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Health Inequality in Korea

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I Introduction

I Introduction

The Korean government regularly updates and implements the Comprehensive National Health Promotion Plan (hereinafter "the Health Plan") with the goal of improving the Korean public's health and quality of life throughout the life course. The Health Plan is renewed every five years pursuant to Article 5 of the National Health Promotion Act. The Korean government thus has released the Third Health Plan 2011-2020 (HP2020), announcing "the extension of healthy life expectancy and the promotion of health equity" as its overarching goal. Espousing a broad approach to the definition of health, the Health Plan particularly focuses on self-management of health and the basic right to health as its key concepts.

The main objectives involved in realizing the goal of the Health Plan are defined on the basis of the decisive factors of health, and include the dissemination of healthy living practices, a preventive approach to diseases, the reinforcement of safety and environmental regulations, health management measures specific to demographic cohorts, and the expansion and effective management of the health infrastructure.

Of these objectives, those of disseminating healthy living practices, taking a preventive approach to diseases, and re-

inforcing safety and environmental regulations concern extending healthy life expectancy, while the health management measures specific to demographic cohorts are more associated with health equity. Yet the Health Plan lacks specific targets regarding health equity (Choi et al., 2012). HP2020 gives an impression that its makers thought the equity of healthcare could be easily achieved by new health measures catering to specific demographic cohorts, in isolation from all the other objectives. Nevertheless, in application, extending the healthy life expectancy and establishing equity in health are not two separate goals, but the two sides of one and the same goal. We need to establish a new conceptual framework that accords well with the combined goal of the Health Plan.

In this study, we develop the indicators of health equity and use those indicators to measure and analyze changes in health equity in Korea over time. The goal is to determine the current state of health equality in Korea.

II

Literature review

1. Measures and mechanism of health inequality
2. European Union's health inequality indicators
3. UK's health inequality indicators
4. US's health inequality indicators

Ⅱ Literature review

1. Measures and mechanism of health inequality

1) Measures of health inequality

In measuring health inequality, we may measure either the absolute or relative differences among different cohorts. We may also measure health disparities in relation to different socioeconomic factors.

〈Table 1〉 Types of Measures of Health Inequality

Source	Measures
Meckenbach and Kunst (1997)	- Absolute or relative differences - Disparity in health due to socioeconomic gap
Anad et al. (2001)	- Health gap between groups - Distribution of health among individuals
Schneider et al. (2005)	- Relative differences - Risk factors for different demographic groups - Index of dissimilarity (ID) - Slope index of inequality (SII) - Relative index of inequality (RII) - Gini coefficient and concentration index (CI)
Harper and Lynch (2006)	- Total inequality index (individual-mean difference (IMD) and inter-individual difference (IID)) - Inequality between groups - Mean-disproportional index (concentration index, CI)

2) Mechanism of health inequality

While earlier studies on health inequality focused on the magnitude of health inequalities, more recent studies seek to identify and analyze the mechanisms and paths by which health inequality arises and spreads.

A given social structure is shaped by a multiplicity of factors, including the labor market, the education system, political and legal institutions, and other cultural and social phenomena and values. Certain of these social conditions fuel the deterioration of health conditions and engender health inequality among different groups of the population.

〈Table 2〉 Mechanism of health inequality

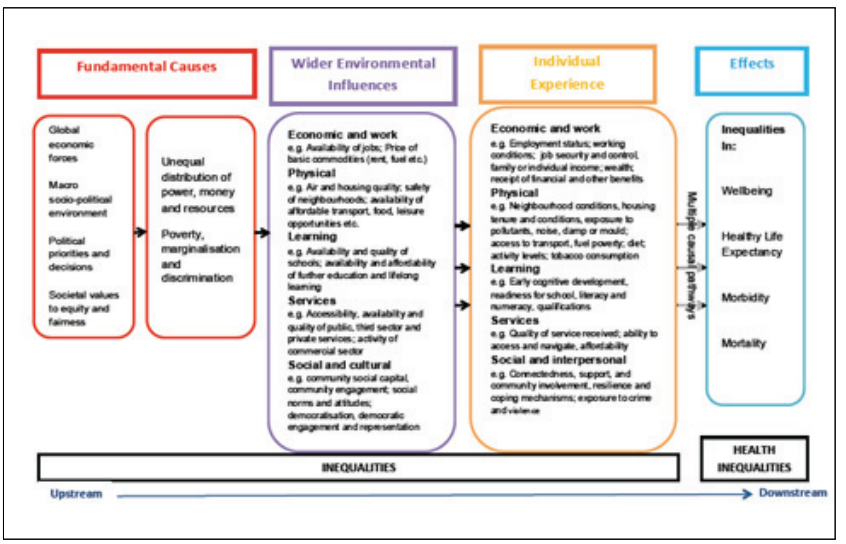
Factor	Categories	Subcategories	Outcomes/symptoms/examples	Scale	Dimensions
Causal factors	Stressful conditions	Financial difficulty	- Loss of means of health management	Continuous	Severe/mild
		Stressful feelings	- Anger, guilt, helplessness		
		Unhealthy lifestyles	- Drinking, smoking		
Major phenomena	Health issues	Chronic diseases	- Cancer, diabetes, heart diseases, strokes, underweight births, sight impairment	Type	
		Acute diseases	- Uterine myoma, hyperthyroidism		
Contextual factors	Unstable labor market	Job insecurity	- Financial difficulty and anxiety	Continuous	Severe/mild
	Poor working conditions	Long work hours	- Chronic fatigue, work-family imbalance		
	Inequality in community	Medical and health facilities	- Inequality of access and quality		
Intermediary factors	Resources	Individual resources (material and social)	- Ability to afford out-of-pocket expenses for healthcare - Family, relatives, religion, friends	Continuous	Severe/mild
		Community resources	- Available facilities and programs		
Actions and interactions	Development of capability for health management	Acceptance	- Acceptance of reality, coping, increased activity, struggle with death, passage of time	Type	Mild/severe Often/rare
		Treatment	- Difficulty of accessing medical facilities - Difficulty of management and care - Mounting medical expenses	Continuous	
		Routine health management	- Healthy diet, regular exercises and visits to doctors, access to information	Dichotomous	Positive/negative
Outcomes	Reconfiguration of life	Recovery	- Self-awakening and change in values	Dichotomous	Positive/negative
		Living with diseases	- Maintaining status quo and gradual improvement		

Source: Kwon et al. (2007), Developing Performance Indicators of Equity in Health Equity, SNU Graduate School of Health · Health Promotion Project Support Group.

3) Causal mechanism of health inequality

Socioeconomic factors exert far-reaching effects on the social and environmental contexts of health and affect individuals' experiences, gradually bringing out inequalities in quality of life, healthy life expectancy, morbidity, and mortality. Figure 1 presents a diagrammatic chart of causal relationships concerning health inequality.

[Figure 1] Causal Relationships of Health Inequality



Source: NHS Health Scotland, *Health Inequalities Policy Review*, 2013.

2. European Union's health inequality indicators

The EU measures health inequalities in member states using the following indicators (Spinakis et al., 2011).[1)]

(1) Life expectancy (LE) gap, absolute and relative

Absolute LE gap:

$LE_i - LE_j$ (i, j: two groups being compared)

Relative LE gap:

$$\frac{LE_i}{LE_j}$$

The LE gap analysis compares different demographic or social groups in terms of life expectancy, and provides easier applications and interpretations.

(2) Inter-quantiles ratios

While inter-quantiles ratios are easy to measure and analyze, they can be applied to groups at extreme ends only.

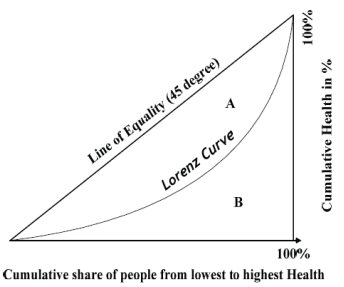
$\frac{P_i}{P_j}, i \neq j$, where P_i, P_j are two groups representing two quantiles.

1) Spinakis A, Anastasiou G, Panousis B et al. Expert review and proposals for measurement of health inequalities in the European Union- Summary report, European Commission Directorate General for Health and Consumers. 2011

(3) Coefficient of variation (CV)

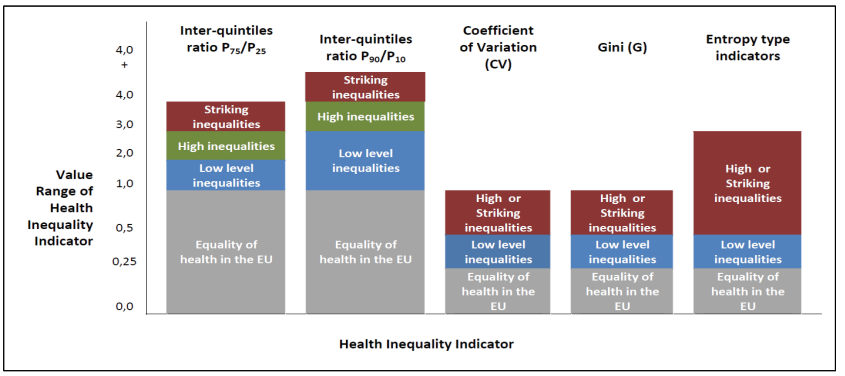
$$CV = \frac{\sigma}{\mu} = \frac{\sqrt{\frac{\sum_{i=1}^{n}(x_i - \mu)^2}{n}}}{\mu}$$

(4) Gini coefficient of inequality



Health inequalities in mortality can be interpreted as follows. For example, if the inter-quantiles ratio (comparing the top 25 percent to the bottom 25 percent) is one, it indicates the absence of health inequality. A measure between one and two indicates slight health inequality; between two and three, a high level of health inequality; and three or more, a very high level of health inequality.

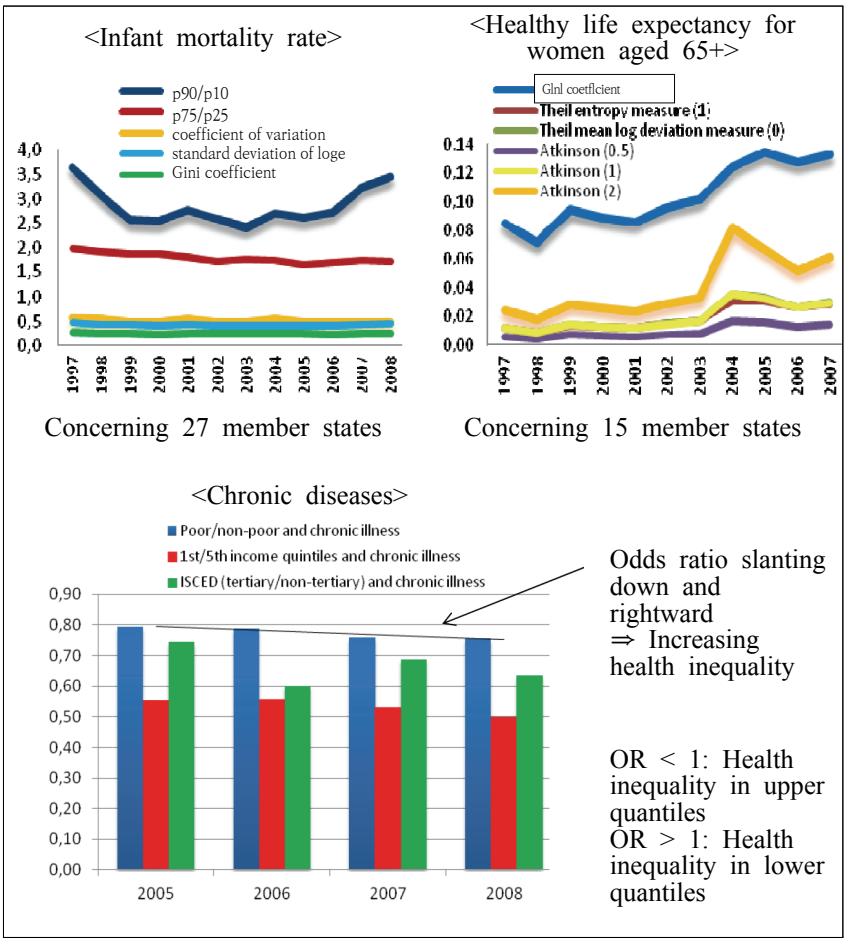
[Figure 2] Reading Health Inequality in Mortality



Source: Spinakis et al. 2011.

The aspects of health inequality of some of the EU member states have been changing over time[Figure 3]. The slope of infant mortality, for example, has been growing less steep, indicating the diminishment of health inequality in this regard. The slope of healthy life expectancy for women aged 65 or older has moved to the upper right, indicating an increase in health inequality.

[Figure 3] Health Inequality Trends in the EU



Source: Spinakis et al. 2011.

3. UK's health inequality indicators

The UK Department of Health (2003) has defined 12 core indicators of health inequality, designed to help the UK government measure health inequality in various programs (〈Table 3〉).

Each indicator is operationalized into a quantitative measure and forms part of the Health Poverty Index, with which to compare health inequality across regions and communities. The indicators forming the Health Poverty Index include health outcomes (numbers of accidents, and mortality by leading causes of death), social factors of health (poverty, education, homelessness, housing, etc.), behavioral factors (sports, smoking, and diets), and service factors (access to primary care, influenza vaccinations, etc.).

〈Table 3〉 UK Health Poverty Index (National Level)

12 indicators	Definition
Access to primary care	Number of general practitioners (GPs) per 100,000 of people
Accidents	Number of traffic accident casualties in prone areas
Child poverty	Proportion of children of low-income households (i.e., living in households consistently earning less than minimum wage)
Diet ("5 a day")	Proportion of people in the bottom income quintile eating five or more types of vegetables and fruits per day
Education	Proportion of those aged 16 who get qualifications equivalent to 5 GCSEs at grades A* to C
Homelessness	Number of homeless families with children in the care of facilities
Housing	Proportion of households living below the housing baseline
Influenza vaccinations	Proportion of seniors (65+) vaccinated against influenza

12 indicators	Definition
Physical education (PE) and school sports	Proportion of students who participate in any sports activities at school, whether as part of their PE class or as extracurricular activities, for at least twice a week
Smoking prevalence	Proportions of physical-labor workers and pregnant women who smoke
Teenage conceptions	Pregnancy rate among women aged 18 or under
Mortality rates by leading causes	Age-standardized mortality rates of proportions of 100,000 seniors aged 75+ living in aged communities (above nationwide-average aging rate) who die from leading causes of death, i.e., cancer and cardiovascular diseases.

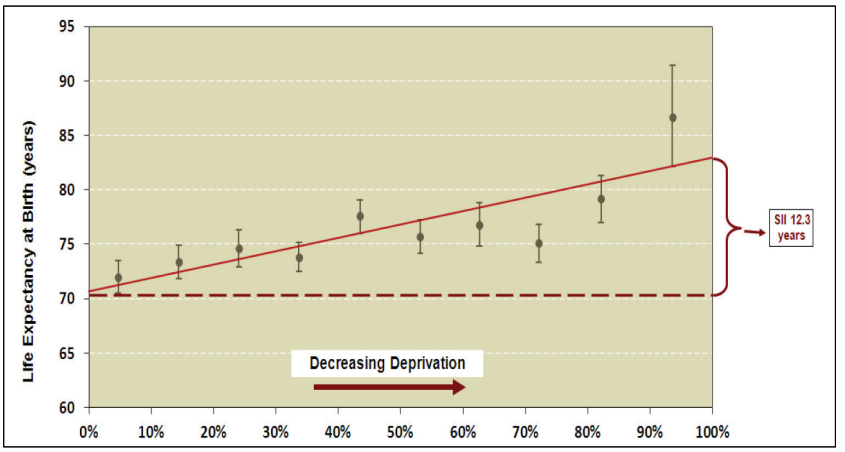
The UK government measures and analyzes health inequality using the slope inequality indices (SIIs) of healthy life expectancy and life expectancy. As Figure 4 illustrates, the UK government first measures the local deprivation index, and uses it to estimate the SII of life expectancy to identify health inequality among local communities. In London, for instance, the difference in life expectancy among communities due to deprivations was 12.3 years as of 2012.

〈Table 4〉 Health Inequality Indices in the UK

Index	Description
Healthy life expectancy	- A general index combining the disease prevalence and mortality rates. Provides information on the changing level and trend of health in a given population.
Difference between life expectancy and healthy life expectancy	- Local deprivation index + SII of life expectancy - Healthy life expectancy of local community - Local deprivation index + SII of healthy life expectancy

Source: UK DoH, Public Health Policy and Strategy Unit, *Health Outcomes Framework*, 2014.

[Figure 4] SII of Life Expectancy Based on the Local Deprivation Index



Note: SII = 12.3 years.
Source: NHS London, 2012.

4. US's health inequality indicators

As for how the Healthy People 2020 differ from the Healthy People 2020[2], the latter, first of all, takes a determinants-of-health[3] approach to measure, trace, and confirm health disparities. Second, Healthy People 2020 adds 13 new indicators to health, including adolescent health. Of these, nine indicators (i.e., adolescent health, blood diseases and safety, early and middle-childhood health, genomics, international health, health of sexual minorities, seniors, sleep health, and the social determinants of health) address the issue of health disparities.

2) Yongjun Choi et al., "Assessment of the Third Health Plan from the Perspective of Health Equity," *Critiques on Social Policy*, 2012.

Third, Healthy People 2020 repeatedly emphasizes the need to reduce health disparities, starting with its statement of the overarching vision and objective and down to the basic health indicators. Its repeated mention of "all people" and "all Americans," along with other rhetorical devices, and stated goals, such as "achieve health equity, eliminate disparities, and improve the health of all groups" confirm the strength of its commitment to health equality. It presents the determinants of health and health disparity as basic health indicators with which the overall success or failure of the federal health policy is to be measured.

5. Health equity indicators as presented some previous studies in Korea

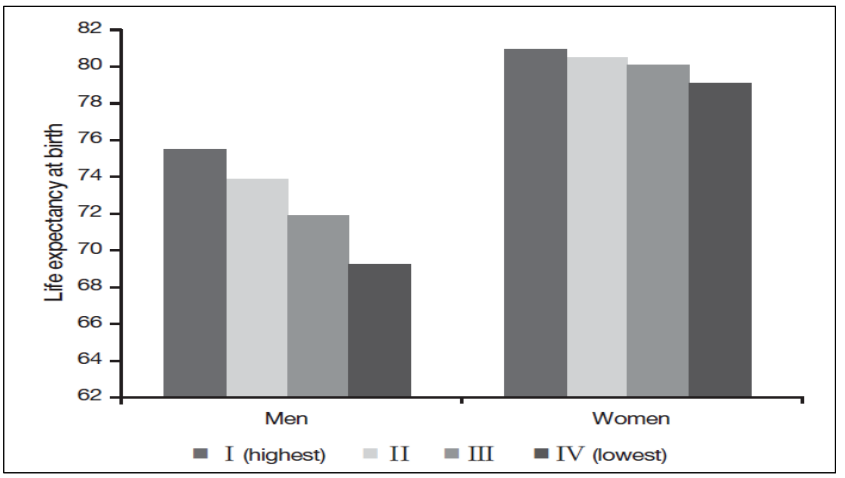
1) Life expectancy by income[3)]

Khang et al. (2010) traced health insurance data on deaths among government employees and private school teachers that occurred in the nine years since 1994 in order to analyze inequality in life expectancy due to income disparity ([Figure 5]). The analysis revealed the life expectancy for men in the highest

3) Khang YH, Yang S, Cho HJ, Jung-Choi K, Yun SC. Decomposition of socio-economic differences in life expectancy at birth by age and cause of death among 4 million South Korean public servants and their dependents. Int J Epidemiol 2010;39:1656-1666

income group to be 75.42 years, and the life expectancy for men in the lowest income group to be 69.20 years.

[Figure 5] Life Expectancy by Income Level in Korea



Source: Khang et al., 2010.

Health Inequality in Statistics in Korea measures health equity along a number of dimensions, including life expectancy and mortality, health status, lifestyle factors, environmental factors, and healthcare system factors (Shin et al., 2009).

〈Table 5〉 Indicators of Health Equity in *Health Inequality in Statistics in Korea*

Category	Indicator	Operationalization
Life expectancy and mortality	Life expectancy	- OECD-average life expectancy at birth - Changing life expectancy-at-birth in Korea
	Mortality	- 10 leading causes of death and their changes in Korea - Age-standardized mortality rates of local communities by sex - Time-series changes in mortality rates by sex and education - OECD-average infant mortality rate - Changing infant mortality rate in Korea - Parents' socioeconomic status and infant mortality rate
Health status	Subjective health status	- People's own assessment of their ill health by income level
	Objective health status	- Obesity rate by income level - Cancer rate in men by income level - Cancer rate in women by income level - Underweight birth rate by income level
Lifestyle factors	Diet	- Proportion of fruit-eating populations in Korea and abroad - Differences in fruit and vegetable proportions in diet by education
	Smoking	- Smoking prevalence rates for men and women in OECD countries - Age-standardized smoking prevalence rates by income
	Exercise	- Age-standardized rates of regular exercise by income
Environmental factors	Housing	- Proportion of households living below housing baseline by community and income level
	Safe water supply	- Water supply rates by nation - Changing water supply rates - Water supply rates by city/province
Healthcare system factors	Resources	- Number of hospital beds by nation (OECD-wide) - Number of hospital beds by city/province - Number of hospital beds per 1,000 by city/province - Number of healthcare workers by nation (OECD-wide) - Number of healthcare workers by city/province
	Public finance	- Ratio of public spending to total healthcare cost by nation (OECD-wide)
	Services	- Municipal/provincial budgets for healthcare - Senior influenza vaccination rate by nation (OECD-wide) - Senior influenza vaccination rate by education - Senior influenza vaccination rate by income - PAP and HPV test rate by nation (OECD-wide) - PAP and HPV test rate by income - Medical checkup rate by income - Odds ratio of medical checkup rate by income - Rates of forgoing/delaying medical treatment by insurance type - Rates of forgoing/delaying medical treatment by monthly household income
Public finance and income	Public finance	- GRDP per capita - GRDP by city/province - GRDP per capita by city/province - Fiscal autonomy rate by city/province
	Income	- Monthly household income by household head's education - Monthly household income for income deciles - Gini coefficient - Interdecile ratio (P90/10) - Poverty rate - Poverty rate of households with female household heads
Education	Educational	- Secondary/postsecondary enrollment rates by parents' monthly

Category	Indicator	Operationalization
	attainment	income level
	Cost of education	- Cost of private education by income level
Labor	Unstable labor	- Unemployment rates by age - Ratios of people with irregular jobs by sex - Ratios of people with temporary/day jobs by sex
	Working poverty	- Ratios of low-wage workers by occupation type

Source: Youngjeon Shin et al., Health Promotion Strategy and Project for Reducing Health Inequality, 2009, Hanyang University Industrial-Academic Collaboration Group and Health Promotion Project Support Group.

III

Health Inequality Index (HII) for Korea and results

1. RIIs and SIIs for the elderly
2. Life expectancy by income
3. Life expectancy estimates by income and sex
4. Healthy life expectancy by income level in Korea

III Health Inequality Index (HII) for Korea and results

1. RIIs and SIIs for the elderly

The US National Center for Health Statistics' guidelines[4] recommends the use of summary measures, such as regression-based ones, as disparities in health resulting from differences in the social-economic positions (SEPs).

The relative inequality index (RII), the SII, and the concentration index (CI) all measure health inequality resulting from differences in individuals' SEPs.

Where RII 〉 0, the proportion of ill health increases with income.
Where RII = 0, there is no correlation between income and ill health.
Where RII 〈 0, the proportion of ill health decreases with income.
Where SII 〉 0, the proportion of ill health increases with income.
Where SII = 0, there is no correlation between income and ill health.
Where SII 〈 0, the proportion of ill health decreases with income.

RII (mean) = $\frac{\beta}{\bar{y}}$, ybar = overall prevalence rate.

RII (ratio) = $\frac{\alpha}{\alpha+\beta}$

4) Keppel K, Pamuk E, Lynch J, et al., "Methodological issues in measuring health disparities," *Vital Health Stat* 2. 2005(141), 1-16.

SII = β, mean difference in ill health between high-income groups and low-income groups.

In this study, we measured the RII and SII in the health of Korean seniors aged 60 and over in relation to income (〈Table 6〉 ~ 〈Table 9〉). We analyzed the *National Health and Nutrition Survey* data on seniors reporting ill or very ill health in their subjective assessments on their health conditions.

〈Table 6〉 Basic Statistics: Seniors Aged 60+, as of 2011

	Income	Number of respondents	Proportion of ill health
Male	Quantile 1 (low)	111	0.181
	Quantile 2	48	0.078
	Quantile 3	22	0.036
	Quantile 4 (high)	20	0.033
Female	Quantile 1 (low)	242	0.395
	Quantile 2	88	0.144
	Quantile 3	46	0.075
	Quantile 4 (high)	35	0.057
	Total	612	-

Note: "Proportion of ill health" = proportion of seniors assessing themselves to be in ill health or very ill health.

Both the RII and the SII showed negative slope, suggesting statistical significance. In other words, the higher one's income level, the better health one was in. We applied either a generalized linear model or a logistic model in gauging the RII.

〈Table 7〉 HII in Relation to Income: Seniors Aged 60+, as of 2011

	HII	Estimate	Confidence interval	
			Low	High
Male	Slope Index of Inequality (SII)	-0.8736**	-1.1809	-0.5663
	Relative Index of Inequality (RII_ratio)	-3.9797**	-5.4148	-2.5445
Female	Slope Index of Inequality (SII)	-0.4003**	-0.5527	-0.2478
	Relative Index of Inequality (RII_ratio)	-1.1609**	-1.6224	-0.6994

Note: Not weighted. Generalized linear model applied.

〈Table 8〉 HEI in Relation to Income: Seniors Aged 60+, as of 2011

	HII	Estimate	se
Male	Relative Index of Inequality (RII_ratio)	-5.1871**	0.9545
Female	Relative Index of Inequality (RII_ratio)	-1.7888**	0.3580

Note: Not weighted. Logistic model applied.

We then sought to measure the RII and the SII of seniors aged 60 and over, using the health insurance cohort data and income data. We found that, the lower one's income level, the steeper the negative slope of one's probability for death.

〈Table 9〉 Mortality Inequality Index in Relation to Income 2010: Seniors Aged 60+

	Mortality Inequality Index	Estimate	Confidence interval	
			Low	High
Male	Slope Index of Inequality (SII)	-0.1669	-0.2149	-0.1189
	Relative Index of Inequality (RII_ratio)	-4.8978	-6.5698	-3.2258
Female	Slope Index of Inequality (SII)	-0.1563	-0.2072	-0.1055
	Relative Index of Inequality (RII_ratio)	-1.1605	-2.3357	0.0147

Note: Not weighted. Generalized linear model applied. Based on NHI cohort database.

2. Life expectancy by income

1) Method

The life expectancy for each income group was estimated using the health insurance cohort database. The database provides information on income distribution based on the health insurance premiums charged, dividing beneficiaries between a single quantile of non-paying beneficiaries and 10 deciles of paying beneficiaries according to their income levels.

The Sullivan method was used to estimate the probable mortality levels, the stationary population, and the life expectancies. Statistics Korea applies the Greville's formula to adjust the mortality levels of different age groups. In this study, we use the Chiang method instead.

In order to convert the mortality rate by age into the probable mortality levels, we applied the formula, $q_x' = \frac{m_x}{1+\frac{1}{2}m_x}$.

〈Table 10〉 Frequency of Samples by Age and Sex

(Unit: number of persons)

Age cohort	Male		Female		Total	
	N (samples)	N (death)	N (samples)	N (death)	N (samples)	N (death)
0	4,664	0	4,368	0	9,032	0
1-4	17,622	10	16,552	2	34,174	12
5-9	24,136	1	22,178	2	46,314	3
10-14	34,397	3	31,261	2	65,658	5
15-19	38,861	11	34,126	9	72,987	20
20-24	32,302	15	30,212	12	62,514	27
25-29	37,563	21	35,861	20	73,424	41
30-34	39,061	26	37,277	29	76,338	55
35-39	44,021	48	42,628	30	86,649	78
40-44	45,533	99	43,929	40	89,462	139
45-49	44,055	152	42,339	62	86,394	214
50-54	41,273	190	40,083	81	81,356	271
55-59	28,940	206	29,654	59	58,594	265
60-64	22,465	237	23,235	96	45,700	333
65-69	17,978	342	20,682	135	38,660	477
70-74	13,988	389	18,122	212	32,110	601
75-79	8,262	421	13,497	366	21,759	787
80-84	3,990	317	8,393	418	12,383	735
85+	2,227	349	6,296	701	8,523	1,050
Total	501,338	2,837	500,693	2,276	1,002,031	5,113

In the health insurance cohort database, a zero number of deaths carries a zero value, which required the following readjustment. Using Statistics Korea's data on death, we estimated the mortality rate of zero by applying 0.0037 to men and 0.0027 to women, or 0.0032 to all.

The income groups were divided using two different scales. Model 1 divided people into two income groups, with the first encompassing the non-paying health insurance beneficiaries and the first five income quantiles of paying beneficiaries, while the latter included the latter income quantiles of paying

beneficiaries. Model 2, on the other hand, divided insurance beneficiaries into four quantiles, i.e., the "Low" group (unpaying + two first quantiles of paying beneficiaries), the "Middle-Low" group (third, fourth, and fifth quantiles), the "Middle-High" group (sixth, seventh, and eighth quantiles), and the "High" group (ninth and 10thquantiles).

〈Table 11〉 Frequency of Samples by Income

(Unit: number of persons)

Age cohort	Income: Low		Income: Middle-Low		Income: Middle-High		Income: High	
	N (samples)	N (death)	N (samples)	N (death)	N (samples)	N (death)	N (samples)	N (death)
0	767	0	1,884	0	2,065	0	4,316	0
1-4	3,216	0	8,759	1	6,796	4	15,403	7
5-9	6,068	1	14,883	0	8,181	0	17,182	2
10-14	10,594	0	22,877	3	12,019	1	20,168	1
15-19	13,519	5	24,757	7	15,180	3	19,531	5
20-24	11,639	6	17,180	6	17,852	8	15,843	7
25-29	10,850	13	10,213	6	27,926	9	24,435	13
30-34	9,142	13	12,295	12	21,630	14	33,271	16
35-39	12,022	20	21,403	11	19,966	22	33,258	25
40-44	14,384	43	27,162	19	20,496	38	27,420	39
45-49	15,199	73	26,661	34	20,449	64	24,085	43
50-54	14,403	89	23,202	43	20,445	71	23,306	68
55-59	10,631	86	14,729	34	14,783	82	18,451	63
60-64	8,987	105	11,526	54	10,188	80	14,999	94
65-69	8,316	133	12,050	116	7,124	98	11,170	130
70-74	7,065	150	11,894	186	5,335	104	7,816	161
75-79	5,397	234	8,348	266	3,389	135	4,625	152
80-84	3,698	226	4,225	237	1,860	127	2,600	145
85+	2,698	309	2,692	323	1,305	169	1,828	249
Total	168,595	1,506	276,740	1,358	236,989	1,029	319,707	1,220

If we compare our life expectancy estimates based on the health insurance cohort database with Statistics Korea's, our study shows the life expectancy in Korea to average 81.77 years, as compared to Statistics Korea's 80.79 years.

〈Table 12〉 Comparison of Life Expectancy Estimates with Statistics Korea's

(Unit: number of persons)

Age cohort	Statistics Korea			This study		
	Male	Female	Total	Male	Female	Total
0	77.20	84.07	80.79	77.97	85.27	81.77
1-4	76.48	83.30	80.06	77.25	84.50	81.03
5-9	72.55	79.36	76.12	73.43	80.54	77.14
10-14	67.60	74.39	71.16	68.44	75.58	72.17
15-19	62.64	69.43	66.20	63.47	70.60	67.19
20-24	57.76	64.49	61.30	58.56	65.69	62.28
25-29	52.92	59.60	56.43	53.69	60.82	57.41
30-34	48.11	54.74	51.60	48.83	55.98	52.56
35-39	43.31	49.88	46.78	43.98	51.19	47.74
40-44	38.58	45.05	42.00	39.21	46.36	42.95
45-49	33.97	40.24	37.31	34.61	41.56	38.26
50-54	29.51	35.49	32.73	30.17	36.85	33.71
55-59	25.23	30.80	28.27	25.81	32.19	29.23
60-64	21.10	26.16	23.92	21.66	27.49	24.85
65-69	17.16	21.63	19.74	17.70	23.01	20.67
70-74	13.49	17.31	15.78	14.22	18.69	16.83
75-79	10.26	13.30	12.20	10.97	14.67	13.24
80-84	7.57	9.83	9.12	8.44	11.44	10.37
85+	5.49	7.04	6.64	6.38	8.98	8.12

2) Life expectancy estimates by income: Model 1

In Model 1 (〈Table 13〉), there was a disparity of about three years between the upper 50 percent and the lower 50 percent of income groups.

〈Table 13〉 Life Expectancy Disparity by Income (2010)

	Lower 50%	Upper 50%	Overall
Life expectancy	80.04	83.03	81.77
Income disparity	3.00 years		

Note: "Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10th income deciles.

The probable causes of the disparity with Statistics Korea's overall average life expectancy, 80.79 years, include the fact that Statistics Korea has adjusted for the zero number of deaths and the associated probable mortality level, and that its estimates are based on randomly selected samples as opposed to a total enumeration survey.

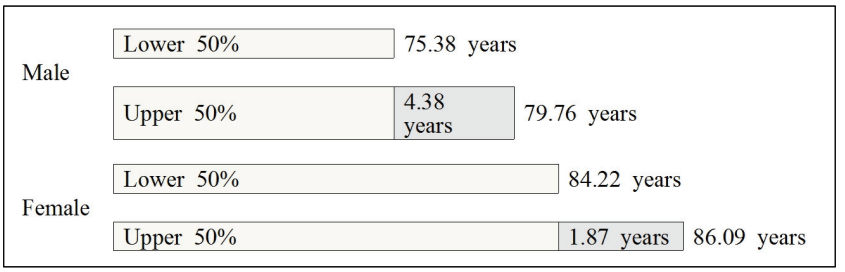
In Model 1, the life expectancy disparities by income amounted to 4.38 years for male and 1.87 years for female (〈Table 14〉).

〈Table 14〉 Life Expectancy Disparities by Income and Sex (2010)

Income	Male	Female
Lower 50%	75.38	84.22
Upper 50%	79.76	86.09
Disparity	4.38 years	1.87 years
Life expectancy	77.97	85.27

Note: Statistics Korea's life expectancies were 77.20 for men and 84.70 for women as of 2010.

[Figure 6] Life Expectancy Disparities by Income (2010)



3) Life expectancy estimates by income: Model 2

Model 2 divides health insurance beneficiaries into four groups according to income ("Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10th income deciles).

The life expectancy for the "High" group was 83.88 years, as opposed to the 78.90 years for the "Low" group, with the income disparity as large as 4.98years (〈Table 15〉).

〈Table 15〉 Life Expectancies by Income (2010)

Income	Life expectancy	Disparity
Low	78.90	4.98 years
Middle-Low	80.70	3.18 years
Middle-High	82.08	1.80 years
High	83.88	-

Note: "Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10th income deciles.

The high-low income group disparity in life expectancies amounted to 5.72 years in 2011, to 5.73 years in 2012, and to 4.56 years in 2013 (〈Table 16〉).

〈Table 16〉 Life Expectancies by Income (2011-2013)

Year	Income	Life expectancy	Disparity
2011	Low	79.12	5.72
	Middle-Low	81.74	3.10
	Middle-High	82.56	2.28
	High	84.84	-
2012	Low	79.01	5.73
	Middle-Low	82.05	2.69
	Middle-High	82.62	2.12
	High	84.74	
2013	Low	80.64	4.56
	Middle-Low	83.56	1.64
	Middle-High	83.16	2.04
	High	85.20	-

Note: "Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10^{th} income deciles.

The table below lists the life expectancies for different income groups in the years 2010 through 2013. Whereas the life expectancies for most groups kept increasing in these four years, the life expectancy for the low income group dropped by 0.1 year in 2012. The life expectancy for the low income group rose from 78.90 to 80.64 years between 2010 and 2013, while that for the high income group rose from 83.88 to 85.20 years.

〈Table 17〉 Life Expectancies by Income (2010-2013)

Income	2010	2011	2012	2013
Low	78.90	79.12	79.01	80.64
Middle-Low	80.70	81.74	82.05	83.56
Middle-High	82.08	82.56	82.62	83.16
High	83.88	84.84	84.74	85.20

The high-low income group disparity in life expectancy increased from 4.98 years in 2011 to 5.72 and 5.73 years in the following two years, respectively, before dropping significantly to 4.56 years by 2013 (〈Table 18〉). Continued monitoring is needed in order to determine whether this decrease in life expectancy disparity is a one-time event or will continue as a phenomenon.

〈Table 18〉 Life Expectancy Disparities by Income (2010-2013)

Income	2010	2011	2012	2013
High-Low	4.98	5.72	5.73	4.56

3. Life expectancy estimates by income and sex

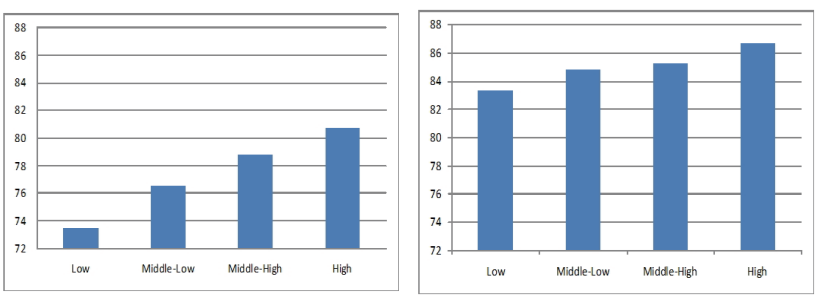
In Model 2, the life expectancy disparity between the high- and low-income men amounted to about 7.30 years, whereas the life expectancy disparity between the high- and low-income women was less than half of that, or 3.30 years.

〈Table 19〉 Life Expectancy by Income and Sex (2010)

Income	Male		Female	
	Life expectancy	Disparity by income	Life expectancy	Disparity by income
Low	73.48	7.27	83.42	3.30
Middle-Low	76.60	4.15	84.83	1.89
Middle-High	78.82	1.93	85.24	1.48
High	80.75	-	86.72	-

Note: "Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10th income deciles.

[Figure 7] Health Inequality in Korea: Life Expectancy by Income and Sex (2010)



Male Female

〈Table 20〉 Life Expectancy by Income and Sex (2011)

Income	Male		Female	
	Life expectancy	Disparity by income	Life expectancy	Disparity by income
Low	73.50	7.66	83.93	4.39
Middle-Low	78.12	3.04	85.15	3.17
Middle-High	79.04	2.12	85.89	2.43
High	81.16	-	88.32	-

Note: "Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10th income deciles.

〈Table 21〉 Life Expectancy by Income and Sex (2012)

Income	Male		Female	
	Life expectancy	Disparity by income	Life expectancy	Disparity by income
Low	73.66	8.11	83.38	4.01
Middle-Low	78.47	3.30	85.55	1.84
Middle-High	79.32	2.45	85.79	1.60
High	81.77		87.39	

〈Table 22〉 Life Expectancy by Income and Sex (2013)

Income	Male		Female	
	Life expectancy	Disparity by income	Life expectancy	Disparity by income
Low	75.06	7.39	85.11	2.49
Middle-Low	79.72	2.73	87.22	0.38
Middle-High	80.15	2.3	86.01	1.59
High	82.45		87.60	

Note: "Low" = unpaying health insurance beneficiaries and the first two income deciles; "Middle-Low" = third, fourth, and fifth income deciles; "Middle-High" = sixth, seventh, eighth income deciles; "High" = ninth and 10^{th} income deciles.

Life expectancy measures for men and women in Korea by income level, from 2010 to 2013, are listed in the table below. Life expectancy for men of all income groups grew steadilyover the period. In the case of women, life expectancy increased similarly grew, except for the 0.5-year drop in the low income group in 2012.

〈Table 23〉 Life Expectancy by Income and Sex (2010-2013)

Income	Male				Female			
	2010	2011	2012	2013	2010	2011	2012	2013
Low	73.48	73.50	73.66	75.06	83.42	83.93	83.38	85.11
Middle-Low	76.60	78.12	78.47	79.72	84.83	85.15	85.55	87.22
Middle-High	78.82	79.04	79.32	80.15	85.24	85.89	85.79	86.01
High	80.75	81.16	81.77	82.45	86.72	88.32	87.39	87.60

As for between the high and low income groups, life expectancy disparity kept growing for men until 2012 before taking a slight drop in 2013, whileit has been decreasing to some extent for women since 2012.

〈Table 24〉 Life Expectancy Disparities by Income and Sex (2010-2013)

Income	2010	2011	2012	2013
Male (High-Low)	7.27	7.66	8.11	7.39
Female (High-Low)	3.30	4.39	4.01	2.49

4. Healthy life expectancy by income level in Korea

1) Healthy life expectancy by income

〈Table-25〉 lists healthy life expectancy estimates for different income groups in Korea in the years 2011 through 2013. The disparity between the low and middle-low income groups grew wider from 2011 to 2012. Healthy life expectancy increased for the low income group from 65.08 years in 2011 to 65.51 years in 2013, but it decreased for the high and mid-

dle-high income groups somewhat during the same period. Healthy life expectancy declined most notably for the high income group, from 69.64 years in 2011 to 69.02 years in 2013.

〈Table 25〉 Healthy Life Expectancy by Income (2011-2013)

Income	2011	2012	2013
Low	65.08	64.22	65.51
Middle-Low	68.25	67.91	68.83
Middle-High	68.20	67.72	68.17
High	69.64	68.63	69.02

The healthy life expectancy disparity between the high income group and the low income group decreased steadily, from 4.56 years in 2011 to 4.41 years in 2012, and to 3.51 years in 2013.

〈Table 26〉 Healthy Life Expectancy Disparity by Income (2011-2013)

Income	2011	2012	2013
High-Low	4.56	4.41	3.51

2) Healthy life expectancy by income and sex

The healthy life expectancy disparity between the high-income and low-income men was 5.77 years in 2011, significantly greater than the disparity of 3.78 years for women. In 2012 and 2013 as well, men showed greater healthy life expectancy disparities due to income differences than women (〈Table 27〉).

〈Table 27〉 Healthy Life Expectancy by Income and Sex (2011-2013)

Year	Income	Male		Female	
		Healthy life expectancy	Disparity	Healthy life expectancy	Disparity
2011	Low	61.58	5.77	68.06	3.78
	Middle-Low	66.26	1.09	70.48	1.36
	Middle-High	66.38	0.97	70.56	1.28
	High	67.35	-	71.84	-
2012	Low	60.99	5.83	66.84	3.39
	Middle-Low	65.81	1.01	69.82	0.41
	Middle-High	65.71	1.11	69.98	0.25
	High	66.82	-	70.23	-
2013	Low	62.15	5.06	68.18	2.34
	Middle-Low	66.52	0.69	70.86	-0.34
	Middle-High	66.43	0.78	69.69	0.83
	High	67.21	-	70.52	-

While the income disparity in healthy life expectancy for men kept growing from 2011 to 2012, before taking a slight drop in 2013, the income disparity in healthy life expectancy for women kept steadily decreasing throughout the three-year period.

〈Table 28〉 Healthy Life Expectancy Disparities by Income and Sex (2010-2013)

Income	2011	2012	2013
Male (High-Low)	5.77	5.83	5.06
Female (High-Low)	3.78	3.39	2.34

IV Reducing health inequality in Korea

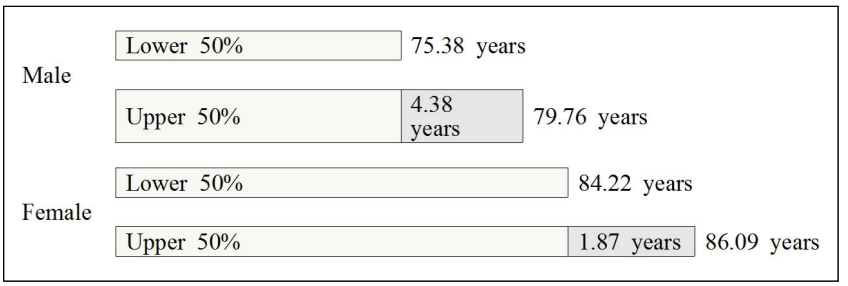
Ⅳ Reducing health inequality in Korea

While there are multiple ways and indicators with which one can measure health inequality in a given society, this study focuses on life expectancy andhealthy life expectancy, for which there were available data, as two representative indicators of health inequality in Korea.

1) Life expectancy disparity between the upper-50 and lower-50 percent income groups

The life expectancy disparity between the two income groups for men was 4.38 years, while that for women was 1.87 years.

[Figure 8] Life Expectancy Disparities by Income (2010)



2) Life expectancy disparities among four income groups

When men and women were divided into four groups (ranging from "Low" to "High") according to income levels, the life expectancy disparity between the low and high income groups for men amounted to 7.30 years, while the disparity for low and high income groups for women amounted to 3.31 years.

〈Table 29〉 Life Expectancies by Income (2010)

Income	Male		Female	
	Life expectancy	Disparity	Life expectancy	Disparity
Low	73.48	7.27	83.42	3.30
Middle-Low	76.60	4.15	84.83	1.89
Middle-High	78.82	1.93	85.24	1.48
High	80.75	-	86.72	-

The high-low income group disparity in life expectancy increased from 4.98 years in 2011 to 5.72 and 5.73 years in the following two years, respectively, before dropping significantly to 4.56 years by 2013. Continued monitoring is needed in order to determine whether this decrease in life expectancy disparity is a one-time event or will continue as a phenomenon.

〈Table 30〉 Life Expectancy by Income (2010-2013)

Income	2010	2011	2012	2013
Low	78.90	79.12	79.01	80.64
Middle-Low	80.70	81.74	82.05	83.56
Middle-High	82.08	82.56	82.62	83.16
High	83.88	84.84	84.74	85.20

〈Table 31〉 Life Expectancy Disparity by Income (2010-2013)

Income	2011	2012	2013
High-Low	4.98	5.72	5.73

3) Healthy life expectancy disparity by sex

The tables below list healthy life expectancy disparity by sex, applying subjective assessment of health. The gender gap in healthy life expectancy has been reducing steadily over the years, with the number of years in ill health reported by women decreasing year from year. By contrast, however, the number of years in ill health reported by men has been on steady rise. The number of years in perfect health, free of all diseases and disabilities, has also been decreasing.

〈Table 32〉 Number of Years in Ill Health by Sex (2011-2013)

	Number of years in ill health		Disparity (male - female)	Overall
	Male	Female		
2011	9.38	15.42	-6.04	12.45
2012	9.50	15.28	-5.78	12.46
2013	9.70	14.96	-5.26	12.43
Difference	(+)	(-)	(-)	

Note: Applying respondents' subjective assessments of their state of health.

〈Table 33〉 Proportion of Men and Women in Perfect Health (2011-2013)

	Number of years in ill health		Overall
	Male	Female	
2011	87.92	81.74	84.67
2012	87.81	81.94	84.70
2013	87.66	82.40	84.83
Difference	(-)	(+)	(+)

4) Healthy life expectancy disparities by income

The tables below summarize our analysis on healthy life expectancy disparities by income, based on health insurance cohort data. While healthy life expectancy for the low and middle-low income groups grew from 2011 to 2012, it decreased for the high and middle-high income groups from 2011 to 2013.

The healthy life expectancy disparity between the high and low income groups was 4.56 years in 2011, but it steadily diminished to 4.41 years in 2012 and to 3.51 year in 2013.

〈Table 34〉 Healthy Life Expectancy by Income Group (2010-2013)

Income	2011	2012	2013
Low	65.08	64.22	65.51
Middle-Low	68.25	67.91	68.83
Middle-High	68.20	67.72	68.17
High	69.64	68.63	69.02

〈Table 35〉 Healthy Life Expectancy Disparities by Income (2011-2013)

Income	2011	2012	2013
High-Low	4.56	4.41	3.51

While the income disparity in healthy life expectancy for men kept growing from 2011 to 2012, before taking a slight drop in 2013, the income disparity in healthy life expectancy for women kept steadily decreasing throughout the three-year period.

〈Table 36〉 Healthy Life Expectancy Disparities by Income and Sex (2011-2013)

Income	2011	2012	2013
Male (High-Low)	5.77	5.83	5.06
Female (High-Low)	3.78	3.39	2.34

In this study, we used available data to determine the indicators of healthy life expectancy and health inequality in Korea. We need to monitor health data in the coming years in order to find, develop, and fine-tune various indicators of health equity.

5) Policy implications

This study measures the changing levels of health equity for different income groups in Korea using indicators corresponding to the two overarching ideals or objectives of the Third Health Plan of Korea, namely, extending healthy life expectancy and improving health equality. Whereas both life expectancy and healthy life expectancy overall have been on the rise over the years in Korea, the life expectancy disparity by income kept growing in the case of men from 2010 to 2012, while the life expectancy disparity by income in the case of women increased until 2011 before turning downward in 2012 and afterward. In the meantime, healthy life expectancy disparity by income narrowed down, from 4.56 years in 2011 to 4.41 years in 2012.

There is growing need to produce, regularly update, and continuously monitor the data indicative of health equality and state in Korea. It is also important to produce forecasts on the likely changes in these indicators of health equality using different scenarios so as to assess whether, and to what extent, the Korean policy projects on improving health and health equality are working.

Each health-promoting policy project should involve monitoring changes in the data on health equality so as to devise and update effective strategies and policy investment projects in enhancing the health of all Koreans.

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