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Healthy Life Expectancy and Health Gains in Cardiovascular Diseases Management in Korea

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Introduction

Chapter 1

Introduction

Life expectancy in Korea rose by 17.2 years from 62.2 years in 1970 to 79.4 years in 2007, on the order of the OECD average, while infant mortality rate dropped to less than one-tenth from 45.0 per 1,000 in 1970 to 4.1 in 2006.[1] However, healthy life expectancy in Korea, a summary measure that combines information on mortality and morbidity, is around 68.6 years, which is still quite low compared to 75 years in Japan and 71.8 years in German.[2] Therefore, despite the remarkable progress achieved, Korean health promotion policy should be further strengthened.

Recognizing that it is important to improve the quality of life through health promotion, the Korean government has made effort to facilitate health promotion programs by, above all, enacting the National Health Promotion Law in 1995 and developing and implementing health promotion policies under the law. Advanced countries as well as Korea have established health promotion goals and pursued health promotion strategies on the national level since the 1980s, for example, 'Healthy People 2000,' 'Healthy People 2010,' and 'Healthy People 2020' of the United States; 'The Health of the Nation (2000)' and

1) Jung, Young-Ho mimeo, Korea Institute for Health and Social Affairs, 2010
2) Jung, Young-Ho, mimeo, Korea Institute for Health and Social Affairs, 2010

'Our Healthier Nation (2010)' of the United Kingdom; 'People's Health Promotion Campaign,' 'Active 80 Health Plan,' and 'Health Japan 21,' of Japan; and 'Better Health Commission' of Australia.

Meanwhile, the Ministry of Health and Welfare recently (June 2, 2011) announced the Third National Health Promotion Plan (HP2020, '11-20) with the goal of increasing the healthy life expectancy of Koreans to 75 by 2020. The health plan was conceived as a long-term plan for a ten-year period, considering that the effects of health promotion programs materialize over a long period, and the target age for 2020 was calculated based on available indices. Healthy life expectancy as proposed in HP2020 was calculated by deducting from the average life expectancy the period in which people are unable to lead a healthy and normal living due to diseases or injuries. Healthy life expectancy. It shows how long people can expect to live in good health, not just how long they can live. There are various ways of estimating healthy life expectancy. In the Third National Health Promotion Plan, WHO's healthy life expectancy index was used, and Korean healthy life expectancy was estimated at 75 under HP 2020 in consideration of the trends of healthy life expectancy in advanced countries and the increase in healthy life expectancy in Korea.

〈Table 1-1〉 Healthy life expectancy under HP2020

		1998	2001	2005	2007	HP2010 goal	HP2020 goal
Korean	Total	74.8	76.5	78.6	79.6	72.0	75.0
average life	Male	71.1	72.8	75.1	76.1	69.7	73.2
expectancy	Female	78.5	80	81.9	82.7	74.2	76.6
WHO	Total	65.0	67.4	-	71.0	-	-
healthy life	Male	62.3	64.5	-	68.0	-	-
expectancy	Female	67.7	70.3	-	74.0	-	-

Source: Third National Health Promotion Plan (2011~2020), Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs

Developed with the overarching goals of increasing healthy life expectancy and promoting health equity, HP2020 comprises health promotion goals and detailed strategies in six fields; realization of healthy living, management of chronic diseases, health management for population groups, management of infectious diseases, safety and health management, and business system management.

The health promotion goals and detailed strategies were developed for the establishment of preventive health promotion system based on the belief that prevention of diseases can help improve quality of life, enhance human resources, and reduce people's health care expenses, and ultimately, contribute to the progress and economic growth of the country. In this relation, key indices were selected and the 2020 goals for these indices were determined. The following table shows estimated goals for various indices chosen under the overall goal of the healthy life expectancy of 75.

〈Table 1-2〉 Estimated goals for HP2020

	Category	Key index	Recent trend		2020 goal
			2008	2009	
1	Non-smoking	Rate of smokers among adult males	47.7%	46.9%	29.0%
2	Drinking moderation	Rate of high-risk drinking among adults	M 28.3% F 8.5%	M 24.6% F 7.3%	M 18.0% F 5.0%
3	Physical activities	Rate of moderate physical activities (excluding walking) among adults	14.5%	13.4%	20.0%
4	Nutrition	Rate of those who take healthy diet	28.9%	-	35.0%
5	Cancer management	Rate of cancer screening among all Koreans	50.7%	53.3%	80.0%
6	Health examination	Rate of those who take health examination	65.3%	65.8%	80.0%
7	Cardio-cerebrovascular diseases	Prevalence rate of hypertension (30 years and above)	26.9%	30.0%	23.0%
8	Obesity	Rate of obesity among adults	M 35.3% F 25.2%	M 35.8% F 26.0%	M 35.0% F 25.0%
9	Mental health	Decrease in suicidal mortality rate (per 100,000 people)	26	31	18
10	Dental health	Rate of experience of dental caries among children & teenagers (permanent teeth)	61.1% ('06)	60.5% ('10)	45.0%
11	Vaccination	Rate of taking mandatory vaccinations among infants & children	59.5%	-	95.0%
12	Tuberculosis	Rate of occurrence of smear-positive tuberculosis (per 100,000 people)	22.7	23.2	10
13	Injury prevention	Traffic-related mortality rate (per 100,000 people)	16.1 ('06)	-	7
14	Maternal health	Maternal mortality rate (per 100,000 expectant mothers)	12	-	9
15	Infant health	Infant mortality rate (per 1,000 infants)	3.4	-	2.8
16	Elderly health	Rate of activity limitation among the elderly - Rate of those with difficulties in activities of daily living (ADL)	11.4%	-	11.4%

Source: Third National Health Promotion Plan (2011~2020), Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs

This study attempted to analyze life expectancy and health life expectancy in relation to chronic diseases. More specifically, we hoped to promote understanding of these indices by examining health indices in detail. By using the numbers of the dead and the total population announced by Statistics Korea, we calculated the life expectancy of Korean people. Then, we estimated healthy life expectancy based on the life expectancy that we drew for the study and the results of the Korea Health Panel, a nationwide survey on the quality of life with the focus on health. In addition, we attempted to estimate by how much life expectancy and healthy life expectancy would increase in the absence of deaths attributable to major chronic diseases. For this, we used the methodology proposed by Sullivan.

Chapter

02

Life Expectancy and Healthy Life Expectancy

Chapter 2

Life Expectancy and Health Life Expectancy

1. Life Expectancy in Korea

Life table is a table that summarizes the process in which a particular birth cohort ages and dies out under the assumption of the current mortality levels of various age groups. Statistics Korea produces a life table each year based on the population of the year (as of July 1) and death registration records. It shows the average period of further survival, death probability for different age groups and the probability of a person of one age group age into an older age group, under the supposition that the pattern and level of mortality for the age group are retained. A life table that divides cohorts by one year is called a complete life table, and one that divides cohorts by five years is called an abridged life table.

In this study, we calculated life expectancy as a preparation for drawing healthy life expectancy. Life expectancy refers to the number of years of survival that a person aged x is expected to live in the future, and it is calculated according to the following process: First, calculate the death probability that indicates the probability of a person aged x dying without reaching the age of $x+n$. Second, after calculating the number of deaths, calculate the number of survivors by subtracting the number of deaths from the total population. In others, the number of survivors means the number of people alive at the age of x, or the number

of people expected to live to reach the age of x as the group of 100,000 people who were born simultaneously decreases due to mortality. Third, calculate the survival probability and draw stationary population for each age group; then, add the number of population of those older than the respective age group to draw the total years for which survivors at age x are expected to live until they reach the age of $x+n$, or the stationary population beyond the particular age. Finally, divide the total years of survival until all survivors at the age of x are expected to die by the number of survivors to calculate life expectancy.

Based on the above process, life expectancy at birth in 2009 was 80.67 years. This was similar to the life expectancy of 80.55 for Korean men and women announced by the Statistics Korea in 2009.

〈Table 2-1〉 Life table: Overall

(Unit: people, years)

Age	Death probability	Number of survivors	Number of deaths	Stationary population	Total years of survival	Life expectancy
0	0.0034	100,000	1,500	99,712	8,067,147	80.67
1 - 4	0.0009	99,661	405	398,468	7,967,435	79.95
5 - 9	0.0007	99,573	384	497,684	7,568,967	76.01
10 - 14	0.0007	99,501	441	497,339	7,071,283	71.07
15 - 19	0.0015	99,435	1,073	496,792	6,573,944	66.11
20 - 24	0.0024	99,282	1,507	495,814	6,077,151	61.21
25 - 29	0.0033	99,044	2,544	494,410	5,581,338	56.35
30 - 34	0.0039	98,721	3,040	492,636	5,086,927	51.53
35 - 39	0.0052	98,334	4,718	490,384	4,594,291	46.72
40 - 44	0.0080	97,820	7,000	487,149	4,103,908	41.95
45 - 49	0.0125	97,040	10,970	482,164	3,616,758	37.27
50 - 54	0.0180	95,825	13,988	474,817	3,134,595	32.71
55 - 59	0.0249	94,102	13,394	464,648	2,659,777	28.26
60 - 64	0.0371	91,758	16,113	450,287	2,195,129	23.92
65 - 69	0.0608	88,357	24,020	428,347	1,744,841	19.75

Age	Death probability	Number of survivors	Number of deaths	Stationary population	Total years of survival	Life expectancy
70 - 74	0.1000	82,982	31,975	394,156	1,316,495	15.86
75 - 79	0.1652	74,681	34,553	342,552	922,338	12.35
80 - 84	0.2746	62,340	33,981	268,910	579,786	9.30
85 - 89	0.4318	45,224	27,439	177,301	310,876	6.87
90 or above	1.0000	25,696	17,934	133,575	133,575	5.20

Life expectancy for men was 76.99 years at birth and 38.21 years at 40. Meanwhile, life expectancy for women was 83.77 years at birth, 44.01 years at 40 and 25.11 years at 60.

〈Table 2-2〉 Life table for male

(Unit: people, years)

Age		Death probability	No. of survivors	No. of deaths	Stationary population	Total years of survival	Life expectancy
Male	0	0.0036	100,000	361	99,693	7,680,474	76.80
	1 - 4	0.0009	99,639	86	398,382	7,580,781	76.08
	5 - 9	0.0009	99,552	89	497,541	7,182,399	72.15
	10 - 14	0.0008	99,464	76	497,130	6,684,858	67.21
	15 - 19	0.0019	99,388	190	496,467	6,187,728	62.26
	20 - 24	0.0029	99,198	283	495,285	5,691,261	57.37
	25 - 29	0.0038	98,915	377	493,635	5,195,977	52.53
	30 - 34	0.0047	98,539	463	491,535	4,702,342	47.72
	35 - 39	0.0067	98,075	657	488,736	4,210,807	42.93
	40 - 44	0.0111	97,419	1,085	484,380	3,722,072	38.21
	45 - 49	0.0181	96,333	1,739	477,318	3,237,692	33.61
	50 - 54	0.0267	94,594	2,522	466,665	2,760,373	29.18
	55 - 59	0.0368	92,072	3,384	451,899	2,293,709	24.91
	60 - 64	0.0542	88,688	4,811	431,414	1,841,809	20.77
	65 - 69	0.0893	83,877	7,493	400,655	1,410,396	16.81
	70 - 74	0.1434	76,385	10,956	354,534	1,009,740	13.22
	75 - 79	0.2262	65,429	14,802	290,139	655,207	10.01
	80 - 84	0.3618	50,627	18,314	207,348	365,068	7.21
	85 - 89	0.5238	32,312	16,925	119,250	157,720	4.88
	90 or above	1.0000	15,388	15,388	38,470	38,470	2.50

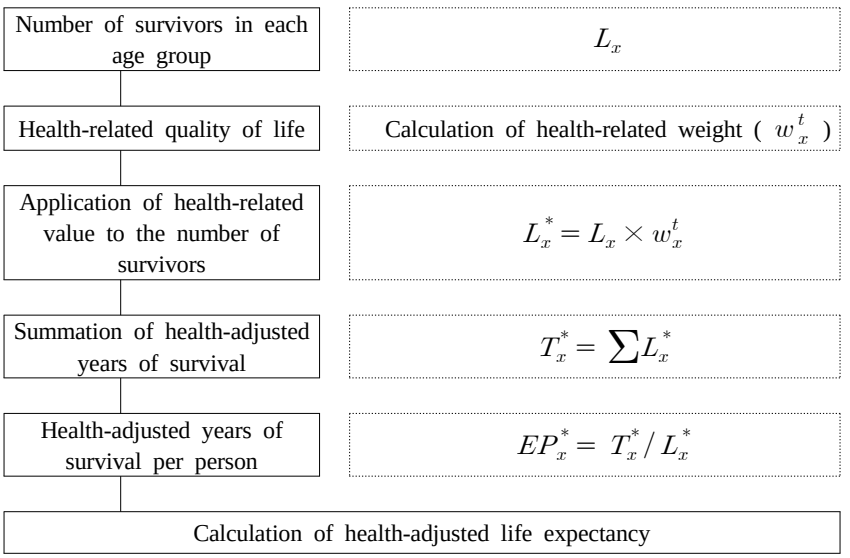
〈Table 2-3〉 Life table for female

Age		Death probability	No. of survivors	No. of deaths	Stationary population	Total years of survival	Life expectancy
Female	0	0.0031	100,000	314	99,733	8,292,273	82.92
	1 - 4	0.0009	99,686	91	398,560	8,192,540	82.18
	5 - 9	0.0005	99,594	54	497,838	7,793,980	78.26
	10 - 14	0.0006	99,541	55	497,566	7,296,142	73.30
	15 - 19	0.0011	99,486	111	497,150	6,798,576	68.34
	20 - 24	0.0019	99,375	189	496,399	6,301,425	63.41
	25 - 29	0.0027	99,185	266	495,261	5,805,026	58.53
	30 - 34	0.0031	98,919	307	493,828	5,309,765	53.68
	35 - 39	0.0037	98,612	365	492,149	4,815,937	48.84
	40 - 44	0.0047	98,247	460	490,087	4,323,789	44.01
	45 - 49	0.0067	97,787	659	487,289	3,833,702	39.20
	50 - 54	0.0091	97,128	886	483,428	3,346,412	34.45
	55 - 59	0.0130	96,243	1,253	478,081	2,862,985	29.75
	60 - 64	0.0204	94,990	1,938	470,105	2,384,904	25.11
	65 - 69	0.0360	93,052	3,348	456,892	1,914,799	20.58
	70 - 74	0.0665	89,705	5,967	433,606	1,457,907	16.25
	75 - 79	0.1282	83,738	10,733	391,856	1,024,302	12.23
	80 - 84	0.2326	73,005	16,982	322,569	632,446	8.66
	85 - 89	0.3937	56,023	22,059	224,967	309,877	5.53
	90 or above	1.0000	33,964	33,964	84,910	84,910	2.50

2. Methods of Health-Adjusted Life Expectancy

To calculate health-adjusted life expectancy (HALE), life expectancy is estimated in the above-mentioned way, and then, the weighted value of health-related quality of life is calculated and applied to the number of survivors. Next, the sum of the health-adjusted years of survival is divided by the number of survivors to draw life health-adjusted life expectancy.

[Figure 2-1] Methods for health-adjusted life expectancy



3. Health-Related Quality of Life

To calculate health-adjusted life expectancy, health-related quality of life should be applied to life expectancy. We used the report published by the Korea Health Panel in 2009.

The Korea Health Panel is a survey conducted by a consortium set up by the Korea Institute for Health and Social Affairs and the National Health Insurance Corporation, and it has generated annual data on individual health conditions, medical service use, medical expenses, etc. with 7,866 households as the original and ongoing sample since 2008. The survey covers information

on emergency service usage, hospitalization, outpatient service usage, chronic diseases, smoking, drinking, mobility, mental health, and quality of life.

Korea Health Panel uses EQ-5 for assessing health-related quality of life. EQ-5D is made of the five categories of “mobility”, “self-care”, “daily activities”, “pain/discomfort”, and “anxiety/depression”, with each category divided into three levels (no difficulty, slight difficulty, severe difficulty).

The overall results of the EQ-5D survey is shown in <Table 2-4> below. The No.1 health problem that the most number of respondents aged 18 and above admitted to suffer from was pain/discomfort, and the percentage of those on levels 2 and 3 was 28.11% and 1.43%, respectively. Next, respondents chose anxiety/depression (13.24%/0.49%), mobility (11.71%/0.23%), usual activities (7.14%/0.35%), and self-care (1.94%/0.20%) as their health problems in order of difficulty.

〈Table 2-4〉 Health profile: 2009

	Mobility	Self-care	Usual activities	Pain/ discomfort	Anxiety/ depression
Level 1	88.07	97.86	92.50	70.45	86.27
Level 2	11.71	1.94	7.14	28.11	13.24
Level 3	0.23	0.20	0.35	1.43	0.49

Age distribution of the five categories of EQ-5D is presented in <Table 2-5>. As expected, the respondents' subjective health conditions in the categories of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression appeared to deteriorate

as they get older. We could see that those aged 60 or older were especially vulnerable to pain/discomfort and mobility, with around 61% of respondents aged 70 years or above, and 44% of those in their 60s replying that they had experienced difficulty from pain/discomfort. Those who had slight or severe difficulties in mobility accounted for 21.85% among those in their 60s and 43.88% among those aged 70 or older.

〈Table 2-5〉 Health profile by age group

(Unit: %)

		18-29	30-39	40-49	50-59	60-69	70+
Mobility	Level 1	98.46	98.49	96.53	90.12	78.15	56.12
	Level 2	1.54	1.51	3.40	9.74	21.61	42.68
	Level 3	0.00	0.00	0.07	0.13	0.24	1.20
Self-care	Level 1	99.88	99.64	99.30	98.47	96.52	91.31
	Level 2	0.12	0.32	0.66	1.39	3.28	7.61
	Level 3	0.00	0.04	0.04	0.13	0.20	1.08
Usual activities	Level 1	98.59	98.45	97.42	93.53	86.04	75.21
	Level 2	1.41	1.51	2.44	6.29	13.42	23.21
	Level 3	0.00	0.04	0.15	0.18	0.54	1.59
Pain/ discomfort	Level 1	88.01	84.21	78.26	68.16	56.00	38.93
	Level 2	11.56	15.47	20.93	30.85	41.16	56.94
	Level 3	0.43	0.32	0.81	0.99	2.84	4.12
Anxiety/ depression	Level 1	86.36	89.34	88.93	87.34	83.64	78.63
	Level 2	13.21	10.30	10.74	12.30	15.73	20.36
	Level 3	0.43	0.36	0.33	0.36	0.64	1.01

Health profile for men and women divided into age groups showed that health problems increased on the whole as they grew older, and that women had poorer overall health conditions compared to men.

〈Table 2-6〉 Health profile by gender

(Unit: %)

			18-29	30-39	40-49	50-59	60-69	70+
Male	Mobility	Level 1	98.96	98.70	96.03	92.06	86.16	69.45
		Level 2	1.04	1.30	3.89	7.64	13.73	29.66
		Level 3	0.00	0.00	0.08	0.30	0.11	0.89
	Self-care	Level 1	100.00	99.54	98.81	98.29	96.76	92.55
		Level 2	0.00	0.37	1.11	1.51	3.14	7.00
		Level 3	0.00	0.09	0.08	0.20	0.11	0.45
	Usual activities	Level 1	99.11	98.05	96.90	93.37	90.92	80.48
		Level 2	0.89	1.86	2.86	6.33	8.65	18.33
		Level 3	0.00	0.09	0.24	0.30	0.43	1.19
	Pain/ discomfort	Level 1	91.10	88.12	81.59	74.97	68.32	55.29
		Level 2	8.75	11.51	17.78	24.22	30.05	42.92
		Level 3	0.15	0.37	0.63	0.80	1.62	1.79
	Anxiety/ depression	Level 1	90.36	92.20	90.56	89.35	88.32	83.90
		Level 2	9.05	7.52	9.13	10.25	11.24	15.80
		Level 3	0.59	0.28	0.32	0.40	0.43	0.30
Female	Mobility	Level 1	98.11	98.33	96.96	88.56	71.51	46.25
		Level 2	1.89	1.67	2.97	11.44	28.14	52.32
		Level 3	0.00	0.00	0.07	0.00	0.36	1.43
	Self-care	Level 1	99.79	99.72	99.72	98.62	96.33	90.40
		Level 2	0.21	0.28	0.28	1.30	3.41	8.06
		Level 3	0.00	0.00	0.00	0.08	0.27	1.55
	Usual activities	Level 1	98.22	98.75	97.86	93.67	81.99	71.30
		Level 2	1.78	1.25	2.07	6.25	17.38	26.82
		Level 3	0.00	0.00	0.07	0.08	0.63	1.88
	Pain/ discomfort	Level 1	85.83	81.28	75.36	62.66	45.79	26.82
		Level 2	13.54	18.44	23.67	36.20	50.36	67.33
		Level 3	0.63	0.28	0.97	1.14	3.85	5.85
	Anxiety/ depression	Level 1	83.53	87.20	87.51	85.71	79.75	74.72
		Level 2	16.16	12.39	12.15	13.96	19.44	23.73
		Level 3	0.31	0.42	0.35	0.32	0.81	1.55

To draw EQ-5D index, it is necessary to develop EQ-5D tariff. In Korea, a study on developing the weighted value for health-related quality of life (EQ-5D) of Korean people was

reported as shown in the table below (Kang Eun-jeong et al., 2006[3]; the Korea Center for Disease Control and Prevention, 2007; Cho Min-woo et al., 2008[4]).

〈Table 2-7〉 EQ-5D tariff in Korea

		Kang et al. (2006)	CDC (2007)	Cho et al. (2008)
Mobility	level 2	0.003*	0.096	0.056
	level 3	0.274	0.418	0.404
Self-care	level 2	0.058	0.046	0.081
	level 3	0.078	0.136	0.399
Usual activities	level 2	0.045	0.051	0.084
	level 3	0.134	0.208	0.301
Pain/discomfort	level 2	0.049	0.037	0.076
	level 3	0.132	0.151	0.297
Anxiety/depression	level 2	0.044	0.043	0.077
	level 3	0.102	0.158	0.391
Constant		0.164	0.050	0.019
N3		0.345	0.050	-0.242
I2sq[1)]		0.014	-	-
R-squared		0.4321	-	0.074

Note: 1) Square of (the number for level 2 - 1)
*) Statistically nonsignificant on the 5% level

EQ-5D index is drawn by taking the utility weights calculated using the regression coefficient in the above table as dependent variables, treating the values of five categories (levels 1 to 3) as dummy variables and applying the weights to the 243 combinations of health conditions as shown in the following formula.

3) Kang Eun-jeong et al., A Valuation of Health Status Using EQ-5D, Korea Institute for Health and Social Affairs & Management Center for Health Promotion, 2006

4) Cho et al. Estimating Quality Weights for EQ-5D Health States with the Time Trade-off Method in South Korea, Value In Health, 2008: 11(7)

Health condition = b0 + b1 × mobility_level2 + b2 × mobility_level3 + b3 × self-care_level2 + b4 × self-care_level3 + ...

In this study, the result of drawing EQ-5D index by applying EQ-5D tariff showed EQ-5D index of Model 2 to be highest at 0.945, followed by 0.940 of Model 3 and 0.903 of Model 1. The results show that EQ-5D index is lower for men than for women in general.

〈Table 2-8〉 EQ-5D index for Korean adults

		Mean	SD	Min	Max
Result of application of Korean weight	Model 1	0.903	0.155	-1.3	1.0
	Model 2	0.945	0.098	-0.3	1.0
	Model 3	0.940	0.104	0.1	1.0

Note: Model 1 applied regression coefficient from Kang, et al.(2006), Model 2 applied that from CDC (2007) and Model 3 applied that from Cho, et al.(2008) to the Korea Health Panel, and all the subjects are adults aged 18 and above.

〈Table 2-9〉 Health-related quality of life for Korean adults by gender and age

		18-29	30-39	40-49	50-59	60-69	70+
Male	Mean	0.941	0.939	0.926	0.892	0.828	0.746
	S.D	0.106	0.105	0.119	0.133	0.187	0.235
Female	Mean	0.963	0.959	0.940	0.919	0.899	0.839
	S.D	0.088	0.093	0.120	0.146	0.153	0.202
Total	Mean	0.950	0.948	0.933	0.904	0.860	0.786
	S.D	0.100	0.100	0.119	0.140	0.176	0.226

Note: Regression coefficient from Kang et al.(2006) was applied.

Among previous studies introducing regression coefficient for Korean adults, we chose the regression coefficient from Kang, et al.(2008) to draw health-adjusted life expectancy of Korean adults. As the EQ-5D questionnaire used by the Korea Health Panel was

developed for people aged 18 and above, we referred to Manuel (2004) for utility weight for people aged between 0 and 19.

〈Table 2-10〉 Utility weight for people aged below 20

	Male	Female	Total
0	0.97640	0.97460	0.97549
1 - 4	0.97640	0.97460	0.97549
5 - 9	0.97000	0.98570	0.97783
10 - 14	0.94780	0.94360	0.94574
15 - 19	0.93510	0.92870	0.93192

Note: Manuel DG, Schultz SE (2004)

4. Health-Adjusted Life Expectancy in Korea

Health-adjusted life expectancy drawn based on EQ-5D appeared to be 72.63 in 2009. Men's health-adjusted life expectancy was 71.38 while women's was 73.37. The difference in life expectancy between men and women was 6.12 years, and the difference in health-adjusted life expectancy was 1.99 years. The fact that the difference in health-adjusted life expectancy between men and women was much smaller than the difference in life expectancy shows that women are in a comparatively worse condition in terms of the years in which they lead healthy lives.

〈Table 2-11〉 Life expectancy and health-adjusted life expectancy

(Unit: years)

	Male	Female	Total
Life expectancy at age 0	76.80	82.92	80.67
Health-adjusted life expectancy at age 0	71.38	73.37	72.63
Difference in life expectancy between men and women	6.12		
Difference in health-adjusted life expectancy between men and women	1.99		

Concerning health-adjusted life expectancy for different age groups, the figure for a person aged 0 was 72.63, while that for a 30-year-old person was 44.74 and that for a 60-year-old was 18.88. The difference between health-adjusted life expectancy and life expectancy was 8.04 for a person aged 0, 6.79 for a person aged 30 and 5.04 for a person aged 60.

Health-adjusted life expectancy took up 90.04% of life expectancy at birth. For a 65-year-old person, the number of years she/he would spend in ill health accounted for 23.45% of the life expectancy.

〈Table 2-12〉 Differences between LE and HALE

(Unit: years)

Age	Life expectancy (LE)	Health-adjusted life expectancy	Difference bet. LE and HALE (years)	Difference bet. LE and HALE (%)
0	80.67	72.63	8.04	9.96
1	79.95	71.91	8.04	10.06
5	76.01	68.07	7.95	10.46
10	71.07	63.22	7.84	11.04
15	66.11	58.54	7.58	11.46
20	61.21	53.96	7.25	11.84
25	56.35	49.34	7.01	12.44
30	51.53	44.74	6.79	13.17

Age	Life expectancy (LE)	Health-adjusted life expectancy	Difference bet. LE and HALE (years)	Difference bet. LE and HALE (%)
35	46.72	40.16	6.56	14.05
40	41.95	35.64	6.32	15.06
45	37.27	31.21	6.06	16.27
50	32.71	26.94	5.77	17.64
55	28.26	22.82	5.45	19.27
60	23.92	18.88	5.04	21.08
65	19.75	15.12	4.63	23.45
70	15.86	11.77	4.09	25.79
75	12.35	8.84	3.51	28.39
80	9.30	6.33	2.97	31.98
85	6.87	4.03	2.84	41.32
90	5.20	2.13	3.07	58.99

There was a difference of 5.42 years between men's life expectancy and health-adjusted life expectancy (76.80 years and 71.38 years, respectively) at birth. Also, the proportion of health-adjusted life expectancy in life expectancy was 92.94%, which means 7.06% of their life would be spent in poor health conditions related to, for example, chronic diseases. Health-adjusted life expectancy at 45 for men was 34.34 years, and its difference from the life expectancy was 3.64 years. For men aged 65, health-adjusted life expectancy was 14.35 years and its gap with the life expectancy was 2.46 years.

〈Table 2-13〉 Health-adjusted life expectancy: Male

Age	Life expectancy (LE)	Health-adjusted life expectancy	Difference bet. LE and HALE (years)	Difference bet. LE and HALE (%)
0	76.80	71.38	5.42	7.06
5	72.15	66.82	5.33	7.39
10	67.21	62.03	5.18	7.71
15	62.26	57.33	4.93	7.91
20	57.37	52.76	4.61	8.04
25	52.53	48.13	4.40	8.37
30	47.72	43.52	4.20	8.80
35	42.93	38.88	4.05	9.44
40	38.21	34.34	3.87	10.13
45	33.61	29.97	3.64	10.82
50	29.18	25.78	3.40	11.66
55	24.91	21.78	3.13	12.57
60	20.77	18.02	2.75	13.24
65	16.81	14.35	2.46	14.63
70	13.22	11.10	2.11	16.00
75	10.01	8.44	1.58	15.74
80	7.21	6.13	1.08	15.03
85	4.88	4.30	0.58	11.88
90	2.50	2.17	0.33	13.20

The difference between life expectancy and health-adjusted life at birth for women was 9.55 years. The proportion of health-adjusted life expectancy om life expectancy was 88.48%, which was smaller than men's 92.94%. This shows that women suffer from diseases and health deterioration for longer periods than men.

Health-adjusted life expectancy at 45 was 31.82 years, shorter than the 34.34 years for men. On the other hand, health-adjusted life expectancy for women aged 65 was 15.10 years, slightly longer than the 14.35 years for men of the same age. This implies that women at age 65 would spend around 26.63% of their

remaining life in ill health.

〈Table 2-14〉 Health-adjusted life expectancy: Female

Age	Life expectancy (LE)	Health-adjusted life expectancy	Difference bet. LE and HALE (years)	Difference bet. LE and HALE (%)
0	82.92	73.37	9.55	11.52
5	78.26	68.79	9.47	12.10
10	73.30	63.90	9.40	12.82
15	68.34	59.21	9.12	13.35
20	63.41	54.63	8.78	13.84
25	58.53	50.01	8.51	14.55
30	53.68	45.41	8.27	15.41
35	48.84	40.85	7.99	16.36
40	44.01	36.33	7.68	17.45
45	39.20	31.82	7.39	18.85
50	34.45	27.45	7.01	20.33
55	29.75	23.16	6.59	22.15
60	25.11	19.01	6.09	24.27
65	20.58	15.10	5.48	26.63
70	16.25	11.60	4.65	28.64
75	12.23	8.40	3.84	31.35
80	8.66	5.67	3.00	34.60
85	5.53	3.03	2.50	45.21
90	2.50	0.60	1.90	76.10

Chapter

03

Gains in HALE after Eliminating Stroke and Risk Factors

Chapter 3

Gains in HALE after Eliminating Stroke and Risk Factors

1. Methods

The National Health Promotion Plan 2020 has set as one of its main goals the prevention of cardio-cerebrovascular diseases through improvement of self-care ability and prolonged treatment of predisposing diseases including hypertension, diabetes, and hyperlipidemia. Also, it aims to reduce deaths and disabilities related to cardio-cerebrovascular diseases through proper actions and treatment in pre-hospital and hospital stages when these diseases occur.

With continued increase in prevalence rates of hypertension and diabetes, which are predisposing diseases of cardio-cerebrovascular diseases, individual and social burdens created by these diseases are also growing. Although cardio-cerebrovascular diseases are not frequently observed in people younger than 30, their occurrence rapidly increases after 60 years of age and men tend to get these diseases at younger ages than women (British Heart Foundation, 2008). Likewise, cardio-cerebrovascular diseases are affected by non-modifiable factors such as age and sex, as well as modifiable factors such as cholesterol, smoking, drinking, hypertension, exercise and diabetes. Factors that affect cardio-cerebrovascular diseases include common diseases such as hypertension, diabetes and hyperlipidemia, and habitual factors such as smoking, drinking,

physical activities, and eating habits. Sociopsychological factors and environmental factors also influence cardio-cerebrovascular diseases. For example, Shinton and Beevers (1989) presented the result of meta-analysis on the relationship between smoking and strokes, and showed that the relative risk of strokes for smokers was at 1.5 (95% confidence interval 1.4~1.6). Relative risks for specific diseases were 1.9 for cerebral infarction and 2.9 for subarachnoid hemorrhage. In terms of different age groups, relative risk for people less than 55 was 2.9, while that for people between 55 and 75 was 1.8 and that for those older than 75 was 1.1. In addition, people who used to smoke appeared to have relative risk of 1.2 in all age groups.

In this part of the study, we would like to analyze the expected effects of the management of predisposing diseases to stroke through EQ-5D index, which was proposed as the overall goal of HP 2020. In this relation, we examined the increments in life expectancy and health-adjusted life expectancy when cause deletion was made.

Cause-deleted life table is made by assuming that a specific cause was completely deleted through prevention or treatment of the disease and calculating the mortality or death probability.

As a result of cause deletion, we can draw the healthy life expectancy adjusted by health-related quality of life in the case people live with diseases other than the specific disease that was prevented or treated. In this case, the figure is influenced by the number of patients with the specific disease, and thus, the weighted value of health-related quality of life, where the specific cause has been deleted is calculated according to the following formula:

$$EQ = \frac{EQ_t - (EQ_c \times P_c)}{1 - P_c}$$

EQ: Cause-deleted EQ
EQt: Total EQ
EQc: EQ of the specific cause (disease)
Pc: Prevalence of the specific cause

By applying the weighted value of health-related quality of life to life table and analyzing it in the above-mentioned way, cause-deleted health-adjusted life expectancy can be drawn.

2. Diabetes-eliminated HALE Gains

Diabetes leads to enormous costs related to the disease and deaths, and it brings considerable burden to the quality of life of those afflicted. Diabetes can be accompanied by various complications and premature deaths. In the long term, diabetes can lead to circulatory problems, renal failure and eye troubles, while at the same time, deteriorating the quality of life and increasing the use of medical services. Preventable hospitalization enhances diabetes complications. Moreover, diabetes patients are reported to experience severe limitation of activities and to be less healthy compared to those without the disease. Indices that measure health conditions of population groups are highly important means for development of health policies. Health-adjusted life expectancy (HALE) is a relatively new criterion showing people's health conditions in relation to mortality

rate and morbidity rate. HALE is drawn by excluding years spent in unhealthy state or with diseases from life expectancy. Diabetes is an important factor in evaluating a health index because it has potential influence on mortality and morbidity rates.

The following table shows the rate of mortality caused by diabetes in 2009. Mortality due to diabetes was 114.73 per 1,000 people for those in the 70-74 age group and 292.39 for those in the 80-84 age group, and men were found to have higher rate of mortality caused by diabetes than women.

〈Table 3-1〉 Mortality caused by diabetes: 2009

(Unit: 100,000 people)

Age	Male		Female		Total	
	No. of deaths	Mortality rate	No. of deaths	Mortality rate	No. of deaths	Mortality rate
0	0	0.00	0	0.00	0	0.00
1 - 4	0	0.00	0	0.00	0	0.00
5 - 9	1	0.07	0	0.00	1	0.04
10 - 14	1	0.06	1	0.06	2	0.06
15 - 19	0	0.00	3	0.18	3	0.09
20 - 24	1	0.06	4	0.27	5	0.16
25 - 29	6	0.30	12	0.63	18	0.46
30 - 34	19	0.96	11	0.58	30	0.77
35 - 39	41	1.78	15	0.68	56	1.24
40 - 44	93	4.19	35	1.63	128	2.93
45 - 49	235	10.60	58	2.71	293	6.73
50 - 54	355	18.30	87	4.55	442	11.47
55 - 59	387	29.27	136	10.20	523	19.69
60 - 64	479	46.00	200	18.31	679	31.83
65 - 69	704	80.11	513	49.55	1,217	63.58
70 - 74	927	143.40	815	93.48	1,742	114.73
75 - 79	805	229.63	1,049	172.38	1,854	193.30
80 - 84	528	320.68	1,033	279.78	1,561	292.39
85 - 89	281	409.45	614	340.16	895	359.25
90 or above	96	482.70	212	289.08	308	330.38

Source: KOSIS, Statistics Korea

Life expectancy at birth was measured to increase by 0.41 years to 81.08 years in the absence of diabetes-induced deaths. Life expectancy at birth for men was measured to be 76.80 years, which was found to increase by 0.35 years to 77.15 years in the absence of diabetes-related deaths. Life expectancy at birth for women, 82.92 years, would increase to 83.25 years in the absence of diabetes-related deaths.

〈Table 3-2〉 Life expectancy after eliminating diabetes

(Unit: years)

Age	Life expectancy			Diabetes-deleted life expectancy			Increment		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0	76.80	82.92	80.67	77.15	83.25	81.08	0.35	0.32	0.41
1	76.08	82.18	79.95	76.43	82.51	80.36	0.35	0.32	0.41
5	72.15	78.26	76.01	72.50	78.58	76.43	0.35	0.33	0.41
10	67.21	73.30	71.07	67.56	73.62	71.48	0.35	0.33	0.41
15	62.26	68.34	66.11	62.61	68.66	66.53	0.35	0.33	0.41
20	57.37	63.41	61.21	57.72	63.74	61.63	0.35	0.32	0.41
25	52.53	58.53	56.35	52.88	58.85	56.77	0.35	0.32	0.42
30	47.72	53.68	51.53	48.07	54.00	51.94	0.35	0.32	0.42
35	42.93	48.84	46.72	43.29	49.16	47.14	0.35	0.32	0.41
40	38.21	44.01	41.95	38.56	44.33	42.37	0.35	0.32	0.41
45	33.61	39.20	37.27	33.96	39.53	37.68	0.35	0.32	0.41
50	29.18	34.45	32.71	29.52	34.77	33.12	0.34	0.32	0.41
55	24.91	29.75	28.26	25.23	30.06	28.66	0.32	0.31	0.39
60	20.77	25.11	23.92	21.07	25.41	24.30	0.30	0.30	0.38
65	16.81	20.58	19.75	17.08	20.87	20.10	0.27	0.29	0.36
70	13.22	16.25	15.86	13.45	16.50	16.19	0.23	0.25	0.32
75	10.01	12.23	12.35	10.19	12.43	12.62	0.18	0.20	0.27
80	7.21	8.66	9.30	7.33	8.79	9.50	0.12	0.13	0.20
85	4.88	5.53	6.87	4.94	5.59	7.01	0.06	0.06	0.14
90	2.50	2.50	5.20	2.50	2.50	5.29	0.00	0.00	0.09

In the absence of diabetes deaths, HALE at birth would rise by 0.58 years to 73.21 years. This shows the absence of diabetes would increase HALE more than life expectancy in general, by 0.58 and 0.41 respectively. In the case of men, HALE at birth was 71.38, and it increased by 0.45 to 71.38 after cause deletion of diabetes. HALE at birth for women, 73.37, rose by 0.66 years to 74.03 in the absence of diabetes deaths.

〈Table 3-3〉 HALE after eliminating diabetes

(Unit: years)

Age	HALE (A)		Diabetes-deleted HALE (B)		Increment (B-A)	
	Male	Female	Male	Female	Male	Female
0	71.38	73.37	71.83	74.03	0.45	0.66
1	70.66	72.63	71.12	73.29	0.45	0.67
5	66.82	68.79	67.27	69.46	0.45	0.67
10	62.03	63.90	62.48	64.57	0.45	0.67
15	57.33	59.21	57.79	59.88	0.45	0.67
20	52.76	54.63	53.22	55.30	0.46	0.67
25	48.13	50.01	48.59	50.62	0.46	0.60
30	43.52	45.41	43.96	45.97	0.44	0.57
35	38.88	40.85	39.31	41.38	0.43	0.53
40	34.34	36.33	34.77	36.85	0.43	0.52
45	29.97	31.82	30.40	32.34	0.43	0.52
50	25.78	27.45	26.20	27.96	0.42	0.52
55	21.78	23.16	22.19	23.62	0.41	0.46
60	18.02	19.01	18.40	19.44	0.38	0.43
65	14.35	15.10	14.70	15.53	0.35	0.43
70	11.10	11.60	11.39	11.98	0.29	0.38
75	8.44	8.40	8.64	8.71	0.21	0.31
80	6.13	5.67	6.30	5.76	0.17	0.10
85	4.30	3.03	4.41	3.10	0.11	0.07
90	2.17	0.60	2.17	0.60	0.00	0.00

As shown above, the difference between life expectancy and health-adjusted life expectancy at birth in the absence of diabetes deaths was 7.87 years. Also, the proportion of their life in ill health was 9.71%. For men, the difference between life expectancy and HALE at the time of cause deletion of diabetes was 5.32, while that for women was larger at 9.21. The difference between life expectancy and HALE for men at age 65 was 2.38 after cause deletion of diabetes and 5.33 for women of the same age, with the proportion of years in ill health within remaining life at 13.94% for men and 25.57% for women.

〈Table 3-4〉 Differences between LE and HALE after diabetes deletion

(Unit: years, %)

Age	Difference (years) of life spent in ill health		Difference (%) of life spent in ill health	
	Male	Female	Male	Female
0	5.32	9.21	6.89	11.07
1	5.32	9.22	6.95	11.17
5	5.23	9.12	7.21	11.61
10	5.08	9.06	7.52	12.30
15	4.82	8.78	7.70	12.79
20	4.51	8.43	7.81	13.23
25	4.29	8.24	8.12	13.99
30	4.12	8.03	8.56	14.87
35	3.97	7.78	9.18	15.83
40	3.79	7.48	9.83	16.88
45	3.56	7.19	10.47	18.18
50	3.32	6.81	11.25	19.58
55	3.05	6.44	12.07	21.42
60	2.67	5.97	12.67	23.50
65	2.38	5.33	13.94	25.57
70	2.06	4.52	15.30	27.41
75	1.55	3.73	15.20	29.97
80	1.03	3.03	14.00	34.47
85	0.53	2.49	10.74	44.59
90	0.33	1.90	13.20	76.10

3. Hypertension-eliminated HALE Gains

Hypertension is one of the major risk factors for cardiovascular diseases. As demonstrated by WHO's report in 2002, 50% of cardiovascular diseases and 75% of strokes are caused by increases in blood pressure. Thus, hypertension is considered one of the key risk factors that bring deaths and disabilities.

Hypertension often leads to premature deaths or reduced life. Due to the high morbidity among the population with hypertension, reports on deaths and life expectancy are not sufficient to show the burden of the chronic disease. This report presents results related to health-adjusted life expectancy. HALE is an index that can be used as a health standard of people. Life expectancy is average years of survival during which people are expected to live, but HALE is life expectancy that reflects quality of living related to health. This integrates morbidity rate and mortality rate as a single index for people's health, and indicates the average years during which a person can live in healthy state. Assessment of the difference between life expectancy and HALE of people who suffer from hypertension and those who don't, proportion of years in unhealthy state and reduced lifespan helps us to understand how hypertension changes people's lives on the whole.

In 2009, the rate of mortality caused by diseases related to hypertension was 32.60 per 100,000 for people aged between 70 and 74, and 199.49 for those aged between 80 and 84. Women's mortality per 100,000 people due to diseases related to hypertension was lower than men's before 75, but after 75, women's mortality related to hypertension exceeded men's.

〈Table 3-5〉 Mortality due to hypertension

(Unit: 100,000 people)

Age	Male		Female		Total	
	No. of deaths	Mortality rate	No. of deaths	Mortality rate	No. of deaths	Mortality rate
0	0	0.00	0	0.00	0	0.00
1 - 4	0	0.00	0	0.00	0	0.00
5 - 9	0	0.00	0	0.00	0	0.00
10 - 14	0	0.00	0	0.00	0	0.00
15 - 19	0	0.00	0	0.00	0	0.00
20 - 24	0	0.00	0	0.00	0	0.00
25 - 29	3	0.15	0	0.00	3	0.08
30 - 34	3	0.15	2	0.11	5	0.13
35 - 39	8	0.35	6	0.27	14	0.31
40 - 44	15	0.68	8	0.37	23	0.53
45 - 49	32	1.44	8	0.37	40	0.92
50 - 54	59	3.04	22	1.15	81	2.10
55 - 59	76	5.75	36	2.70	112	4.22
60 - 64	100	9.60	43	3.94	143	6.70
65 - 69	140	15.93	115	11.11	255	13.32
70 - 74	223	34.50	272	31.20	495	32.60
75 - 79	243	69.32	488	80.19	731	76.22
80 - 84	265	160.95	800	216.67	1,065	199.49
85 - 89	230	335.14	806	446.53	1,036	415.85
90 or above	125	628.52	620	845.41	745	799.14

In the absence of hypertension-related deaths, life expectancy at birth was estimated to increase by 0.22 years to 80.90 years on average, by 0.10 years to 76.90 years for men, and by 0.17 years to 83.07 years for women.

〈Table 3-6〉 Life expectancy in the absence of hypertension-related deaths

(Unit: years)

Age	Life expectancy		Life expectancy in the absence of hypertension-related deaths		Increment	
	Male	Female	Male	Female	Male	Female
0	76.80	82.92	76.90	83.09	0.10	0.17
1	76.08	82.18	76.18	82.35	0.10	0.17
5	72.15	78.26	72.25	78.42	0.10	0.17
10	67.21	73.30	67.31	73.46	0.10	0.17
15	62.26	68.34	62.36	68.50	0.10	0.17
20	57.37	63.41	57.47	63.58	0.10	0.17
25	52.53	58.53	52.63	58.69	0.10	0.17
30	47.72	53.68	47.82	53.84	0.10	0.17
35	42.93	48.84	43.03	49.00	0.10	0.17
40	38.21	44.01	38.31	44.18	0.10	0.17
45	33.61	39.20	33.71	39.37	0.10	0.17
50	29.18	34.45	29.28	34.62	0.10	0.17
55	24.91	29.75	25.01	29.91	0.10	0.17
60	20.77	25.11	20.86	25.27	0.10	0.17
65	16.81	20.58	16.91	20.74	0.09	0.16
70	13.22	16.25	13.31	16.41	0.09	0.16
75	10.01	12.23	10.09	12.38	0.08	0.15
80	7.21	8.66	7.28	8.79	0.07	0.12
85	4.88	5.53	4.93	5.60	0.05	0.07
90	2.50	2.50	2.50	2.50	0.00	0.00

HALE at birth in the absence of hypertension-related diseases was found to rise by 0.95 years to 73.59 years, an increase greater than in the case of life expectancy. The absence of hypertension-related deaths was measured to increase HALE at birth by 0.44 years to 71.82 years for men and by 0.83 years to 74.20 years for women.

〈Table 3-7〉 HALE in the absence of hypertension-related diseases

(Unit: years)

Age	HALE		HALE in the absence of hypertension-related deaths		Increment	
	Male	Female	Male	Female	Male	Female
0	71.38	73.37	71.82	74.20	0.44	0.83
1	70.66	72.63	71.11	73.46	0.44	0.83
5	66.82	68.79	67.26	69.63	0.44	0.84
10	62.03	63.90	62.47	64.73	0.44	0.84
15	57.33	59.21	57.77	60.05	0.44	0.84
20	52.76	54.63	53.21	55.47	0.44	0.84
25	48.13	50.01	48.58	50.85	0.45	0.84
30	43.52	45.41	43.97	46.25	0.45	0.84
35	38.88	40.85	39.33	41.69	0.45	0.84
40	34.34	36.33	34.79	37.17	0.45	0.84
45	29.97	31.82	30.43	32.66	0.46	0.85
50	25.78	27.45	26.22	28.29	0.44	0.84
55	21.78	23.16	22.24	23.96	0.46	0.80
60	18.02	19.01	18.45	19.80	0.43	0.79
65	14.35	15.10	14.76	15.90	0.41	0.80
70	11.10	11.60	11.54	12.29	0.43	0.69
75	8.44	8.40	8.70	9.09	0.26	0.70
80	6.13	5.67	6.55	6.26	0.42	0.60
85	4.30	3.03	4.55	3.46	0.25	0.43
90	2.17	0.60	2.27	0.92	0.10	0.32

As seen above, the difference between life expectancy at birth and HALE at birth in the absence of hypertension-related diseases was 7.31 years. The proportion of life in ill health was around 9.04%. The difference was 5.08 years for men and 8.89 years for women. In the case of men aged 65, the difference between the two life expectancies after the cause deletion was 2.14, while the difference for women of the same age was 4.84. The proportion of life that they should spend in ill health was 12.69% for men aged 65 and 23.33% for women of the same age.

〈Table 3-8〉 Difference between life expectancy and HALE after deletion of hypertension-related diseases

(Unit: years)

Age	Difference (years) of life spent in ill health		Difference (%) of life spent in ill health	
	Male	Female	Male	Female
0	5.08	8.89	6.61	10.70
1	5.08	8.89	6.66	10.80
5	4.99	8.80	6.90	11.22
10	4.84	8.73	7.19	11.88
15	4.58	8.45	7.35	12.34
20	4.27	8.10	7.42	12.75
25	4.05	7.84	7.70	13.36
30	3.85	7.60	8.06	14.11
35	3.71	7.31	8.61	14.92
40	3.52	7.01	9.19	15.86
45	3.28	6.71	9.73	17.04
50	3.06	6.33	10.44	18.28
55	2.77	5.96	11.07	19.91
60	2.41	5.47	11.57	21.65
65	2.14	4.84	12.69	23.33
70	1.77	4.12	13.29	25.11
75	1.39	3.29	13.79	26.54
80	0.73	2.52	10.01	28.72
85	0.38	2.14	7.67	38.22
90	0.23	1.58	9.19	63.22

4. Stroke-eliminated HALE Gains

Concerning the mortality caused by cerebrovascular diseases in 2009, it was 260.09 per 100,000 for people aged from 70 to 74, and 900.06 for those aged from 80 to 84. Men appeared to have higher mortality rate caused by cerebrovascular diseases than women.

〈Table 3-9〉 Mortality caused by stroke

(Unit: 100,000 people)

Age	Male		Female		Total	
	No. of deaths	Mortality rate	No. of deaths	Mortality rate	No. of deaths	Mortality rate
0	6	2.61	2	0.94	8	1.81
1 - 4	1	0.11	3	0.34	4	0.22
5 - 9	3	0.22	1	0.08	4	0.15
10 - 14	5	0.29	1	0.06	6	0.18
15 - 19	8	0.43	6	0.37	14	0.40
20 - 24	18	1.10	6	0.40	24	0.77
25 - 29	17	0.85	24	1.27	41	1.05
30 - 34	45	2.28	32	1.68	77	1.99
35 - 39	151	6.57	51	2.32	202	4.49
40 - 44	257	11.57	118	5.48	375	8.57
45 - 49	472	21.29	196	9.17	668	15.34
50 - 54	587	30.26	305	15.94	892	23.15
55 - 59	667	50.45	255	19.12	922	34.72
60 - 64	915	87.86	457	41.85	1,372	64.31
65 - 69	1,612	183.43	904	87.32	2,516	131.45
70 - 74	2,231	345.11	1,718	197.05	3,949	260.09
75 - 79	2,167	618.14	2,663	437.60	4,830	503.59
80 - 84	1,877	1,139.99	2,933	794.37	4,810	900.96
85 - 89	1,178	1,716.50	2,325	1,288.07	3,503	1,406.09
90 or above	431	2,167.14	1,187	1,618.56	1,618	1,735.59

Note: Cerebrovascular diseases (I60-I69)

Life expectancy after cause deletion of cerebrovascular diseases at age 0 was 81.86, 1.19 up from the general life expectancy of 80.67. For men, life expectancy in general of 76.80 at age 0 was expected to rise by 0.91 to 77.71 after cause deletion of cerebrovascular diseases. In the case of women, life expectancy of 82.92 at age 0 was estimated to increase to 83.77 after the cause deletion, showing an increment of 0.84.

〈Table 3-10〉 Life expectancy after stroke deletion

(Unit: years)

Age	Life expectancy		Life expectancy after cause deletion		Increment	
	Male	Female	Male	Female	Male	Female
0	76.80	82.92	77.71	83.77	0.91	0.84
1	76.08	82.18	76.99	83.03	0.91	0.85
5	72.15	78.26	73.06	79.10	0.91	0.85
10	67.21	73.30	68.12	74.14	0.91	0.85
15	62.26	68.34	63.17	69.18	0.91	0.85
20	57.37	63.41	58.28	64.26	0.91	0.85
25	52.53	58.53	53.44	59.37	0.91	0.85
30	47.72	53.68	48.63	54.52	0.91	0.85
35	42.93	48.84	43.85	49.68	0.91	0.84
40	38.21	44.01	39.11	44.85	0.90	0.84
45	33.61	39.20	34.50	40.04	0.89	0.83
50	29.18	34.45	30.06	35.28	0.87	0.82
55	24.91	29.75	25.77	30.55	0.86	0.80
60	20.77	25.11	21.59	25.89	0.83	0.79
65	16.81	20.58	17.60	21.33	0.79	0.75
70	13.22	16.25	13.93	16.95	0.71	0.70
75	10.01	12.23	10.61	12.83	0.60	0.59
80	7.21	8.66	7.66	9.09	0.45	0.42
85	4.88	5.53	5.12	5.74	0.24	0.21
90	2.50	2.50	2.50	2.50	0.00	0.00

Health-adjusted life expectancy at 0 was 72.63, while after cause deletion of cerebrovascular diseases, it grew by 0.97 to 73.60. The increment in life expectancy after the cause deletion was 1.19 compared to that of 0.97 in HALE, indicating that life expectancy increased further than HALE. Among men aged 0, HALE in general was 71.38, and it rose by 1.04 to 72.42 by deleting the cause of cerebrovascular diseases. As for women, HALE of 73.37 at age 0 grew to 74.38 after the cause deletion, with an increment of 1.01.

〈Table 3-11〉 Health-adjusted life expectancy after stroke deletion

(Unit: years)

Age	HALE		HALE after cause deletion		Increment	
	Male	Female	Male	Female	Male	Female
0	71.38	73.37	72.42	74.38	1.04	1.01
1	70.66	72.63	71.70	73.64	1.04	1.01
5	66.82	68.79	67.86	69.80	1.04	1.01
10	62.03	63.90	63.06	64.91	1.04	1.01
15	57.33	59.21	58.37	60.23	1.04	1.01
20	52.76	54.63	53.80	55.65	1.04	1.01
25	48.13	50.01	49.17	51.03	1.04	1.01
30	43.52	45.41	44.56	46.42	1.04	1.01
35	38.88	40.85	39.92	41.86	1.04	1.01
40	34.34	36.33	35.37	37.34	1.03	1.01
45	29.97	31.82	30.99	32.81	1.02	0.99
50	25.78	27.45	26.78	28.43	1.00	0.98
55	21.78	23.16	22.75	24.13	0.97	0.97
60	18.02	19.01	18.91	19.97	0.89	0.95
65	14.35	15.10	15.22	15.99	0.86	0.89
70	11.10	11.60	11.89	12.44	0.79	0.84
75	8.44	8.40	9.10	9.12	0.67	0.72
80	6.13	5.67	6.57	5.95	0.45	0.28
85	4.30	3.03	4.55	3.17	0.24	0.14
90	2.17	0.60	2.17	0.60	0.00	0.00

As seen above, the difference between life expectancy and health-adjusted life expectancy after cause deletion of cerebrovascular diseases was 8.26 years at age 0, which means that these people would spend an average of 8.26 years of their life in ill health. The proportion of life in ill health was estimated to be around 10.09%. In men's case, the difference between life expectancy and HALE after cause deletion of cerebrovascular diseases was 5.30 years, and in women's case, the difference was 9.39 years, which was much larger than men's. For men

aged 65, the difference between the two types of life expectancies after cause deletion of cerebrovascular diseases was 2.38, while in the case of women of the same age, the difference was 5.35. The proportion of remaining years in ill health was 13.54% for men and 25.06% for women at this age.

〈Table 3-12〉 Differences between LE and HALE after stroke deletion

(Unit: years, %)

Age	Difference (years) of life spent in ill health		Difference (%) of life spent in ill health	
	Male	Female	Male	Female
0	5.30	9.39	6.82	11.21
1	5.29	9.39	6.87	11.31
5	5.20	9.30	7.12	11.76
10	5.06	9.23	7.42	12.46
15	4.80	8.96	7.60	12.95
20	4.48	8.61	7.69	13.40
25	4.27	8.35	7.99	14.06
30	4.07	8.10	8.37	14.86
35	3.92	7.82	8.95	15.75
40	3.74	7.52	9.56	16.76
45	3.51	7.23	10.18	18.06
50	3.28	6.85	10.90	19.40
55	3.02	6.42	11.70	21.02
60	2.68	5.93	12.43	22.89
65	2.38	5.35	13.54	25.06
70	2.04	4.51	14.64	26.63
75	1.51	3.71	14.22	28.89
80	1.09	3.14	14.24	34.53
85	0.58	2.57	11.26	44.77
90	0.33	1.90	13.20	76.10

Meanwhile, mortality caused by heart diseases in 2009 was 119.93 per 100,000 people for people aged between 70 and 74,

and 405.15 for those between 80 and 84. Men showed higher rate of mortality caused by heart diseases compared to women.

〈Table 3-13〉 Mortality caused by heart diseases

(Unit: 100,000 years)

Age	Male		Female		Total	
	No. of deaths	Mortality rate	No. of deaths	Mortality rate	No. of deaths	Mortality rate
0	0	0.00	0	0.00	0	0.00
1 - 4	0	0.00	0	0.00	0	0.00
5 - 9	1	0.07	1	0.08	2	0.08
10 - 14	0	0.00	0	0.00	0	0.00
15 - 19	4	0.22	4	0.25	8	0.23
20 - 24	3	0.18	1	0.07	4	0.13
25 - 29	19	0.95	2	0.11	21	0.54
30 - 34	44	2.23	3	0.16	47	1.21
35 - 39	111	4.83	14	0.64	125	2.78
40 - 44	227	10.22	34	1.58	261	5.97
45 - 49	369	16.64	49	2.29	418	9.60
50 - 54	536	27.63	95	4.97	631	16.38
55 - 59	563	42.59	97	7.27	660	24.85
60 - 64	610	58.58	188	17.21	798	37.40
65 - 69	897	102.07	363	35.06	1,260	65.83
70 - 74	1,065	164.74	756	86.71	1,821	119.93
75 - 79	980	279.55	1,178	193.58	2,158	225.00
80 - 84	827	502.28	1,336	361.84	2,163	405.15
85 - 89	531	773.74	1,083	599.99	1,614	647.85
90 or above	431	2,167.14	1,187	1,618.56	1,618	1,735.59

Note: Ischemic heart diseases (I20-I25)

Life expectancy in general was 80.67 for people aged 0, but after cause deletion of heart diseases, it rose by 0.64 to 81.31. For men of age 0, the overall life expectancy of 76.80 was expected to grow by 0.49 to 77.30. In the case of women aged 0, their life expectancy of 82.92 increased to 83.27 after the

cause deletion, showing an increment of 0.35.

〈Table 3-14〉 Life expectancy after cause deletion of heart diseases

(Unit: years)

Age	Life expectancy		Life expectancy after cause deletion		Increment	
	Male	Female	Male	Female	Male	Female
0	76.80	82.92	77.30	83.27	0.49	0.35
1	76.08	82.18	76.58	82.54	0.50	0.35
5	72.15	78.26	72.64	78.61	0.50	0.35
10	67.21	73.30	67.70	73.65	0.50	0.35
15	62.26	68.34	62.75	68.69	0.50	0.35
20	57.37	63.41	57.87	63.76	0.50	0.35
25	52.53	58.53	53.03	58.88	0.50	0.35
30	47.72	53.68	48.22	54.03	0.50	0.35
35	42.93	48.84	43.43	49.19	0.49	0.35
40	38.21	44.01	38.69	44.36	0.49	0.35
45	33.61	39.20	34.08	39.56	0.47	0.35
50	29.18	34.45	29.64	34.80	0.46	0.35
55	24.91	29.75	25.34	30.09	0.43	0.35
60	20.77	25.11	21.16	25.45	0.40	0.34
65	16.81	20.58	17.18	20.91	0.36	0.33
70	13.22	16.25	13.53	16.56	0.31	0.31
75	10.01	12.23	10.28	12.50	0.26	0.26
80	7.21	8.66	7.41	8.85	0.20	0.19
85	4.88	5.53	4.99	5.63	0.11	0.10
90	2.50	2.50	2.50	2.50	0.00	0.00

Note: Ischemic heart diseases (I20-I25)

Cause deletion of heart diseases is estimated to bring an increment of 0.50 in HALE from 72.63 to 73.14 at age 0. Increment in life expectancy after the cause deletion was 0.64, which was bigger than 0.50 of that in HALE. Men's HALE at age 0 was 71.38, and it grew 0.43 to 71.82 after the cause of heart diseases was deleted. For women, whose HALE was 73.37 at age 0,

the cause deletion led to an increase of 0.40 to 73.76.

〈Table 3-15〉 Health-adjusted life expectancy after cause deletion of heart diseases

(Unit: years)

Age	HALE		HALE after cause deletion		Increment	
	Male	Female	Male	Female	Male	Female
0	71.38	73.37	71.82	73.76	0.43	0.40
1	70.66	72.63	71.10	73.02	0.43	0.40
5	66.82	68.79	67.25	69.19	0.44	0.40
10	62.03	63.90	62.46	64.30	0.44	0.40
15	57.33	59.21	57.77	59.61	0.44	0.40
20	52.76	54.63	53.20	55.03	0.44	0.40
25	48.13	50.01	48.57	50.41	0.44	0.40
30	43.52	45.41	43.96	45.81	0.44	0.40
35	38.88	40.85	39.31	41.25	0.43	0.40
40	34.34	36.33	34.76	36.73	0.43	0.40
45	29.97	31.82	30.39	32.21	0.42	0.40
50	25.78	27.45	26.18	27.84	0.40	0.39
55	21.78	23.16	22.16	23.54	0.38	0.38
60	18.02	19.01	18.37	19.38	0.35	0.37
65	14.35	15.10	14.69	15.45	0.33	0.35
70	11.10	11.60	11.41	11.92	0.30	0.32
75	8.44	8.40	8.66	8.68	0.23	0.28
80	6.13	5.67	6.29	5.83	0.16	0.16
85	4.30	3.03	4.44	3.13	0.14	0.10
90	2.17	0.60	2.17	0.60	0.00	0.00

Note: Ischemic heart diseases (I20-I25)

As shown above, difference between life expectancy and health-adjusted life expectancy after cause deletion of heart diseases was 8.18 years for people aged 0, which means that they would spend 8.18 years of their life in ill health. The proportion of life spent in ill health was estimated at around 10.06%. In men's case, the difference between life expectancy and HALE

after the cause deletion was 5.48 while that for women was 9.51, with women showing larger difference. Difference between the two life expectancies for men aged 65 after cause deletion of heart diseases was 2.49 compared to that of women at 5.45, and the proportions of remaining years that they should spend in ill health were 14.49% for men and 26.09% for women at age 65.

〈Table 3-16〉 Difference between life expectancy and HALE after cause deletion of heart diseases

(Unit: years, %)

Age	Difference (years) of life spent in ill health		Difference (%) of life spent in ill health	
	Male	Female	Male	Female
0	5.48	9.51	7.09	11.42
1	5.48	9.51	7.16	11.53
5	5.39	9.42	7.42	11.99
10	5.24	9.36	7.75	12.70
15	4.99	9.08	7.95	13.22
20	4.67	8.73	8.07	13.69
25	4.46	8.47	8.41	14.38
30	4.26	8.23	8.84	15.22
35	4.12	7.94	9.48	16.15
40	3.93	7.64	10.16	17.21
45	3.70	7.34	10.84	18.56
50	3.46	6.97	11.67	20.01
55	3.19	6.55	12.57	21.78
60	2.79	6.06	13.20	23.83
65	2.49	5.45	14.49	26.09
70	2.12	4.64	15.70	28.01
75	1.61	3.82	15.69	30.55
80	1.11	3.02	15.05	34.16
85	0.55	2.50	10.94	44.41
90	0.33	1.90	13.20	76.10

Note: Ischemic heart diseases (I20-I25)

Mortality caused by cardio-cerebrovascular diseases in 2009 was 498.18 per 100,000 people in the 70-74 age group and

1,858.68 in the 80-84 age group. In addition, men appeared to have higher rate of mortality per 100,000 people from cardio-cerebrovascular diseases than women.

〈Table 3-17〉 Mortality caused by cardio-cerebrovascular diseases

(Unit: 100,000 people)

Age	Male		Female		Total	
	No. of deaths	Mortality rate	No. of deaths	Mortality rate	No. of deaths	Mortality rate
0	21	9.15	18	8.43	39	8.80
1 - 4	4	0.43	9	1.02	13	0.71
5 - 9	7	0.51	11	0.86	18	0.68
10 - 14	15	0.86	8	0.51	23	0.69
15 - 19	29	1.56	19	1.16	48	1.38
20 - 24	45	2.75	15	1.00	60	1.91
25 - 29	101	5.05	47	2.48	148	3.80
30 - 34	172	8.72	59	3.10	231	5.96
35 - 39	394	17.15	103	4.68	497	11.05
40 - 44	676	30.43	210	9.75	886	20.25
45 - 49	1,144	51.59	322	15.07	1,466	33.66
50 - 54	1,504	77.54	519	27.13	2,023	52.51
55 - 59	1,610	121.78	498	37.35	2,108	79.38
60 - 64	1,988	190.90	881	80.67	2,869	134.48
65 - 69	3,155	359.01	1,719	166.05	4,874	254.64
70 - 74	4,183	647.06	3,381	387.79	7,564	498.18
75 - 79	4,071	1,161.26	5,217	857.30	9,288	968.40
80 - 84	3,597	2,184.63	6,326	1,713.32	9,923	1,858.68
85 - 89	2,420	3,526.26	5,384	2,982.78	7,804	3,132.49
90 or above	990	4,977.88	3,377	4,604.77	4,367	4,684.37

Concerning life expectancy after cause deletion of cardio-cerebrovascular diseases, it was 80.67 for people aged 0, while after the cause deletion, it increased 2.87 years to 83.55. For men of age 0, life expectancy after cause deletion of cardio-vascular diseases was expected to rise 1.97 years from

76.80 to 78.78. For women aged 0, the general life expectancy of 82.92 was estimated to grow to 84.74, with an increment of 1.81 years.

〈Table 3-18〉 Life expectancy after cause deletion of cardio-cerebrovascular diseases

(Unit: years)

Age	Life expectancy		Life expectancy after cause deletion		Increment	
	Male	Female	Male	Female	Male	Female
0	76.80	82.92	78.78	84.74	1.97	1.81
1	76.08	82.18	78.06	84.00	1.97	1.81
5	72.15	78.26	74.12	80.07	1.97	1.81
10	67.21	73.30	69.18	75.11	1.97	1.81
15	62.26	68.34	64.23	70.14	1.97	1.81
20	57.37	63.41	59.34	65.22	1.97	1.80
25	52.53	58.53	54.50	60.33	1.97	1.80
30	47.72	53.68	49.68	55.48	1.96	1.80
35	42.93	48.84	44.89	50.64	1.95	1.80
40	38.21	44.01	40.14	45.80	1.93	1.80
45	33.61	39.20	35.50	40.99	1.89	1.78
50	29.18	34.45	31.02	36.22	1.84	1.77
55	24.91	29.75	26.69	31.48	1.78	1.74
60	20.77	25.11	22.46	26.81	1.69	1.70
65	16.81	20.58	18.41	22.22	1.59	1.64
70	13.22	16.25	14.65	17.78	1.43	1.53
75	10.01	12.23	11.24	13.56	1.22	1.33
80	7.21	8.66	8.14	9.65	0.93	0.99
85	4.88	5.53	5.39	6.04	0.51	0.51
90	2.50	2.50	2.50	2.50	0.00	0.00

Health-adjusted life expectancy of 72.63 at age 0 appeared to increase 3.02 years to 75.66 after cause deletion of cardio-cerebrovascular diseases. While life expectancy grew by 2.87 years after the cause deletion, HALE grew by 3.02 years, indicating that HALE rose further than life expectancy. HALE

for men at age 0 was 71.38, and after the cause deletion, it increased to 73.69, with a gain of 2.31 years in life. For women, HALE of 73.37 at age 0 increased to 75.56 after the cause deletion of cardio-cerebrovascular diseases, rising by 2.19 years.

〈Table 3-19〉 Health-adjusted life expectancy after cause deletion of cardio-cerebrovascular diseases

(Unit: years)

Age	HALE		HALE after cause deletion		Increment	
	Male	Female	Male	Female	Male	Female
0	71.38	73.37	73.69	75.56	2.31	2.19
1	70.66	72.63	72.97	74.82	2.31	2.19
5	66.82	68.79	69.13	70.98	2.31	2.19
10	62.03	63.90	64.34	66.09	2.31	2.19
15	57.33	59.21	59.64	61.41	2.31	2.19
20	52.76	54.63	55.07	56.83	2.31	2.19
25	48.13	50.01	50.44	52.21	2.31	2.19
30	43.52	45.41	45.83	47.60	2.31	2.19
35	38.88	40.85	41.17	43.04	2.29	2.19
40	34.34	36.33	36.60	38.51	2.27	2.18
45	29.97	31.82	32.21	33.99	2.24	2.18
50	25.78	27.45	27.96	29.60	2.18	2.15
55	21.78	23.16	23.91	25.25	2.13	2.09
60	18.02	19.01	20.04	21.04	2.02	2.03
65	14.35	15.10	16.27	17.06	1.91	1.96
70	11.10	11.60	12.89	13.39	1.79	1.79
75	8.44	8.40	9.84	10.00	1.40	1.60
80	6.13	5.67	7.31	6.91	1.18	1.25
85	4.30	3.03	4.94	3.80	0.64	0.77
90	2.17	0.60	2.27	0.81	0.10	0.21

As shown above, difference between life expectancy and HALE after cause deletion of cardio-cerebrovascular diseases was 7.89 years for people aged 0, which means that they would spend 7.89 years in poor health. The proportion of years spent in

unhealthy state was estimated at around 9.44%. Among men, the difference between life expectancy and health-adjusted life expectancy was 5.09 years after the cause deletion, which was smaller compared to 9.17 years for women. The difference between the two life expectancies was 2.14 years for men aged 65 and 5.15 years for women, with the proportion of remaining years in ill health at 11.62% for men and 23.20% for women.

〈Table 3-20〉 Difference between life expectancy and HALE after cause deletion of cardio-cerebrovascular diseases

(Unit: years, %)

Age	Difference (years) of life spent in ill health		Difference (%) of life spent in ill health	
	Male	Female	Male	Female
0	5.09	9.17	6.46	10.83
1	5.08	9.18	6.51	10.92
5	4.99	9.08	6.74	11.34
10	4.85	9.02	7.01	12.00
15	4.59	8.74	7.15	12.46
20	4.27	8.39	7.20	12.87
25	4.06	8.13	7.45	13.47
30	3.86	7.88	7.77	14.21
35	3.72	7.60	8.28	15.01
40	3.53	7.29	8.80	15.92
45	3.29	6.99	9.27	17.06
50	3.06	6.62	9.87	18.27
55	2.78	6.24	10.43	19.81
60	2.42	5.77	10.79	21.52
65	2.14	5.15	11.62	23.20
70	1.76	4.39	12.01	24.70
75	1.40	3.56	12.43	26.24
80	0.84	2.74	10.27	28.36
85	0.45	2.24	8.43	37.07
90	0.23	1.69	9.19	67.60

Chapter

04

Summary and Conclusion

Chapter 4

Summary and Conclusion

1. Differences between Life Expectancy and Health-Adjusted Life Expectancy

In this study, we calculated life expectancy based on the mortality rate and number of population announced by the Statistics Korea, and analyzed health-adjusted life expectancy using the results of the survey on health-related quality of life reported by the Korea Health Panel. The results of analysis showed that life expectancy for infants born in 2009 was 80.67 years, and concerning different genders, life expectancy for boys was 76.99 and that for women was 83.77. More detailed results can be seen in the table below:

〈Table 4-1〉 Life expectancy by gender and age in Korea

Gender	Male			Female		
Age	0	40	60	0	40	60
Life expectancy	76.80	38.21	20.77	82.92	44.01	25.11

Meanwhile, health-adjusted life expectancy of Korean people estimated through analysis using the results of the Korea Health Panel's survey on health-related quality of life was 72.63 in 2009. For men, it was 71.38 years, and for women, it was 73.37 years. While there was a difference of 6.12 years in life expectancy between men and women, the difference in HALE between two

genders was 1.99 years.

〈Table 4-2〉 Differences between LE and HALE in Korea

	Male	Female	Total
Life expectancy at age 0	76.80	82.92	80.67
HALE at age 0	71.38	73.37	72.63
Difference in life expectancy between men and women	6.12		
Difference in HALE between men and women	1.99		

Proportion of health-adjusted life expectancy within life expectancy was estimated at 9.96% at age 0, which implies that around 10% of life time would be spent under diseases. For people aged 65, 23.45% of the remaining years of life expectancy appeared to be in morbidity. Difference between Korean people's life expectancy and HALE can be summarized as follows:

〈Table 4-3〉 Difference between LE and HALE by age and sex

Total	Life expectancy	HALE	Difference between HALE and life expectancy in years	Difference between HALE and life expectancy in %
0	80.67	72.63	8.04	9.96
40	41.95	35.64	6.32	15.06
65	19.75	15.12	4.63	23.45
Male	Life expectancy	HALE	Difference between HALE and life expectancy in years	Difference between HALE and life expectancy in %
0	76.80	71.38	5.42	7.06
40	38.21	34.34	3.87	10.13
65	16.81	14.35	2.46	14.63
Female	Life expectancy	HALE	Difference between HALE and life expectancy in years	Difference between HALE and life expectancy in %
0	82.92	73.37	9.55	11.52
40	44.01	36.33	7.68	17.45
65	20.58	15.10	5.48	26.63

The National Health Promotion Plan 2020 sets prevention of cardio-cerbrovascular diseases through enhanced self-care ability and continued treatment of predisposing diseases including hypertension, diabetes, and hyperlipidemia as its main goal. The study aimed at estimating the expected effects of the outcomes of the HP2020 by analyzing the increments in life expectancy and health-adjusted life expectancy expected to be gained through management of predisposing diseases of cardio-cerebrovascular diseases.

When the cause deletion of diabetes was made, an increase of 0.35 years in life expectancy was expected for men, and an increase of 0.35 years was expected for women. Increments in health-adjusted life expectancy appeared to be 0.45 years for men and 0.66 years for women.

In the case of cause deletion of hypertension, the increase in life expectancy was 0.1 years for men and 0.17 years for women, whereas that of HALE appeared to be 0.44 years and 0.83 years for men and women respectively. We could see that cause deletion of hypertension had larger impact on the increase in HALE than life expectancy.

Meanwhile, when the cause of cerebrovascular diseases was deleted, increments in life expectancy were estimated at 0.91 years for men and 0.84 years for women. The increments in HALE were expected to be 1.04 years and 1.01 years for men and women, respectively.

Concerning heart diseases, the cause deletion appeared to add 0.49 years for men and 0.35 years for women in life expectancy, and 0.43 years and 0.40 years respectively in HALE.

Cause deletion of cardio-cerebrovascular diseases was

estimated to bring increases of 1.97 years in life expectancy for men and 1.81 years for women, and 2.31 years and 2.19 years in HALE for respective sexes.

As shown in the table below, in men's case, increment in health-adjusted life expectancy exceeds that of life expectancy after cause deletion of chronic diseases, with the exception of heart diseases. Chronic diseases that we covered in the study can be categorized as diseases that can be prevented beforehand and, after early detection, can be managed to a substantial degree. Therefore, it is important to carry out chronic disease prevention and health promotion policies more actively, thereby improving the quality of life for Korean people and increasing their health-adjusted life expectancy:

〈Table 4-4〉 Increments in life expectancy and HALE after deletion of major causes

Classification	Increment in life expectancy		Increment in HALE	
	Male	Female	Male	Female
Diabetes	0.35 yrs	0.32 yrs	0.45 yrs	0.66 yrs
Hypertension	0.10 yrs	0.17 yrs	0.44 yrs	0.83 yrs
Cerebrovascular diseases	0.91 yrs	0.84 yrs	1.04 yrs	0.10 yrs
Heart diseases	0.49 yrs	0.35 yrs	0.43 yrs	0.40 yrs
Cardio-cerebrovascular diseases	1.97 yrs	1.81 yrs	2.31 yrs	2.19 yrs

2. Policy implications and Suggestions

Korea has shown a remarkable development in health and medical care in a short period of time. However, as in most other OECD member countries, it is suffering from the serious burden of chronic diseases, including those caused by living habits, on people's quality of living, premature deaths, and medical expenses. Due to Korea's unique conditions, health and medical policies have been carried out with priority on expansion of medical security of treatment after occurrence of diseases. However, the government has recognized the importance of disease prevention and health promotion and is now strengthening policies in these areas. OECD member countries are also actively advancing health promotion policies suitable for situations in their countries.[5)]

In Korea, the National Health Promotion Law was enacted in 1995 to help the government to fulfill its responsibilities and roles in people's health. In this relation, based on the awareness of the importance of living habits (behaviors), "healthy living habits" was established as one of the key goals and "changes in individual activities" and "preventive health services" are being pursued as major strategies.[6)] To lead individual behaviors, which

5) For details of health promotion policies in OECD member countries, please refer to Choi Yun-jeong et al., A Study on Health Promotion Policies in Major OECD Countries, OECD Regional Centre on Health and Social Policy, 2006.

6) In 2000, the National Health Promotion Plan 2010 was announced with specific tasks and strategies, and in 2010, the National Health Promotion Plan 2020 was established.

are affected by various factors, to change into healthy living habits, it is necessary to make an integrated approach that combines facilitation of proper social environment, supply and promotion of accurate information, active price policy and appropriate regulations (non-price policy), and establishment of a system that can continuously maintain and manage healthy living habits.

Meanwhile, there is a rather long time gap until we can enjoy the benefits of changing our living habits to promote health after spending expenses on activities for health promotion. Thus, it is necessary to consider conditions related to the national health program, changing environment and various factors that affect health in forming long-term vision and goals and developing a new framework of national health promotion strategies. For this purpose, it is required to examine the implications, importance, and effects of the national health promotion policies in relation to national objectives and policies. This is because it is important, under the macroscopic perspective of proper distribution of limited national resources, to carry out health promotion program efficiently through the analysis of its effects. There are few models with which to estimate expected effects of, evaluate, and analyze health promotion program based on a comprehensive framework, and therefore, it is necessary to develop a systematic estimation model for strategic execution of health promotion program.

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