(Draft)

Social inequalities in life expectancy during the transition period of economic crisis (1995-2005) in Korea

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Abstract

Objectives: To examine social inequalities in life expectancy during the transition period of the Korean economic crisis.

Methods: Data from the census and national deaths in the National Statistics Office in Korea. Life expectancy estimates were calculated by age, gender, and educational attainment for three time periods: 1994-1997, 1998-2001, 2002-2005. Absolute differences in life expectancy by educational attainment were utilized as a proxy measure of social inequality.

Findings: Those with less education experienced a shorter life expectancy at each age than their counterparts with higher levels of education attainment. At age 30, university-educated men experienced life expectancy 15.4 years (1994-1997), 17.9 years (1998-2001) and 19.2 years (2002-2005) higher than those elementary or less-educated counterparts did. For women, the corresponding differences by each period were 8.8 years, 10.0 years and 18.8 years. Widening social inequalities in life expectancy are evident during the transitional period of the Korean financial economic crisis, 1994-2005.

Conclusions: This study evinces that the widening gap of social inequalities in life expectancy is closely related to the widening gap of social inequalities in Korea following a macroeconomic crisis.

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Introduction

In most countries, the mortality rate has seen an overall decrease to date, resulting in an increase in life expectancy and prolongation of the survival period (*1, 2*). Substantial inequalities in life expectancy across socioeconomic groups, however, have been shown to exist in many of the countries that have set out to assess the scale of the problem (*2-9*). Recently, a widening gap in these inequalities across socioeconomic groups has been reported in several countries such as the United States, Denmark, Switzerland, and Finland (*2, 3, 7, 8*). Although previous studies have utilized individual variables such as education and occupation as the social and economic proxies in order to find differences in average life span, few studies have discussed the time before and after an economic crisis and its relationship with average life span (*10*). Even fewer studies have been published on a theory that an economic crisis increases social differences in average life span. Therefore, the core topic of this research is an economic crisis and its unequal influence on life expectancy across social classes. To address this topic, we focus on Korea, a country hit hard by an economic crisis in 1997-8. The purpose of this research is to examine changes in life span across social classes before and after the economic crisis.

Although Korea, commonly referred to as one of the "Asian tigers", has achieved rapid economic growth since the 1980s, it has been reported that the economic crisis that spread throughout the country in 1997 and 1998 exacerbated extant social inequalities (*11, 12*). Several studies report that social inequalities in health and mortality have worsened since the economic crisis (*13-15*). Although these studies are noteworthy, they are limited in that they pay attention only to the post economic crisis differentials in health across socioeconomic groups. Studies concerning both pre- and post-economic crisis (or “transitional”) periods, and the changes of social inequalities in life expectancy are almost non-existent.

The objective of this study is to delve into the effects of education on life expectancy in Korea, and to document the trend in life expectancy during the past twelve years, from 1994 to 2005, including the period of economic and social fluctuation (1997 and 1998). This study analyses how differences in life expectancy across social classes are changing in Korea, which has seen rapid worsening of social inequality since the economic crisis occurred between the end of 1997 and early 1998.

Methods

We used two national data sources, the Korean national death file and the Korean census data, to calculate educational inequalities in life expectancy between 1994 and 2005. We divided our analysis into three periods: before the economic crisis (1994-1997), in the middle of the economic crisis (1998-2001), and after the economic crisis (2002-2005) to observe how the economic crisis affected to social inequalities in life expectancy. Therefore, we constructed three subsets of the data, the first of which is based on the 1995 census linked to the records of all deaths in 1994-1997 by classifications of educational attainments, sex, and age. The other data sets were constructed in the same way by linking the 2000 and 2005 census records to the death records for the periods 1998-2001 and 2002-2005, respectively. This study uses educational attainment as a proxy for social class because of the following two reasons: 1) several previous studies in Korea show that the level of education mirrors social class more clearly than any other proxy indicators (*16, 17*), and 2) educational attainment is the only available information in the Korean death files regarding socioeconomic status. Education is classified into five categories: elementary school or less (0-6 years), middle school (7-9 years), high school (10-12 years), high school (10-12 years), and university or up (>= 13 years). We constructed 5-year abridged life tables based on education and sex specific mortality rates from age 30 for the three periods. Life expectancy was calculated using Chiang's methods (*18*), and a Gomperts model (*19*) was used for the

estimation of life expectancy of open-ended age interval (85 years and older).

Results

Table 1 features life expectancies by the level of education for men, women, and all Koreans among three different time points. Across all three time points, the level of education considerably increases life expectancy for all age intervals, although some exceptions exist. In the first time point, life expectancy at age 30 for those who graduated from elementary school, middle school, high school, and university were 42.8, 43.9, 45.0, and 48.5 years for all Koreans, respectively. The corresponding figures in the second and third time points also gradually increases as the level of education increases. Consistent patterns were observed even when men and women were independently examined. Exceptions were found for the elderly population (aged about 50 or greater) between elementary and middle school graduates in the first and the second time points in that the life expectancy of the elementary school graduates were slightly higher than those of the middle school graduates. This exception was not observed in the latest time point. These findings suggest that the gradient effect of education on life expectancy become much clearer after the economic crisis.

--table 1 about here--

Table 2 presents the differences in life expectancy between university and or up and other levels of education. At younger ages, the life expectancy gap between those university graduated or up and those elementary school graduated or less grows during the later time points (5.7 years in 1994-1997, 8.7 years in 1998-2001, and 11.6 years in 2002-2005) among all Koreans. Thus, the gap approximately doubled during the past ten years. Worsening life expectancy differentials between the highest and the lowest education level was observable for all subsequent age groups. In the comparison between those high school graduated and those university graduated or up at age 30, however, the gap in life expectancy decreased from 3.5 years in the first time point to 2.8 years in the last time point. This pattern of a

narrowing gap was observed for all age intervals. Accordingly, one may posit that the economic crisis has resulted in some small positive contributions to Korean society in terms of life expectancy since the gap between the highest and the second highest education levels became narrower. However, it is much more likely that the economic crises had differential effects by education and it is very certain that the crisis has had a large negative impact on the life of the least educated Koreans.

--Table2 about here--

When men and women are separately considered, more interesting findings were observed. For men, the differences in life expectancy and their changing patterns for the last decade were about the same as what observed for all Koreans. That is, the inequality has increased between the highest and the lowest educational groups, but decreased between the first and second highest groups. However for women, the inequality has gradually increased for all education groups in that university graduated women at age 30 outlive their high school graduated counterparts by 3.4 years in the first time point, and 3.8 years in the last time point. This pattern was consistent throughout all age intervals. Further, the disadvantage in life expectancy of the least educated Koreans women, relative to the highest educated counterparts, has more than doubled during the ten years in almost all age intervals. Note that men experienced an average of 50% increase in life expectancy advantage over time. These results clearly suggest that the adverse effect of economic crisis was much greater for women and the less educated than for men and the highly educated.

Discussion

This study presents large differentials in life expectancy by education level in Korea. Furthermore, the social inequality between the highest and the lowest education levels in life expectancy widened over the years from 1994-1997, 1998-2001, and 2002-2005. This widening gap in life expectancy is much more pronounced among women. An interesting

result obtained in this study is that, compared to 1994-1997, social inequality in life expectancy has gradually worsened since the economic crisis.

Our study adds to the growing literature showing differentials in life expectancy by level of education. If we compare our results to recently reported inequalities in life expectancy by educational attainment from several Western societies (*4, 6, 7, 9, 20-22*), present-day Korea belongs to a group with the steepest gradient of inequality. For example, differences in life expectancy at age 25 between the highest and the lowest levels of education (university education vs compulsory education or less) were about 6 years for white men and about 5 years for white women in the US in 1979-1980 (*7*); 7.1 years for men and 3.6 for women in Switzerland in 1990-1997 (*9*). In Denmark, during the period of 1996-2005, the gap in life expectancy from age 30 to 75 between people with low and high educational level increased by 0.3 years (*3*).

What makes education so strongly affect life expectancy in Korea? In Korea, education has been considered as one of the strongest factors in determining one's social status, because it is an important qualification and instrument for obtaining a better occupation and position in Korea (*23*). In general, skills obtained from education enable the specialization of labor power and gaining a better education can secure more opportunities for better employment and occupation. It is not exception in Korea that one's life chance is mainly determined by his/her educational attainment (*24*).

The disadvantage status of the less educated and women in regards to life expectancy has tended to increase since the economic crisis in Korea. Several previous studies stress how economic failure affects health. For instance, Wnuk and Lipinski (*25*) discribe how an economic failure affects inequalities in mortality, and Hertzman and Siddiqi (*10*) argue that in places where economic growth takes place, life expectancy increases, while in areas where economic growth is stunted, life expectancy decreases. In Asia, Chelala (*20*) also discusses

how economic deterioration impacts health. Results from the current study add to these extant studies on the relationship between economic changes and life expectancy and how a sudden downturn in economic growth may result in substantial disadvantages mostly among the less educated and women, while inequality slightly narrows between the most highly and the second most-highly educated men. In other words, sudden economic crisis can create the polarization of life expectancy by exacerbating the disadvantage of already-socially disadvantaged population such as women and those with low educational attainment.

The Korea National Statistical Office reports that overall life expectancy at birth was 73.53 years in 1995 (69.57 years for men, 77.41 years for women), and 78.63 years in 2005 (75.14 years for men, 81.89 years for women), an increase of about 5 years over a decade (*26*). Yet as shown by this study, the gap in life expectancy based on social differences has been growing ever wider during the same period. This naturally leads to another important question: What is/are the reason(s) for the current life expectancy trends in Korea given that life expectancy increased overall, while social inequalities in life expectancy also increased? We think that the root cause was the worsened social inequalities in Korea since the outbreak of economic crisis. When entire Korean economy was shaken by the currency crisis and financial insecurity in 1997 and 1998, the Korean government accepted neo-liberal market economic system as advised by the International Monetary Fund (IMF). This new economic system resulted in a reorganization of the Korean economic structure, rather than a temporary crisis management policy (*27*). This included immediate enforcement of policies increasing flexibility and softness in the labor market, a substantial opening of the capital market and active attraction of overseas capital and installment of the Economic and Social Development Commission to control and systematize the labor union movements (*28*). Under this new system and subsequent legalization of layoffs during corporate restructuring, companies, regardless of their sizes, began to actively utilize human resource policies that replaced

regular workers with non-regular workers. Increased insecurity in the job market and employment situation quickly resulted in the deterioration of the distribution structure by creating a sharp increase in the number and share of non-regular jobs and a rapid surge in the size of the working poor population apart from the traditional poor, which then gave rise to worsening inequalities and socioeconomic upheaval among all poor Koreans the (*29,30*). In the process of such economic restructuring, poverty became a more serious problem in Korea, and the number of people under the poverty line, whose earnings fell below the minimum cost of living, rose from 5.91% of the entire population in 1996, to 11.46% in 2000 (*31*). Widened inequality after the economic restructuring is clearly reflected through educational attainment profiles. During the period of economic crisis, toward the end of 1997 and beginning of 1998, Koreans with low educational attainment experienced larger drops in labor force participation rates and a sharper increase in unemployment rates, compared to their counterparts with higher education. In particular, unemployment rates for persons with educational levels at or below middle school rose substantially, compared to the years before the economic crisis. Even after the economic crisis, the unemployment rate for these populations failed to stabilize and continues to plunge downward, which has resulted in rapid polarization of socioeconomic conditions (*32, 33*). This situation was clearly evidenced by the *Gini* coefficient, an index of income redistribution, which increased from 0.283 in 1997 to 0.337 in 2006. (*27*)

Our results show that the adverse consequence of economic crisis regarding social differences in life expectancy by the levels of education was larger for women than for men. It may suggest that Korean women were victimized by the economic crisis to a much larger extent relative to their men counterparts. For centuries, Korea has been a men dominated society where husbands are the major bread winners and wives occupy more domestic roles. Since economic crisis, women, particularly among the lower social classes, were driven out

of the house and had to participate in the labor market due to a rapidly increased risk of unemployment and wage cutoffs of their husband. Because these women workers were unskilled, they mainly occupied jobs with very low wages and small to no job security (*34*). For women, labor force participation rate after the economic crisis increased (47.1% in 1998 to 50% in 2006), while the men labor force participation rate sustained a downward tendency (74.5% in 2000 to 74.1% in 2006). The picture would seem to have improved for women in the labor market since the economic crisis after 1998. However, this increase in labor force participation is primarily due to the entry of the low-educated women into the labor market in order to make a living for their family. These women workers remain in unskilled positions, with low wage works, and continue to rely on informal economies as well as traditional economic modalities such as agriculture and fishing (*35*). The proportion of women non-regular workers among the wage women workers increased from 62.4% in 1990 to 66.4% in 2002. This is much higher proportion compared with wage men workers (35.5% in 1990 and 41% in 2002).

Our study has the following limitations. First, as the data from the census and the national deaths were not matched by individual person, misclassification of educational variable is likely in the census and national death data, which would be referred to as a numerator-denominator bias. Second, the denominators in this study might not be estimated on a yearly basis as we used the census that is administered every 5 years. Third, the use of education as a proxy for social class in this study might not be an accurate indicator for measuring true social class differentials. However, as the previous Korean studies showed that educational differences were more strongly related to the inequalities in health, therefore, the limitations of education would make the result less likely to be biased (*16, 17*).

Despite these and other limitations, our study has contributed to an existing literature on the socioeconomic conditions and population health by documenting that the life span of

social minorities does not expand as much as the progress in human productivity. Although bounded in Korean situation, our study empirically indicates that the time of economic decline may impose more critical damages on the health of low social classes and women.

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Table 1. Life expectancy by educational attainments, Korea (1995-2005)

All Koreans												
	1994-1997				1998-2001				2002-2005			
age	Elemen	Middle	High	Univ	Elemen	Middle	High	Univ	Elemen	Middle	High	Univ
30-34	42.8	43.9	45.0	48.5	41.7	45.6	47.4	50.4	41.7	46.8	50.6	53.4
35-39	39.2	39.4	40.3	43.7	39.2	41.5	42.7	45.5	38.8	43.3	45.8	48.5
40-44	35.5	34.9	35.5	38.9	36.0	37.2	37.9	40.7	36.1	39.6	41.1	43.6
45-49	31.6	30.4	30.9	34.1	32.3	32.8	33.2	35.9	33.3	35.5	36.4	38.8
50-54	27.5	26.0	26.4	29.4	28.5	28.3	28.6	31.1	29.7	31.2	31.8	34.0
55-59	23.6	21.8	22.1	25.0	24.5	24.0	24.2	26.6	25.9	26.8	27.3	29.3
60-64	19.7	17.9	18.0	20.8	20.7	19.9	20.1	22.3	21.9	22.4	23.0	24.9
65-69	15.9	14.1	14.2	16.8	16.9	16.0	16.3	18.3	18.2	18.5	19.0	20.7
70-74	12.4	10.8	10.9	13.4	13.2	12.4	12.6	14.6	14.6	14.7	15.3	16.8
75-79	9.4	8.1	8.2	10.5	10.0	9.2	9.5	11.3	11.1	11.3	11.8	13.2
80-84	6.9	5.9	6.0	8.3	7.4	6.7	7.0	8.7	8.2	8.4	8.9	10.3
85 and up	5.1	4.3	4.6	6.8	5.5	5.0	5.2	7.1	5.8	6.3	6.8	8.2
Men												
	1994-1997				1998-2001				2002-2005			
age	Elemen	Middle	High	Univ	Elemen	Middle	High	Univ	Elemen	Middle	High	Univ
30-34	35.1	40.3	43.0	47.7	33.8	41.4	45.0	49.3	33.9	41.8	47.7	52.1
35-39	32.1	36.3	38.3	42.9	31.6	37.8	40.3	44.4	30.9	38.5	43.1	47.2
40-44	29.2	32.3	33.7	38.1	29.2	34.2	35.7	39.6	28.8	35.4	38.5	42.4
45-49	26.2	28.2	29.1	33.4	26.5	30.2	31.2	34.8	26.9	32.2	34.0	37.6
50-54	22.9	24.1	24.7	28.7	23.5	26.2	26.7	30.2	24.3	28.4	29.6	32.9
55-59	19.7	20.3	20.6	24.4	20.2	22.2	22.5	25.7	21.2	24.4	25.2	28.2
60-64	16.5	16.6	16.7	20.2	17.2	18.5	18.5	21.5	18.0	20.4	21.1	23.9
65-69	13.3	13.3	13.0	16.3	14.1	15.0	14.9	17.6	15.0	16.8	17.3	19.8
70-74	10.4	10.2	9.9	12.9	11.0	11.7	11.3	13.9	12.0	13.4	13.8	16.1
75-79	7.8	7.6	7.5	10.1	8.4	8.8	8.4	10.6	9.0	10.4	10.4	12.5
80-84	5.7	5.4	5.4	7.9	6.2	6.4	6.2	8.0	6.4	7.7	7.7	9.6
85 and up	4.1	3.6	4.3	6.7	4.5	4.6	4.5	6.3	4.1	5.7	6.0	7.5
Women												
	1994-1997				1998-2001				2002-2005			
age	Elemen	Middle	High	Univ	Elemen	Middle	High	Univ	Elemen	Middle	High	Univ
30-34	47.9	49.1	50.2	53.6	47.2	50.7	53.2	57.0	47.7	53.0	56.2	59.9
35-39	43.7	44.3	45.3	48.7	44.1	46.2	48.4	52.1	44.5	49.1	51.4	55.0
40-44	39.3	39.5	40.5	43.8	40.1	41.5	43.5	47.2	41.0	44.8	46.5	50.1
45-49	34.8	34.8	35.7	39.0	35.7	36.8	38.7	42.3	37.1	40.2	41.7	45.2
50-54	30.3	30.1	31.0	34.2	31.3	32.0	33.9	37.5	32.8	35.5	36.9	40.4
55-59	25.8	25.5	26.4	29.5	26.8	27.4	29.3	32.8	28.4	30.8	32.1	35.6
60-64	21.5	21.1	21.9	24.9	22.5	22.8	24.7	28.2	24.0	26.2	27.5	30.8
65-69	17.4	16.8	17.5	20.5	18.3	18.4	20.3	23.6	19.9	21.7	23.0	26.2
70-74	13.6	13.0	13.6	16.4	14.3	14.2	16.2	19.4	15.8	17.4	18.7	21.8
75-79	10.2	9.8	10.0	12.8	10.8	10.6	12.5	15.6	12.1	13.4	14.7	17.6
80-84	7.4	7.5	7.2	9.7	7.9	7.7	9.2	12.6	9.0	10.0	11.2	14.1
85 and up	5.4	5.8	5.0	7.4	5.8	5.8	6.9	10.7	6.6	7.5	8.4	11.6

Table 2. Differences in life expectancy across educational groups, Korea (1995-2005)

All Koreans									
	1994-1997			1998-2001			2002-2005		
age	Univ-Elemen	Univ-Middle	Univ-High	Univ-Elemen	Univ-Middle	Univ-High	Univ-Elemen	Univ-Middle	Univ-High
30-34	5.7	4.7	3.5	8.7	4.8	3.0	11.6	6.5	2.8
35-39	4.5	4.3	3.4	6.4	4.0	2.9	9.7	5.2	2.6
40-44	3.4	4.0	3.4	4.7	3.5	2.8	7.5	4.0	2.5
45-49	2.5	3.7	3.2	3.5	3.1	2.6	5.5	3.3	2.3
50-54	1.9	3.4	3.1	2.7	2.8	2.5	4.3	2.9	2.2
55-59	1.4	3.2	2.9	2.1	2.6	2.4	3.5	2.6	2.1
60-64	1.1	2.9	2.8	1.7	2.4	2.2	2.9	2.4	1.9
65-69	0.9	2.7	2.6	1.4	2.3	2.0	2.5	2.2	1.7
70-74	0.9	2.5	2.5	1.3	2.2	1.9	2.3	2.1	1.5
75-79	1.1	2.4	2.3	1.3	2.0	1.8	2.2	1.9	1.5
80-84	1.3	2.3	2.2	1.3	2.0	1.7	2.1	1.9	1.4
85 and up	1.8	2.6	2.3	1.6	2.1	1.8	2.4	1.9	1.4
Men									
	1994-1997			1998-2001			2002-2005		
age	Univ-Elemen	Univ-Middle	Univ-High	Univ-Elemen	Univ-Middle	Univ-High	Univ-Elemen	Univ-Middle	Univ-High
30-34	12.6	7.4	4.7	15.5	7.9	4.3	18.2	10.3	4.3
35-39	10.8	6.6	4.6	12.8	6.6	4.1	16.3	8.7	4.1
40-44	8.9	5.8	4.4	10.4	5.4	3.9	13.5	6.9	3.8
45-49	7.2	5.2	4.2	8.3	4.6	3.7	10.7	5.4	3.6
50-54	5.8	4.6	4.0	6.7	3.9	3.4	8.6	4.5	3.3
55-59	4.7	4.1	3.8	5.5	3.5	3.2	7.0	3.9	3.0
60-64	3.7	3.6	3.5	4.3	3.0	2.9	5.9	3.5	2.8
65-69	3.0	3.0	3.3	3.5	2.6	2.7	4.8	3.0	2.5
70-74	2.5	2.7	3.0	2.8	2.2	2.5	4.1	2.6	2.2
75-79	2.3	2.5	2.6	2.3	1.8	2.2	3.5	2.1	2.1
80-84	2.3	2.5	2.5	1.8	1.6	1.8	3.2	1.9	1.9
85 and up	2.6	3.1	2.3	1.7	1.6	1.8	3.4	1.8	1.5
Women									
	1994-1997			1998-2001			2002-2005		
age	Univ-Elemen	Univ-Middle	Univ-High	Univ-Elemen	Univ-Middle	Univ-High	Univ-Elemen	Univ-Middle	Univ-High
30-34	5.6	4.5	3.4	9.8	6.3	3.8	12.2	7.0	3.8
35-39	5.0	4.4	3.4	8.0	5.9	3.7	10.5	5.9	3.7
40-44	4.5	4.3	3.3	7.1	5.7	3.7	9.1	5.3	3.6
45-49	4.2	4.2	3.3	6.6	5.6	3.6	8.1	5.0	3.5
50-54	3.9	4.1	3.2	6.3	5.5	3.6	7.5	4.8	3.5
55-59	3.6	4.0	3.1	6.0	5.4	3.5	7.2	4.8	3.4
60-64	3.4	3.8	3.0	5.7	5.3	3.4	6.8	4.7	3.3
65-69	3.1	3.7	3.0	5.3	5.2	3.3	6.4	4.5	3.2
70-74	2.9	3.5	2.8	5.1	5.2	3.2	5.9	4.4	3.1
75-79	2.6	2.9	2.8	4.8	5.0	3.1	5.5	4.3	2.9
80-84	2.3	2.2	2.5	4.8	4.9	3.4	5.1	4.1	2.9
85 and up	2.1	1.7	2.4	4.9	4.8	3.8	5.0	4.1	3.1