Differential Effects of Educational Attainment on Chronic Diseases with Age*

Min-Ah Lee**

The purpose of this study was to examine relationships between chronic diseases, age, and education in Korea. Logistic regression techniques were used to analyze data from the Korean Longitudinal Study of Ageing (KLoSA), which is a nationally representative sample of Koreans aged 45 years and older. The findings show that probability of having chronic diseases increased with age up to about 74; however, it was reduced for respondents aged 74 years or older. Associations between age and chronic diseases were also differential by education. Less educated Koreans tended to have chronic diseases earlier in their lifetime; however, they were likely to have chronic diseases later in life less than more educated counterparts. The findings suggest that individuals with fewer years of education are at an increased risk of developing chronic diseases earlier in their lifetimes, thereby, leading to a higher rate of mortality at younger ages.

Key Words: Chronic diseases, Age, Educational attainment, Health inequality, Mortality selection

Ⅰ. Introduction

It has been well known that educational attainment is an important factor explaining health inequality in western societies. Compared to most other indicators of socio-economic status, level of education is often more strongly associated with the onset of health problems(Herd, Goesling and House, 2007) and also an appropriate factor for older adults who have reached the age of retirement(Ross and Wu, 1996). Many studies have revealed the beneficial

---

effects of higher education on a number of health outcomes, including self-rated health(Zhang, McCubbin, McCubbin, Chen, Foley, Strom and Kehl, 2010), cognitive function in older adults(Cagney and Lauderdale, 2002), disability(Keddie, Peek and Markides, 2005; Clarke, Ailshire and Lantz, 2009), and mortality(Winkleby and Cubbin, 2003).

The beneficial effects of educational attainment are explained in that education is an important resource itself and also increases other resources through the life course. Educational attainment is a critical indicator of socio-economic status, which in turn influences other factors such as occupation and income and even health in the long run(Ross and Wu, 1996: 106). Moreover, education is associated with social networks that facilitate the flow of social capital among people within the networks.

Despite these conclusions, questions remain. Given that empirical studies examining health inequality in diverse health outcomes have not been cumulated enough in Korea(Son, 2002), it is premature to conclude if and how education affects the health of Koreans. Education effects depend on the extent to which education serves as beneficial human capital associated with obtaining other resources. Prior observations, for instance, have shown that there are no or only weakly significant associations between educational attainment and health outcomes in Asian countries(Zimmer, Chayovan, Lin and Natividad, 2004; Liu, Chi, Song and Zheng, 2009).

Moreover, there is little study examining the relationship between education and the chronic diseases of Koreans and its change with age. Although some studies have examined the patterns of education effect with age in relation to prevalence of chronic diseases and self-rated health(Park, 2005; Kim, 2007), it is still questionable if an education-based gap in health converges or diverges with age in Korea given the limited number of studies. Especially, prevalence of chronic diseases is an important health indicator associated with quality of life and mortality in the future. It is also a reliable health measure in that it is an objective measure more than self-rated health outcomes.

The present study seeks to analyze associations among chronic diseases, age, and education and examine differential effects of education on chronic

diseases with age in Korea. It would be analyzed if an education-based gap in chronic diseases exists in Korea and how it, if so, changes with age.

Ⅱ. Literature Review

1. Educational Attainment and Health

Cumulative inequality theory that integrates life course perceptive and cumulative disadvantage/advantage theory focuses on the lifelong process of aging and health in relation to accumulation of disadvantages/advantages affecting life trajectories(Dannefer, 1987; O'Rand, 1996; Ferraro, Shippee and Schafer, 2008). Disadvantage is defined as an "unfavorable position in a status hierarchy(Ferraro et al., 2008: 422)" and advantage is vice versa. In the perspective, exposure to risks and available resources are important factors shaping health through the life course(Ferraro et al., 2008). Experiencing eventuated risks(disadvantages) and obtaining resources are not one time events of which its effects diminish with time, but long lasting factors affecting life trajectories. As the term, cumulative disadvantage or inequality, implies, disadvantages lead to other disadvantages and increase exposure to risks in the future(O'Rand, 2006; Ferraro et al., 2008). Advantages accumulate as well. Beneficial resources reduce exposure to risks and lead to other resources, increasing probability of having better health in later life.

As there have been consistent efforts to identify protective resources to diminish or reverse cumulative disadvantage processes(Hatch, 2005; Willson, Shuey and Elder, 2007), it has been considered that higher educational attainment is a critical advantage for the health of older adults. Given that socioeconomic status is associated with health, educational attainment is not only an important indicator of socioeconomic status but also affects the others such as occupation and income(Ross and Wu, 1996: 106). Educational attainment also influences lifestyle factors including health behaviors, knowledge, and health care utilization, influencing later life health. In this sense, education can serve as proxy for achieved human capital and life trajectories.

Another notable point on educational attainment is that it is more appropriate for research on older adults because it is relatively stable after young adulthood compared with other indicators of socioeconomic status such as income. Income may not be an appropriate indicator for older adults after retirement(Ross and Wu, 1996). Consequently, higher educational attainment compensates poor health status and delays health decline by reducing probability and duration of exposure to risks and increasing protective factors for health over the life course(Ferraro et al., 2008).

As mentioned above, previous studies have shown significant associations between educational attainment and diverse health outcomes. Higher educational level is associated with better health in terms of self-rated health(Zhang et al., 2010), cognitive function of older adults(Cagney and Lauderdale, 2002) as well as mortality(Winkleby and Cubbin, 2003).

2. Empirical Evidences in Korea and Assessing Contribution from Previous Studies

A few studies have investigated health inequality in Korea in relation to educational attainment. It has been reported that educational attainment has a beneficial effect on life expectancy(Woo, 2009), physical and mental health status(Kang and Cho, 2007), and even mortality(Son, 2002; Kim et al., 2007). People with higher educational level are likely to have lower mortality risks than those with lower educational level(Son, 2002).

A couple of studies have examined a health gap across educational levels with age in Korea(Kim, 2007; Park, 2005). Kim(2007) has shown that educational attainment has a significant effect on individual health by examining the effects of education on two health indicators(self-rated health and prevalence of chronic diseases) and its change with age. In his study, respondents who have higher educational attainment are likely to have better self-rated health and lower prevalence of chronic diseases and, notably, the education-based gap increases with age(Kim, 2007), which means that health inequality by education diverges with age. Another study on self-rated health of Koreans also has shown that a diverging pattern in the change of

self-rated health by socioeconomic status with age exists(Park, 2005). The health gap in self-rated health does not converge with age but remain constant or even increase with age(Park, 2005).

Although previous studies successfully have shown the differential effects of education on health with age, it is premature to conclude that an education-based gap in health diverges with age in Korea. There are a couple of reasons why caution is merited.

First of all, there are no many studies examining an education-based gap with age in Korea. In fact, the pattern of the education-based gap in health with age has been debated over the past decade in western societies. Some previous studies have detected diverging patterns with respect to health outcomes and age, such as self-rated physical health(Ross and Wu, 1996) and mortality(Dupre, 2007). Alternatively, several empirical studies have shown that the education-based gap in health outcomes converges with age(House et al., 1994; Beckett, 2000). This pattern of convergence has been often explained by social services for older adults, as well as selection effects associated with higher mortality levels among groups with lower educational levels in the United States(House et al., 1994). Given that education can have differential effects across societies, it is worth examining whether and how levels of education are associated with chronic diseases in Korea, as well as how these relationships are affected by age. Only limited numbers of studies have examined this issue in Korea, and their results suggest that the education-based gap in health outcomes diverges with age (Park, 2005; Kim, 2007; Kim, 2008). More empirical evidences should be cumulated.

Moreover, in terms of methodological aspect, it should be noted that most studies have utilized subjective self-reports from respondents(self-rated health) to assess health. Although self-rated health is a well-defined, useful, and widely accepted measure and also a critical factor in predicting mortality(Ferraro and Kelley-Moore, 2001), it is a relatively less reliable measure than others based on medical examinations(Jung, Cho and Oh, 2007). Also, it has been criticized that it may not accurately represent health in diverse ethnic groups out of western societies(Reynolds and Brown, 1984). Self-rated health is subject to different interpretations depending on the

sub-population being assessed(Zimmer, Natividad, Lin and Chayovan, 2000). Specifically, cultural differences may result in subjects forming different interpretations of survey questions regarding health. These cultural differences may also affect answers, which may in turn lead to problems in the external validity of these measures.

Alternatively, the present study focuses on chronic diseases that were diagnosed during medical examinations. The prevalence of chronic diseases differs across racial/ethnic groups both within a given country(Chen, Martin and Matthews, 2006) and across countries(WHO, 2010). For instance, Koreans are thought to have higher rates of cerebrovascular disease than White Americans(Park, 1999). Additionally, chronic diseases, such as diabetes and respiratory problems, are more commonly fatal in Korea than in the United States(WHO, 2010).

Ⅲ. Methods

1. Data

The data used in this study were drawn from the Korean Longitudinal Study of Ageing(KLoSA), collected by the Korean Labor Institute in 2006. The KLoSA is based on a nationally representative sample of Koreans aged 45 and older. The sampling frame of KLoSA is the residence unit for 2005 Korean Population Census for obtaining the representative sample. The KLoSA was intended to examine various aspects of aging, including health status, prevalence of chronic diseases and the socioeconomic standing of respondents.

2. Measurements

Chronic disease is defined as a condition lasting 3 months or longer, by the definition of US National Center for Health Statistics regardless of the types of the condition. Specifically, respondents were asked whether they had been diagnosed by a doctor with any of chronic diseases and eight

chronic diseases were used to measure if respondents have at least one chronic disease: hypertension, diabetes mellitus, respiratory disease, liver disease, cardiovascular diseases, cancer, arthritis, and cerebrovascular disease. The dependent variable, having chronic diseases, is a binary variable, which means that respondents who do not have any chronic illness have zero value for the dependent variable, whereas those who have at least one disease among the eight chronic diseases have one value for the variable.

Independent variables in the study include age, gender, marital status, level of education and homeownership. Age was measured in years, and the quadratic transformation of age was also included in analytic models to adjust for an expected non-linear relationship between age and chronic disease[1]. Gender was treated as a dichotomous variable(female=1). Marital status was assessed by asking whether respondents were married, widowed, separated, divorced, or never married. In this study, two dummy variables(widowed and divorced/separated) were used to code marital status. Married served as the referent group in analytic models[2].

Educational attainment was divided into four categories for this study, including elementary school or less, middle school graduate, high school graduate, and 2 year college graduate or beyond[3]. The 'elementary school or less' group served as the referent group in analytic models for being compared with other groups. Homeownership was included as a variable for assessing current economic situations because it would be an appropriate indicator of economic situations more than income for older adults after retirement(Ross and Wu, 1996). 〈Table 1〉 presents descriptive statistics for all variables used in analyses.

3. Analytic Plans

Logistic regression was used to estimate the parameters of covariates in a

---

1) The quadratic term of age was centered around the mean of age(61.689) for avoiding a multicollinearity problem.
2) Due to the very small number of individuals(n=92) who had never married, they were excluded from the analyses of the study.
3) 151 of 2,497 aged 70 or over had 2 year college or advanced degree(5.71%).

<Table 1> Descriptive statistics of variables, unweighted statistics

	Total N=10,154	Elementary school or less N=4,623	Middle school graduates N=1,726	High school graduates N=2,676	2 year college or beyond N=1,129
Having chronic diseases	47.0	59.0	45.5	33.2	32.4
Age	61.8	67.8	59.0	55.4	56.4
	(11.1)	(10.0)	(9.1)	(8.9)	(10.0)
Educational Attainment					
Elementary school or less	45.5	-	-	-	-
Middle school	17.0	-	-	-	-
High school	26.4	-	-	-	-
2 year College or beyond	11.1	-	-	-	-
Female	56.6	71.8	54.4	44.9	25.3
Marital status					
Married	78.5	64.3	85.7	91.9	93.4
Widowed	18.8	33.6	10.0	5.2	3.6
Divorced or separated	28.0	2.1	4.3	2.9	2.9
Own house	76.5	76.0	74.6	77.6	78.5

Note: Mean and proportion are presented for continuous and binary variables respectively. Numbers in parentheses are standard deviations and standard deviations of binary variables are excluded.

sample of Koreans aged 45 and older. First set of logistic regression models hierarchically examines associations between age, level of education, and having chronic diseases. The second logistic regression model tests interactions between education and age in order to assess whether and how relationships between age and chronic diseases are affected by differential levels of education in the study sample. Using the results of logistic regression models, predicted probabilities of having chronic diseases classified by education and age would be calculated.

Ⅳ. Results

1. Age, Educational Attainment, and Chronic Diseases

〈Table 2〉 presents the results of logistic regression models, evaluating the effects of age and educational attainment on having chronic diseases. The effects of education on having chronic diseases are congruent with

those in previous studies. In the model 1 of 〈Table 2〉, all education variables are significant, which means that respondents whose educational level is elementary school or less are more likely to have chronic diseases than others. The relationships between education and chronic diseases are still significant after controlling for age and its quadratic term in model 2. Only middle school graduates became not significant after controlling for other covariates in model 3. Odds ratios of the significant education variables show that the likelihood of having chronic diseases reduces as educational level increases.

As shown in the models 2 and 3 of 〈Table 2〉, not surprisingly, the likelihood of having chronic diseases increases with age. The significant quadratic term of age indicates that the relationship between age and chronic diseases is non-linear. Respondents are more likely to have chronic diseases with age, but the likelihood of having chronic diseases decreases after a certain point of age. Additionally, other independent variables are significant. Females are more likely to have chronic diseases than males. Married are less likely to have chronic diseases than widowed and divorced

<Table 2> Multivariate logistic regression models of chronic diseases among Koreans aged 45 and older(odds ratios)

	Having chronic diseases		
	Model1	Model2	Model3
Educational Attainment			
Elementary school or less(referent group)			
Middle school	0.562 ***	0.880 *	0.945
High school	0.351 ***	0.706 ***	0.804 ***
2 year college or beyond	0.311 ***	0.616 ***	0.731 ***
Age		1.071 ***	1.073 ***
Age^2		0.998 ***	0.997 ***
Female			1.283 ***
Marital Status			
Married(referent group)			
Widowed			1.191 **
Divorced/separated			1.357 **
Own house			0.792 ***
Weighted N	10,143	10,143	10,143
χ^2	1067.07 ***	1067.07 ***	1067.07 ***
Pseudo R-squared	0.109	0.109	0.109

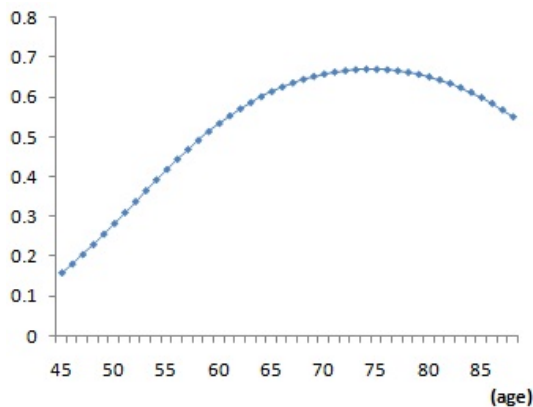Note: * p<0.10, ** p<0.05, *** p<0.01

or separated counterparts, and respondents who owned houses are less likely to have chronic diseases than their renting counterparts. The benefit of being married in terms of health in the findings are consistent with those of previous studies(Lee and Ferraro, 2009).

⟨Figure 1⟩ depicts the relationship between age and having chronic diseases as outline in model 3, in which the covariates were controlled. The X and Y axes represent the respondents' age and expected probability of having chronic diseases, respectively. As shown in Figure 1, the expected probability of having chronic diseases increases as age increases until the respondents are 74 years old. The probability of having chronic diseases decreases after the mid-70s, suggesting that Koreans who are older than about 74 tend to have chronic diseases less than relatively younger Koreans.

2. Interactions between Age and Educational Attainment

⟨Table 3⟩ presents the results of a logistic regression model, which examines the interactions between age and education. All of the interaction terms between age and education are statistically significant. Among the interaction terms between education and the quadratic term of age, only interaction with 2 year college or over is statistically significant. The finding

<Figure 1> Expected probabilities of having chronic diseases among Koreans aged 45 and older by age

<Table 3> Multivariate logistic regression models of chronic diseases among Koreans aged 45 and older, Interaction between education and age(odds ratios)

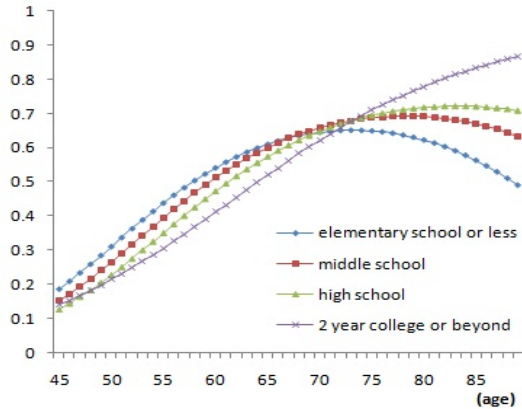|	Having chronic diseases
Interaction Terms	
Age and educational attainment	
Age×middle school	1.015 *
Age×high school	1.025 ***
Age×2 year college or beyond	1.028 ***
The quadratic term of age and educational attainment	
Age^2×middle school	1.000
Age^2×high school	1.001
Age^2×2 year college or beyond	1.002 ***
Educational attainment	
Elementary school or less(referent group)	
Middle school	0.355 **
High school	0.179 ***
2 year college or over	0.114 ***
Age	1.063 ***
Age^2	0.997 ***
Female	1.293 ***
Marital status	
Married(referent group)	
Widowed	1.222 ***
Divorced/separated	1.352 **
Own house	0.795 ***
Weighted N	10,143
χ^2	1109.9 ***
Pseudo R-squared	0.1105

Note: * p<0.10, ** p<0.05, *** p<0.01

shows that the relationship between chronic diseases and age differs by level of education. The effects of other covariates are similar to those in 〈Table 2〉.

〈Figure 2〉 shows the differential patterns of the relationship between age and having chronic diseases by level of education, which are similar(reversed U shape) across most levels of education. The probability of having chronic diseases increases with age until a certain point of age and then decreases. However, the peak of the probability of having chronic diseases varies by education.

〈Figure 2〉 shows that the lower the level of education, the earlier in age the respondent tends to experience chronic diseases in general. For example, respondents whose educational level is elementary school or less have highest

<Figure 2> Expected probabilities of having chronic diseases among
Koreans aged 45 and older by education and age

probability of having chronic diseases than all others until the mid-60s. Less educated people are more likely to have chronic diseases at relatively younger ages. However, the likelihood of having chronic diseases experienced by respondents with lower levels of education tends to decrease after a certain point of age, which varies by educational levels. As such, the peak of the likelihood of having chronic diseases for least educated individuals occurs at about 72 years old, and this is earlier than the peak points for respondents with higher education.

As shown in 〈Figure 2〉, the education-based gap in chronic diseases converges in the early 70s, but, in turn, diverges again. Less educated people are more likely to have chronic diseases until about the early 70s, but become to have chronic diseases less than more educated individuals in later life. It appears that highly educated people tend to have chronic diseases more than those with lower levels of education after the mid-70s.

Ⅴ. Discussion

The findings of the present study show that the likelihood of having chronic diseases experienced by Koreans differs according to age and

educational attainment. First, higher educated people were less likely to have chronic disease than lower educated counterparts even after controlling for all covariates in general. The findings support previous studies showing the beneficial effects of educational attainment on the health of Koreans(Son, 2002; Kim, 2007). Higher educational attainment is a critical factor leading to advantaged life trajectories as an accumulating resource. Education leads to achievement of other resources(Ross and Wu, 1996) and also influences lifestyle factors including health behaviors, knowledge, and health care utilization, affecting later life health. Indeed, education is a long lasting factor being associated with health over the life course.

Chronic diseases had a nonlinear relationship with age. The likelihood of having chronic diseases increased up to mid-70s(about 74), and then decreased even under controlling for other independent variables in the findings. Respondents in their mid-70s or older tended to experience a reduced likelihood of having chronic diseases relative to individuals in their early 70s or late 60s. This can be explained by mortality selection. That is, older adults who are healthier tend to survive to older ages, and as such, individuals who survive to their mid-70s and older are healthier than their younger counterparts.

The associations between age and chronic diseases were also differentially associated with level of education. Specifically, individuals with lower educational level were more likely to have chronic diseases until their early 70s in general; however, the likelihood of having chronic diseases among less educated individuals decreased after the period. For example, high school graduates were more likely to have chronic diseases than individuals with 2 year college or advanced degrees until the early 70s; however, these individuals tended to experience a reduced likelihood of having chronic diseases at later ages. Individuals with more years of education were likely to have chronic diseases more than those with fewer years of education at older ages(mid-70s or older).

The findings of the study are not consistent with those of the previous studies(Park, 2005; Kim, 2007). In Kim's study(2007), the education-based gap in the prevalence of chronic diseases finally diverges until about 75

years old. The findings of the present study, however, showed that the education-based gap in having chronic diseases converges until about the early 70s and then, re-diverges after that point. The inconsistent results across the studies suggest that more empirical evidences and debate on this issue are needed in Korea.

In the findings, the education-based gap in chronic diseases converged during the early 70s. How can be the convergence explained? Although a few studies showing the converging patterns in the United States support benefits of social policy for disadvantaged older adults as well as mortality selection(House et al. 1994), it is improbable that this converging pattern in the findings of the present study is due to social policy which has been put into place to reduce health inequality among older adults. First, there are no major social policies directed at decreasing health inequality among older adults in Korea. Additionally, although respondents who were diagnosed with chronic diseases may become to have better health status as long as they are given appropriate health care, this does not mean that they no longer have chronic diseases because most chronic diseases are manageable but not curable. Thus, it is not likely that social policy can fully reduce this health gap. Moreover, the converging education-based gap diverged again at later ages, which suggests that individuals with higher levels of education tend to live longer when provided proper management of their health conditions(Son, 2002; Kim et al., 2007).

As mentioned above, the education-based gap diverged with age again after the early and mid-70s. For the group of people older than mid-70s, less educated people were healthier than more educated counterparts. These findings support a hypothesis of mortality selection(Beckett, 2000) and cumulative inequality theory(Ferraro and Shippee, 2009). Older adults who have higher educational level might have exposure to chronic diseases later and manage them better than those with lower educational level, which, in turn, leads to a lower mortality risk of higher educated people. This is supported by previous research showing that lower educational levels are associated with relative disadvantages in utilizing health care services for chronic diseases(Choo et al., 2007), leading to social inequality in mortality.

In addition, according to cumulative inequality theory, given that advantages such as higher education accumulate over the life course, cumulative inequality leads to premature morality, which results in observation of reduced health inequality in later life(Ferraro and Shippee, 2009). This study supports that population truncation due to nonrandom mortality selection in old age can give the appearance of the converging and re-diverging inequality in chronic diseases. Lower educated people in the oldest group might be healthier than higher educated counterparts in that they are successful survivors. Thus, older adults with higher educational attainment might be observed not healthier.

This study has several limitations. First, although it is not a critical problem, in terms of causality between education and chronic diseases, that the data are cross-sectional, further studies need to analyze longitudinal data for examining relationships between onset of chronic diseases between survey waves and education. Another issue is that age and cohort effects are not distinguishable in the cross-sectional data analysis(Kim, 2007; Park, 2005). Longitudinal data would allow researchers to examine whether and how level of education affects the onset and development of chronic diseases(initiation of the diseases process and duration of exposure to the diseases) with age and cohorts. Third, although it is meaningful to measure a dependent variable based on eight chronic diseases for investigating a general pattern in relation to educational attainment and age, further study should analyze the eight chronic diseases separately because they have different epidemiological characteristics(Kim et al., 2007).

Finally, educational attainment may affect self-reported information with respect to chronic diseases. Individuals with lower levels of education may not know whether they have chronic conditions, as individuals of lower socioeconomic status are less likely to have access to medical resources(Sim, Seah, and Tan, 2009). If it is true, the education based gap in chronic diseases shown in the study would be underestimated. Such differences in access to medical resources should be considered in further studies.

Despite these limitations, the results of the present study have shown not only that level of education is a critical factor in the health of mid-life and

older Koreans but also that education has differential effects on the health of Koreans with age. This study has important implications for Koreans. Most efforts to improve the health statuses of older adults are prone to focus on older adults only. However, the findings suggest that health inequality in chronic diseases starts in mid-life, leading to worse health and higher rates of mortality among Koreans of lower educational level earlier in their lifetimes. Health practitioners and policy makers should address social policy initiatives in order to delay early exposure to chronic diseases among individuals of lower education or socioeconomic statuses.

〈 References 〉

Beckett, M. (2000) "Converging Health Inequalities in Later Life - An Artifact of Mortality Selection?" *Journal of Health and Social Behavior* 41(1): 106-119.

Cagney, K. A. and D. S. Lauderdale (2002) "Education, Wealth, and Cognitive Function in Later Life" *Journal of Gerontology: Psychological Sciences* 57B: 163-172.

Choo, S., S. C. Kim, S. Kim, T. Yoon, H. Shin and O. Moon (2007) "Educational Differences in Health Care Utilization in the Last Year of Life among South Korean Cancer Patients (in Korean)" *Journal of Preventive Medicine and Public Health* 40: 36-44.

Dannefer, D. (1987) "Aging as Intracohort Differentiation: Accentuation, the Matthew Effect, and the Life Course" *Sociological Forum* 2: 211-236.

Dupre, M. E. (2007) "Educational Differences in Age-Related Patterns of Disease: Reconsidering the Cumulative Advantage and Age-as-Leveler Hypotheses" *Journal of Health and Social Behavior* 48: 1-15.

Ferraro, K. F. and J. A. Kelley-Moore (2001) "Self-rated Health and Mortality among Black and White Adults: Examining the Dynamic Evaluation Thesis" *Journals of Gerontology: Social Sciences* 56: 195-205.

Ferraro, K. F. and T. P. Shippee (2009) "Aging and Cumulative Inequality: How Does Inequality Get Under the Skin" *The Gerontologist* 49(3): 333-343.

Ferraro, K. F., T. P. Shippee and M. H. Schafer (2008) "Cumulative Inequality Theory for Research on Aging and the Life Course" pp. 413-434 in *Handbook of Theories of Aging*, edited by Bengtson, V. L., M. Silverstein, N. M. Putney,

and D. Gans, New York: Springer Publishing Company.

Hatch, S. L. (2005) "Conceptualizing and Identifying Cumulative Adversity and Protective Resources: Implications for Understanding Health Inequalities" *Journal of Gerontology: Social Sciences* 60B: 130-134.

Herd, P., B. Goesling and J. S. Hous (2007) "Socioeconomic Position and Health: The Differential Effects of Education versus Income on the Onset versus Progression of Health Problems" *Journal of Health and Social Behavior* 48: 223-238.

House, J. S., M. Lepkowski, A. M. Kinney, R. P. Mero, R. C. Kessler and A. R. Herzog (1994) "The Social Stratification of Aging and Health" *Journal of Health and Social Behavior* 35: 213-234.

Jung, Y., Y. Cho and J. Oh (2007) "Differential Effects of Family Income on Self-rated Health by Age: Analysis of Seoul Citizens Health Indicators Survey 2001, 2005" *Journal of Preventive Medicine and Public Health* 40: 381-387.

Kang, H. and Y. Cho (2007) "Socioeconomic Status, Social Integration, and Health Inequality of Elderly Koreans (in Korean)" *Korean Journal of Sociology* 41: 164-201.

Keddie, A. M., M. K. Peek and K. S. Markides (2005) "Variation in the Associations of Education, Occupation, Income, and Assets with Functional Limitations in Older Mexican Americans" *Annals of Epidemiology* 15: 579-589.

Kim, K., K. Lee, S. Lee, S. Lee, Y. Lee, K. Lim, J. Chang, S. Cho, E. Choi, S. Chung, E. Jin and M. Son (2007) "The Proportional Mortality Ratios of Specific-cause Mortality by Occupation and Education among Men Aged 20-64 in Korea (1993-2004)" *Journal of Preventive Medicine and Public Health* 40: 7-15.

Kim, J. (2007) "The Relationship between Socioeconomic Status and Health in Korea: Focusing on Age Variations(in Korean)" *Korean Journal of Sociology* 41: 127-153.

_____ (2008) "Education and Age Trajectories of Self-rated Health in Korea: Latent-Growth-Curve Approach (in Korean)" *Korean Journal of Sociology* 42: 164-190.

Lee, M. and K. F. Ferraro (2009) "Perceived Discrimination and Health among Puerto Rican and Mexican Americans: Buffering Effect of the Lazo Matrimonial?" *Social Science & Medicine* 68: 1966-1974.

Liu, J., I. Chi, X. Song and X. Zheng (2009) "Prevalence and Correlates of

Functional Disability in Chinese Older Adults" *Geriatrics and Gerontology International* 9: 253-261.

O'Rand, A. M. (1996) "The Precious and The Precocious: Understanding Cumulative Disadvantage and Cumulative Advantage over the Life Course" *The Gerontologist* 36: 230-238.

_____ (2006) "Stratification and the Life Course: Life Course Capital, Life Course Risks, and Social Inequality" pp. 145-162 in *Handbook of aging and the social sciences*, edited by Binstock, R. H. and L. K. George, Boston: Academic Press.

Park, H. (2005) "Age and Self-rated Health in Korea" *Social Forces* 83: 1165-1182.

Park, K. (1999) "Life Expectancy and Causes of Death for the Elderly of Korea, USA, and Japan(in Korean)" *Korean Journal of Population Studies* 22: 97-119.

Reynolds, C. R. and R. T. Brown (1984) "Bias in Mental Testing: An Introduction to the Issues" pp. 1-40 in *Perspectives on Bias in Mental Testing*, edited by Reynolds, C. R. and R. T. Brown, New York: Plenum Press.

Ross, C. E. and C. Wu (1996) "Education, Age, and the Cumulative Advantage in Health" *Journal of Health and Social Behavior* 37: 104-120.

Sim, H. L., M. Seah and S. M. Tan (2009) "Breast Cancer Knowledge and Screening Practices: A Survey of 1,000 Asian Women" *Singapore Medical Journal* 50: 132-138.

Son, M. (2002) "The Relationships of Occupational Class, Educational Level and Deprivation with Mortality in Korean(in Korean)" *Korean Journal of Preventive Medicine* 35: 76-82.

WHO (2010) *Chronic Diseases and Health Promotion: Region and Country Specific Information Sheets* Geneva: WHO.

Willson, A. E., K. M. Shuey and G. H. Elder (2007) "Cumulative Advantage Processes as Mechanisms of Inequality in Life Course Health" *American Journal of Sociology* 112: 1886-1924.

Winkleby, M. A. and C. Cubbin (2003) "Influence of Individual and Neighborhood Socioeconomic Status on Mortality among Black, Mexican-American, and White Women and Men in the United States" *Journal of Epidemiology and Community Health* 57: 444-452.

Woo, H. (2009) "Differences in Healthy Life Expectancy by Gender and Education for Middle-Aged and Older Koreans (in Korean)" *Korean Journal of Sociology*

43: 165-187.

Zhang, W., H. McCubbin, L. McCubbin, Q. Chen, S. Foley, I. Strom and L. Kehl (2010) "Education and Self-rated Health: An Individual and Neighborhood Level Analysis of Asian Americans, Hawaiians, and Caucasians in Hawaii" *Social Science & Medicine* 70: 561-569.

Zimmer, Z., N. Chayovan, H. S. Lin and J. Natividad (2004) "How Indicators of Socioeconomic Status Relate to Physical Functioning of Older Adults in Three Asian Societies" *Research on Aging* 26: 224-258.

Zimmer, Z., J. Natividad, H. Lin and N. Chayovan (2000) "A Cross-national Examination of the Determinants of Self-assessed Health" *Journal of Health and Social Behavior* 41: 465-481.

연령에 따른 교육수준과 만성질환의 관계

이민아

  본 논문의 목적은 연령과 교육수준이 한국인의 만성질환에 미치는 영향을 분석하는 데 있다. 이를 위해 한국노동연구원이 2006년에 수집한 '고령화연구패널조사(KLoSA: Korean Longitudinal Study of Ageing)'에 참여한 45세 이상의 한국인을 분석하였다. 분석결과는 먼저 연령과 만성질환이 비선형 관계를 갖고 있음을 보여준다. 연령이 증가함에 따라 응답자가 만성질환을 앓고 있을 확률도 증가하나 약 74세를 기준으로 다시 감소한다. 또한 이러한 연령과 만성질환의 관계는 교육수준에 따라 다르게 나타났다. 교육수준이 낮을수록 상대적으로 이른 나이에 만성질환이 발현하여 70대 초까지 상대적으로 만성질환에 노출될 확률이 높게 나타난다. 그러나 이러한 교육수준에 따른 건강격차는 수렴현상(convergence)을 보이다가 70대 초반 이후부터 역전되어 다시 분기(divergence)한다. 즉, 고령층에서는 오히려 교육수준이 높을수록 만성질환을 가질 확률이 높게 나타나는 것이다. 이러한 결과는 교육수준이 낮은 사람들이 만성질환에 상대적으로 더 젊은 나이에 노출되고 결국에는 이른 사망으로 이어질 수 있다는 점을 함의한다.

핵심단어: 만성질환, 교육수준, 연령, 건강불평등, 사망불평등