	516	85709	1066	65 - 69	4296437	25619	65	93592	2236330
	70 - 74	75759	726	75622	2037	70 - 74	3752050	36778	70	90872	1774737
	75 - 79	69931	1200	69432	4219	75 - 79	3379056	60415	75	86507	1330308
	80 - 84	56957	1963	56552	7570	80 - 84	2663083	91456	80	78971	914910
	85 -	59664	6364	59241	21500	85 -	2761968	292332	85	66190	549344

change any of the indices.

The bottom half of the screen has cells that display the calculation results (light blue section). When the data in the basic data input cells in the upper half of the screen are changed, the calculation results are immediately displayed. The calculation results for 65-year-old men, for example, shown on the screen are 17.56 years for average number of healthy years, 17.45–17.67 years for 95% confidence interval, 92.0% for percentage of average number of healthy years among remaining life expectancy, 1.53 years for average number of years of poor health, 1.50–1.56 years for 95% confidence interval, and 8.0% for percentage of average remaining life expectancy. For 0-year-old boys, the respective figures are 78.68 years, 78.48–78.89 years and 98.3%; and 1.40 years, 1.37–1.42 years, and 1.7%.

The “Healthy life expectancy calculation table” sheet shows the intermediate results

Figure 4-3. "Helathy life expectancy calculation table" of the "healthy life expectancy calculation program" (continued)

Results of the calculation for the target population

: Proportion in the life expectancy

Sex	Age	Life expectancy			Average healthy period				Average unhealthy period			
	(years)	(years)	95% Confidence Interval		(years)	95% Confidence Interval		(%) #	(years)	95% Confidence Interval		(%) #
Male	0	80.08	79.86	80.30	78.68	78.48	78.89	98.3	1.40	1.37	1.42	1.7
	5	75.29	75.08	75.50	73.89	73.70	74.09	98.1	1.40	1.37	1.43	1.9
	10	70.33	70.12	70.54	68.93	68.74	69.12	98.0	1.40	1.37	1.43	2.0
	15	65.36	65.16	65.57	63.96	63.77	64.15	97.9	1.40	1.37	1.43	2.1
	20	60.47	60.27	60.67	59.07	58.88	59.25	97.7	1.40	1.38	1.43	2.3
	25	55.66	55.48	55.85	54.26	54.08	54.43	97.5	1.41	1.38	1.43	2.5
	30	50.84	50.66	51.02	49.43	49.26	49.60	97.2	1.41	1.39	1.44	2.8
	35	46.03	45.85	46.21	44.61	44.45	44.77	96.9	1.42	1.39	1.44	3.1
	40	41.24	41.06	41.41	39.81	39.65	39.97	96.5	1.42	1.40	1.45	3.5
	45	36.52	36.35	36.68	35.08	34.93	35.23	96.1	1.43	1.41	1.46	3.9
	50	31.88	31.72	32.03	30.43	30.29	30.58	95.5	1.44	1.42	1.47	4.5
	55	27.43	27.28	27.57	25.96	25.83	26.10	94.7	1.46	1.44	1.49	5.3
	60	23.17	23.03	23.31	21.67	21.55	21.79	93.5	1.50	1.47	1.52	6.5
	65	19.09	18.96	19.22	17.56	17.45	17.67	92.0	1.53	1.50	1.56	8.0
	70	15.30	15.18	15.41	13.74	13.63	13.84	89.8	1.56	1.53	1.59	10.2
	75	11.76	11.65	11.86	10.19	10.10	10.28	86.7	1.57	1.54	1.60	13.3
	80	8.73	8.65	8.82	7.18	7.10	7.25	82.2	1.56	1.52	1.59	17.8
	85	6.38	6.18	6.57	4.84	4.69	5.00	75.9	1.54	1.48	1.59	24.1
Fe-male	0	86.46	86.26	86.66	83.51	83.33	83.69	96.6	2.95	2.92	2.99	3.4
	5	81.73	81.55	81.91	78.77	78.61	78.93	96.4	2.96	2.93	3.00	3.6
	10	76.74	76.56	76.92	73.78	73.62	73.94	96.1	2.96	2.93	3.00	3.9
	15	71.78	71.60	71.95	68.81	68.66	68.97	95.9	2.96	2.93	3.00	4.1
	20	66.83	66.66	67.01	63.87	63.71	64.02	95.6	2.97	2.93	3.00	4.4
	25	61.90	61.73	62.07	58.93	58.78	59.08	95.2	2.97	2.93	3.01	4.8
	30	56.98	56.81	57.14	54.00	53.86	54.15	94.8	2.97	2.94	3.01	5.2
	35	52.09	51.93	52.25	49.11	48.97	49.25	94.3	2.98	2.94	3.02	5.7
	40	47.23	47.07	47.38	44.24	44.10	44.37	93.7	2.99	2.95	3.03	6.3
	45	42.38	42.23	42.53	39.38	39.25	39.51	92.9	3.00	2.96	3.04	7.1
	50	37.63	37.49	37.77	34.62	34.50	34.74	92.0	3.01	2.97	3.05	8.0
	55	32.97	32.83	33.10	29.93	29.82	30.04	90.8	3.04	3.00	3.07	9.2
	60	28.37	28.24	28.49	25.30	25.20	25.40	89.2	3.07	3.03	3.10	10.8
	65	23.90	23.79	24.01	20.79	20.70	20.89	87.0	3.11	3.07	3.14	13.0
	70	19.54	19.44	19.64	16.40	16.32	16.49	83.9	3.14	3.10	3.18	16.1
	75	15.37	15.28	15.46	12.22	12.15	12.29	79.5	3.15	3.12	3.19	20.5
	80	11.53	11.46	11.60	8.40	8.35	8.46	72.9	3.12	3.09	3.16	27.1
	85	8.24	8.05	8.43	5.25	5.12	5.37	63.7	2.99	2.91	3.06	36.3

of the calculations for reference. Moving to the right of the screen, the results are shown for the five levels of the healthy life expectancy calculation method: (1) Calculation preparations, (2) Life table calculations, (3) Life table calculations for health and ill health, (4) Calculation of healthy life expectancy, and (5) Healthy life expectancy interval estimation. These cells (purple section) must never be changed (cells are protected).

5. Points to remember in calculating healthy life expectancy

Points to remember in calculating healthy life expectancy are related to Comprehensive Survey of Living Conditions data, surveys based on the Comprehensive Survey of Living Conditions, long-term care insurance information, and small subject populations.

(1) Comprehensive Survey of Living Conditions data

In calculating the “average period of time spent without limitation (in daily activities)” and “average period of time individuals consider themselves as healthy” in prefectures, it is assumed that poor health ratio is obtained from Comprehensive Survey of Living Conditions data. The denominator and numerator are the total number of respondents (people who did not answer this question are not included among respondents) and the number of respondents who classified as having poor health, respectively, from the relevant questions (see Tables 2-1 and 2-2). In this case the target year for calculations is the year of large-scale implementation of the same survey (expected to be 2010 and every three years afterward), and the subject population is the nation or prefectures. Since 0–5-year-old children are not included among the response subjects for the

questions used, the poor health ratio for 6–9-year-old children is substituted for the ratio in 0–4 and 5–9-year-old children. In the “Healthy life expectancy calculation table” sheet of the “Healthy life expectancy calculation program,” data for 6–9-year-olds is entered into cells for 0–4 and 5–9-year-olds in the input columns for the denominator and numerator for poor health ratio. The effect of these manipulations is relatively small, and even if “0” is entered into the cell for the number of 0–4-year-olds, the change in the index value is limited to about 0.1 years.

In the Comprehensive Survey of Living Conditions the estimated number of people is shown rather than the number of people surveyed. In the “Healthy life expectancy calculation table” sheet in the “Healthy life expectancy calculation program,” the variance in the estimated number is not considered when the estimated number is entered into the denominator and numerator input columns for poor health ratio. As a result, the 95% confidence interval for healthy life expectancy becomes excessively narrow. In prefectural data large numbers of 10,000 to 22,000 people are surveyed and so the 95% confidence interval is relatively narrow (see “9. Appendix (4) Trial calculations of healthy life expectancy accuracy”).

(2) Surveys that conform to the Comprehensive Survey of Living Conditions

When calculating the “average period of time spent without limitation in daily activities” and “average period of time individuals consider themselves as healthy” in municipalities, the poor health ratio cannot be obtained from the Comprehensive Survey of Living Conditions. A separate survey that conforms to the Comprehensive Survey of Living Conditions is therefore conducted to obtain the denominator and numerator for the poor health ratio. When such surveys are not done, the “average period of time spent

independent in daily activities" is calculated from long-term health insurance information.

The following raises some points to bear in mind when conducting a survey that conforms to the Comprehensive Survey of Living Conditions. The survey should be self-administered and use the same questions with regard to healthy life expectancy (see Tables 2-1 and 2-2). As a rule survey subjects should be selected randomly. For example, by simple random sampling from the subject population or subdividing the subject population into small groups and taking all subjects of a randomly sampled small group as the subjects. To limit the bias in healthy life expectancy from non-collection of survey forms, the response rate should preferably meet a given standard (for example, 70% or higher). Repeated requests for responses from survey subjects are effective in achieving this. Ensuring a certain level of accuracy in healthy life expectancy requires a quite large number of survey subjects. From the results of trial calculations for the accuracy of "average period of time spent without limitation in daily activities" (see "9. Appendix (4) Trial calculations of healthy life expectancy accuracy"), the target for number of responses (number of survey subjects × response rate) should be 3,000 people or more; if possible 10,000 or more is preferable. Information from surveys that do not satisfy the above is not appropriate for use in calculating healthy life expectancy.

(3) Information from long-term care insurance

In calculating the "average period of time spent independent in daily activities," the poor health ratio is obtained from long-term care insurance information. That information should be for some point in the subject year; for example, information as of the end of September or information from an October screening. If the long-term care

insurance system has been recently revised, it is important to avoid a time soon after the revisions.

The denominator and numerator for the poor health ratio are the number of people covered by long-term care insurance (or the population) and the number of people certified as having care need levels 2–5, respectively. The poor health ratio for 0–39 years old is assumed to be zero. In the “Healthy life expectancy calculation table” of the “Healthy life expectancy calculation program,” “0” is entered in the input column for 0–39-year-olds as the numerator for the poor health ratio (the population or other figure can be entered in the denominator input column). “Average period of time spent independent in daily activities” at 65 years old is calculated from the data for ages 65 years and older (the input column for 0–64 years old can be left blank). When the number of people aged 40–64 years who are certified as having care need levels 2 to 5 is obtained as the number of people by 5-year age group, the number of people is apportioned a uniform number of people for each age group or a predetermined ratio. The method of apportioning with a predetermined ratio is shown on the “Notes on using the calculation table” sheet in the “Healthy life expectancy calculation program.”

(4) Small subject populations

In subject populations of small size the number of deaths will be low, and as a result the accuracy of the healthy life expectancy based on this subject population will decrease. To ensure a certain level of accuracy it is necessary to have a certain population size. From the trial calculations of accuracy in the “average period of time spent independent in daily activities” (see “9. Appendix (4) Trial calculations of healthy life expectancy accuracy”), the target for the subject population size should be 130,000

people or more. To improve the accuracy with fewer than 130,000 people it is recommended that the number of deaths in several years be used. For example, the number of deaths in three years, including the target year and the years before and after the target year, may be used.

When using the number of deaths in multiple years in the “Healthy life expectancy calculation program,” the *number of deaths* for the *study population* in the “Healthy life expectancy calculation table” sheet is the total number of deaths in all the years, and the *population size* of the *study population* is the total population in the all the years. Other settings are the same as for single years. For example, in calculating the “average period of time spent independent in daily activities” in 2010, the total population in 2009–2011 (or three times the population in 2010) is taken as the population. The numerator and denominator for the poor health ratio in the subject population and the national basic data are data for 2010. Even in cases when data for multiple years are used for the numerator for the poor health ratio (the number of people certified to need care in the long-term care insurance), correlations associated with duplication of the same individuals need to be corrected. Even so, this does lead to much improvement in accuracy.

In subject populations of very small size the accuracy declines markedly. There is a high likelihood that the healthy life expectancy will become excessively high or low, the interpretation of which is difficult. Based on the results of trial calculations of the “average period of time spent independent in daily activities” at age 65, healthy life expectancy cannot be considered accurate even with the use of the number of deaths over three years in populations of less than 120,000. Such subject populations are not appropriate for calculating healthy life expectancy.

Since the accuracy of healthy life expectancy is not high when subject populations are small, the estimated value and 95% confidence interval need to be calculated, displayed, and interpreted together. Due consideration should be given to this in order to avoid interpretation errors in healthy life expectancy associated with low accuracy. In very small study populations, one may consider using calculation methods that employ life tables for the study population (life tables for each municipality, etc.) in place of the population and number of deaths (see “9. Appendix (6) Healthy life expectancy calculation method using subject population life tables).