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EXPLANATIONS FOR EDUCATION GRADIENTS IN DEPRESSION —THE CASE OF KOREA

Abstract

Objectives—We examine gender differences in educational gradients in depressive symptoms of married couples and identify what accounts for education gradients for husbands and wives.

Methods—We use a nationally representative sample of married couples from the 2006 Korean Longitudinal Study of Aging, which collected information about depressive symptoms and risk factors for both spouses.

Results—For married couples, we find significant education gradients in depressive symptoms for both husbands and wives. Economic resources, physical health, children, and the relationship of spouse explain educational gradients of both husbands and wives. On the other hand, work and organized social activities are important pathways for husbands, but not for wives. In contrast, spouse's educational attainment accounts for wives' educational gradient, but not husbands'.

Conclusions—Education is a strong predictor of depressive symptoms, but the pathways linking education to depressive symptoms differ between men and women.

Keywords

Mental Health; Depression; CES-D; Education Gradients; Gender Difference; Social Network; Assortative Mating

Introduction

Previous research has observed a large and persistent association between education and mental health (Lorant et al., 2003; Muntaner, Eaton, Miech & O'Campo, 2004): the more educated tend to have better mental health, exhibiting less depressive symptoms. Particularly, among various indicators of socioeconomic status, including education, income, and occupation, education has been found to be most robust (Smith, 2007). Nevertheless, the mechanisms underlying the link between education and mental health are not all clear (Cutler & Lleras-Muney, 2006). In this paper, we examine the potential pathways linking education to mental health outcomes of married couples, specifically depressive symptoms, highlighting gender differences in educational gradients and the pathways linking education to mental health.

Education may improve health because it results in higher earnings and therefore greater resources including access to health care and better physical health outcomes. Education may also lead to better jobs, offering safer work environment and less exposure to adversity. Education also helps building social network, not only larger network but also providing more social support (Berkman, 1995), and more educated spouse through assortative mating (Mare, 1991): the more a person is educated, the more educated his/her spouse would be.

Education is particularly important for Koreans, often described as “education fever” (Seth, 2002). The importance of education in the Korean society has philosophical and historic roots. Confucianism governed all aspects of life in Korea, including education and gender roles (Deuchler, 1992; Lee, 2010). Up until the Korean War, the Korean society was based on hierarchical and rigid social class system where education was available only to the upper

classes, and even among the upper class, ruling officials were selected through the examination of Confucian principles. After the Korean War in 1953, the social class system was abolished and educational opportunity was opened to everyone, becoming the most reliable vehicle for elevating one's socioeconomic status. For this reason, Korean parents became eager to invest in their children's education. Under Confucian values, Koreans put high priorities on the parent-child relationship and tend to consider their children's success as the family's fame. The expansion of higher education has been remarkable, as illustrated in Figure 1, reflecting the high value placed on education. The increase in education over the thirty year period depicted in Figure 1 was much higher in Korea than in any of the other countries included in the Figure.

Under the Confucian tradition, Korean families observe strict gender differentiation and patriarchy (Deuchler, 1992). Traditionally, Korean women's responsibilities have been domestic, leading them to develop a "relational" concept of self (Park, 2007). That is, Korean women may define themselves primarily as a daughter, wife, or mother. Married women may receive residual respect from all those who respect her husband, meaning the success of a woman's husband may affect her own self-fulfillment.

Furthermore, the patriarchic values were also manifested as son preference, investing more on son, especially the eldest son compared to daughters. Only boys remain in the lineage; a daughter is perceived to permanently leave her parents' family upon marriage. Traditionally, the eldest son is the provider for old-age support for Korean parents (Lee, Lim & Kim, 2004), and family transfers, especially from the eldest son, are still the main source of income for a large number of elderly parents in Korea (Lee & Lee, 2009). Consequently, children's educational achievement, particularly sons' achievement, matter greatly for Korean parents, which contributed to gender differences in educational attainment.

Korean society has gone through dramatic shifts in the value system with the erosion of traditional Confucian values accompanied by industrialization and urbanization. Son preference has diminished dramatically, and declining support for elders has been observed (Kwon S., 2001; Sung, 1995; Levande, Herrick, & Sung, 2000). However, the increase in women's labor participation is relatively more modest: the female labor force participation rate among those aged between 15 and 64 increased from 37.8% in 1964 to 58.3% in 2009 (data retrieved from the OECD data library, http://stats.oecd.org/BrandedView.aspx?oecd_bv_id=ifs-data-en&doi=data-00288-en, on Feb 8, 2011). Therefore, for about a large proportion of women, two pathways linking education to health, namely jobs and earnings, are not operating in effect. Instead, the pathways through family network and assortative mating would be particularly important for Korean women.

Related Literature

Depression and Suicides in Korea

Depression is a leading cause of disability worldwide, because of its high prevalence, chronicity, and high degree of resultant impairment (Institute of Medicine, 2000; WHO, 2006). In Korea, depression is quite prevalent and recently becoming a social issue with rapid increase in suicides (Washington Post, April 10, 2010). About 23.1 percent of men and 27.4 percent of women have clinically important level of depressive symptoms, and about 6.8 percent of men and 10.4 percent of women experience severe depressive symptoms (Cho, Nam & Suh, 1998).

Depression is one of the most important risk factors of suicide, and in Korea, suicide rates has tripled since 1990s and is currently one of the highest in the world. In 2008, the suicide rate in Korea was 26 persons per 100,000 persons (KNSO, 2009), which is nearly two and a

half times that in the United States, at 11 per 100,000 (National Institute of Mental Health [NIMH], 2007). Suicide also increases with age and is highest among the elderly in Korea. As shown in Table 1, the suicide rate among those 75 and older, it is more than 14 times than the U.K. rate and five times the U.S. rate.

Education Gradients in Mental Health

Individuals with lower level of education have higher odds of being depressed than those with higher level of education. In this paper, we further investigate this association between education and depressive symptoms in Korea, identifying what contributes to explaining this association and gender difference in the pathways linking education to mental health outcomes.

First, education may improve mental health, because it results in higher earnings and therefore greater resources. Previous studies that controlled income in estimating the effect of education on health, however, find that education coefficients remain significant independent of the income effect (Smith, 2007). In this study, we look into both household income and assets as potential pathways linking education to health outcomes.

Education also leads to better jobs, offering safer work environments and less exposure to adversity. Previous literature has extensively studied occupational hazards and other health-impairing characteristics of work, such as stress (Rushton, 2007; Cole et al., 2009). We study the effect of these health-impairing characteristics of work as well as type of occupation on depressive symptoms.

Biological risk factors may contribute to this association between education and depression. For example, more educated persons tend to have less physical health problems than less educated persons, and physical health problems increase the risk of depression (National Institute of Mental Health [NIMH], 2007).

Social networks may also help link education to health. Berkman (1995) found the more educated have more social support. Both informal family networks and formal networks (e.g., social clubs and other social engagements) can help protect against depression (Michael, Berkman, Colditz & Kawachi, 2001). Qualities of social relationships also matter, especially with key persons, such as spouse and children (Choi, 2008).

Furthermore, the more educated a person is, the more likely s/he would be married to a more educated spouse. Assortative mating is well-established in the literature, and in Korea, such assortative mating is quite explicit. Traditionally, Korean parents chose spouses for their children based on the family's social status, and a tradition of arranged marriage has remained in the form of match makers. The match making service has now grown to a professional industry, and professional match makers evaluate their clients' merits based on educational attainment, occupation, family wealth, age, and appearance and arrange blind dates for the clients with comparable merit scores (Choi & Keith, 1991; Kim, 2007; Lee, 2008).

Gender Difference in Korea

Blehar and Oren (1997) found that the prevalence of depression among women is twice as high as that among men, regardless of racial and ethnic background, and Park et al. (2006) confirmed such gender difference in Korea. There is also evidence that risk factors of depression work differently for men and women (Michael, Berkman, Colditz & Kawachi, 2001), but, only a few studies have examined gender differences in the risk factors of depression (Hyman et al., 2006; Muntaner et al., 2004), as we do in this paper.

There is reason to believe gender differences in depression may be more pronounced in Korea than elsewhere. As discussed earlier, given a long Confucian tradition, Korean families observe strict gender differentiation and patriarchy (Deuchler, 1992; Park & Cho, 1995). Given a large proportion of older Korean women have never been in labor force, we anticipate the educational linkage to better jobs and higher earnings are not operating for them. Instead the anticipated pathway from education to better emotional health outcome is marrying a more educated husband through assortative mating. For men, the characteristics of spouse, may not contribute as much.

Korean patriarchal values may also affect emotional health of older persons in other ways as well. Traditionally, adult children are the providers for old-age support for Korean parents (Lee, Lim & Kim, 2004). Sons are particularly important (and desired by parents) for such support (Das Gupta et al., 2003). Only sons remain in the lineage; a daughter is perceived to permanently leave her parents' family upon marriage. Children's financial transfers to parents are still the main source of income for a large number of elderly parents in Korea (Lee & Lee, 2009). Consequently, children's achievement, particularly achievement of sons, may matter greatly for Korean parents and their mental health. Therefore, for Korean parents, the educational gradients in depressive symptoms would be explained by their children's, particularly sons', achievement.

Methods

Data

We drew data for this study from the 2006 baseline wave of the KLoSA, a large-scale, longitudinal survey of the South Korean population at least 45 years of age residing in the community. The baseline survey instrument was modeled after the *Health and Retirement Survey*, and includes questions on demographics, family and social networks, health, employment and retirement, income and assets. The KLoSA collected respondent data from August 1 to December 22, 2006, with a study sample drawn from the 2005 Census.

For sampling, KLoSA used a stratified, multi-stage area probability design. The first component of this sampling framework is the probability proportional to size (PPS) systematic sampling of the 2000 (South Korean) Census enumeration districts after stratifying by the location (16 major metropolitan cities and provinces) and characteristic of the district (urban or rural, and apartment building or non-apartment dwelling). Households were selected within PSUs from a listing of households in the Census identified as age-eligible; that is, inhabited by at least one person 45 years of age and older. The sample population was selected to be nationally representative. This household listing comes from the Korean Statistical Office Census sample selected from the 2000 Census by simple random sampling. The complex sampling procedure necessitates weighting for some statistical analysis. The weight has four components: the age-eligible household selection weight, a household non-response adjustment factor, a household benchmarking, post-stratification factor, and respondent-level selection weight. The design weight is the inverse probability of selection of sample households through both stages of sampling, and the benchmark weights consider education level, age, and gender.

To account for design effects created by stratified multi-stage area probability sampling, we used weights and strata used in estimation. A total of 6,171 households completed the interview. Of these, there were 3,105 households in which both married partners participated in the interview (excluding proxy interviews) comprise the sample for this study.

Measures

Depressive symptoms were measured using the Korean version of the 10-item *Center for Epidemiologic Studies Depression* (CESD) Scale. CESD is a self-report scale for depressive symptoms developed to identify high-risk individuals for epidemiological studies (Radloff, 1977). The validity and reliability of the Korean-version of CESD have been examined and confirmed for both 20-item original scale (Cho & Kim, 1993; Lee & Farran, 2004) and 10-item shortened scale (Jang et al., 2010). The ten items ask about symptoms experienced during the past week, and the exact wording of the questions is: “how often did you lose interest in most things?” “how often did you have trouble concentrating?”; “how often did you feel depressed?”; “how often did you feel tired out or low in energy?”; “how often did you feel pretty good?”; “how often were you afraid of something?”; “how often did you have trouble falling asleep?”; “how often did you feel you were overall satisfied?”; “how often did you feel alone?”; “how often have you felt down on yourself, no good or worthless?”. The survey scores responses by how often symptoms were experienced, using a 4-point Likert scale ranging from zero to three. This yields CESD-10 scores ranging from 0 to 30 with higher scores representing more frequent depressive symptoms. The cut-off point, reflecting clinically significant levels, for the 10-item CESD score has been suggested as the score of 10 or higher (Andreasen et al., 1994). The internal consistency of the 10-item scale is .79.

Educational attainment was divided into five categories: no formal schooling (no school); elementary school (1~6th grade, ES); middle school (7~9th grade, MS); high school (10~12th grade, HS); and some college education or more (BS).

Risk factors—Previous literature suggests several groups of risk factors that we control among respondents (Carney et al., 2003; Institute of Medicine, 2000; Kendler, Gardner & Prescott, 2002; Li, Seltzer & Greenberg, 1997; Michael, Berkman, Colditz & Kawachi, 2001; Netterstrom et al., 2008; Oxman & Hull, 2001): income and assets; work status and job characteristics; physical health; social network; and spouse’s education. In all models, we include quartile variable of *age*.

For income and wealth, we include tercile variables on *income* and a binary variable on *home ownership*.

Our work-related variables are: (1) *work status*, a categorical variable indicating current work for pay (reference), retired, unemployed, and never been in labor force, (2) *number of working hours per week*, (3) binary variables of *stressed at work* and very stressed at work with no stress at work as reference, (4) binary variables of dissatisfied with job, very dissatisfied with job with no dissatisfaction as reference, and (5) categorical variable of *occupation type*, with service for private households (reference); professional/managerial; sales; clerical; service/food preparation; health services; farming/forestry; machine operation; other.

For health, we assessed a set of binary variables on *disease prevalence*, *functional ability*, and *pain*. Respondents reported whether they had ever been diagnosed with specific types of chronic disease (i.e., diabetes, hypertension, cancer, lung disease, heart problems, and stroke); a binary variable of whether they had any difficulties performing activities of daily living (ADLs) such as dressing, bathing, or eating; a binary variable of whether pain limited their daily activities.

For social network, we include a set of variables, capturing the effects of children, parents, siblings, and friends, organized social activities, and relationship with spouse. First, for children, we considered binary variables for *childlessness*, *the presence of a son*, and *the*

presence of a daughter, as well as a variable on the *number of children*. We categorized *living arrangements with children* into three groups: co-residing with children; living nearby (within 30 minutes by public transportation); and no children co-residing or living nearby (base). We assessed the quality of relationships with children by a self-reported index ranging from 0 to 100, with 100 indicating perfect satisfaction with the relationship. We also included a variable on number of years of schooling of the most educated son above age 25. Because in Confucian culture a son's education may matter more to parents than a daughter's, we included an interaction variable between the years of schooling of the most educated child with the sex of that child (base: most educated child being daughter, the same years of education for most educated daughter and son, and most educated child being son).

To assess parental and sibling attributes, we assessed a binary variable for whether the father or mother of a respondent is *still alive*; a variable on *living arrangements with parents*, including categories of co-residency with parents, living nearby, and neither co-residing nor living nearby (base); the number of siblings; and a binary variable on the presence of close friends.

We assessed *social organization* through a continuous variable of frequency of participating in any organized social activities, such as church, social clubs, or other volunteering.

For spouse, we also include a continuous variable of the quality of relationship, ranging from 0 to 100, with 100 indicating perfect satisfaction with the relationship. Finally, to capture assortative mating, we include the educational attainment of spouse.

Statistical Methods

We present descriptive data (accounting for sampling design) on each set of risk factors for CESD, highlighting gender differences in bivariate association between CESD and risk factors. We also present distributions of each risk factor by education separately for husbands and wives.

We then estimate educational gradients in depressive symptoms simultaneously for husbands and wives by estimating the following seemingly unrelated regression models (SUR):

$$\begin{aligned} D_{ih} &= c_h + \beta_{oh} E_{ih} + \beta_{sh} E_{iw} + X_h \delta_{ih} + \varepsilon_{ih} \\ D_{iw} &= c_w + \beta_{sw} E_{ih} + \beta_{ow} E_{iw} + X_w \delta_{iw} + \varepsilon_{iw} \end{aligned}$$

where D_{ih} and D_{iw} are husband's and wife's depressive symptoms for couple i , E_{ih} and E_{iw} stands for the husband's and wife's education for couple i , X_{ih} and X_{iw} are vectors of husband's and wife's individual characteristics such as age, c is a constant term, and the error terms ε_{ih} and ε_{iw} are allowed to be correlated to reflect possible dependence of the outcomes within each married couple. The coefficients on education (also referred to as education gradients) β_{oh} and β_{ow} are the objects of interest and measure the effect of own educational attainment on depressive symptoms, while the coefficients β_{sh} and β_{sw} measure the effect of spouse's education. We test the differences in education gradients between husbands and wives for dyadic model.

To investigate what contributes to education gradients in depressive symptoms, we first estimate the effects of education on depressive symptoms for husbands and wives separately, while controlling for age only (Model 1, base model). Once we obtain this age-adjusted education gradient, we then estimate education gradients after controlling for each set of risk factors that indicate different pathways (Model 2). The central question we ask is

whether a set of covariates reduces the estimated education gradient. Significant reductions in the estimated education gradients indicate that the underlying mechanisms account for some of education gradients. We test differences in education coefficients between two models (Model 1, base model, and Model 2, model after controlling for a set of covariates of interests), by using an estimate of the simultaneous covariance matrix for regression parameter estimates from both models, and report chi-square statistics.

Results

Table 2 presents means and distributions of CESD scores and the distribution of risk factors by gender for married couples completing the interview. Despite quite different distributions of schooling by gender—with one in seven Korean married women having no formal schooling at all—there is a sharp negative CESD gradient for both men and women. In particular, the most educated have CESD scores only about half those for the least educated. Table 2 demonstrates that CESD is higher for childless couples and in large families, among those whose children do not reside with them, for those with no siblings or close friends, for those not belonging to clubs or church groups, and for those who are not working. Those reporting higher quality of relationships with their spouse or children have lower CESD scores. Later we will examine whether these associations persist in multivariate modeling. The most educated child being son matters for men, but not for women.

To help explain an education gradient in depression, a risk factor must be associated with both depression and education. Table 3 presents distributions of risk factors by education separately for husbands and wives. Those with the least education are more likely to be childless yet also have more children, including at least one son or one daughter. The least educated are also much less likely to live with or be close to their children and are much less satisfied with the relationship with their children. Because they are older, the less educated are less likely to have a living parent and also have fewer siblings. Education was strongly associated with participation in organized social activities as well as the quality of the relationship respondents report with spouse and children.

Illness can also help explain education gradients in depression. Rates of diagnosed illness, pain, and ADL difficulties are all strongly related to years of schooling. More-educated Koreans are also more likely to work and to be satisfied with their work, which may reduce depression. Nevertheless, if working, they may be more likely to experience stress on the job, which may lead to depression. Multivariate analysis is necessary to establish the importance of all these pathways given the strong negative correlation of education with age and the positive correlation of age with depression.

Table 3 shows the association between education and other covariates of depressive symptoms. Being childless is not associated with educational attainment, but the number of children is negatively associated with education for both husbands and wives. Similarly, having a son or a daughter is negatively associated with educational attainment. The more educated, the more likely to live with their children and more satisfied with their relationships with children. On the other hands, education is not significantly associated with co-residence with parents, but significantly associated with living close by. For men, those with any schooling are more likely to live nearby, whereas for women, those with college education are more likely to live nearby parents. Educational attainment is positively associated with the number of living siblings. Education is not significantly associated with having a close friend for men, but this relation is significant and positive for women. Education is positively associated with organized social activities for both men and women. Education is positively associated with current working status but negatively associated with mean number of working hours for both husbands and wives. But for women, being retired,

unemployed, or never been in labor force is not significantly associated. Among workers, less educated are more stressed and more dissatisfied with their jobs than more educated Koreans. We find strong education gradients in physical health, including incidence of chronic diseases, limitations in activities of daily living, and pain for both men and women. Education is also positively associated with the satisfaction with the relationship with spouse, and the more educated husbands/wives are, the more educated his/her spouses are. All these characteristics could contribute to the strong education gradient in depression that we might identify through multivariate analysis.

Table 4 presents education coefficients from multiple models and chi-square statistics, testing differences in education coefficients between the base model (controlling for only age) and after controlling for a set of covariates capturing a particular pathway (e.g., job characteristics, assortative mating), separately for husbands and wives. Because the results from the Tobit regression are consistent, both in direction and significance of coefficients, we report only the results of the OLS regression. To remove the influence of age, we estimated depressive symptoms as a function of only education and age in Model 1. For both men and women, we found a strong age-adjusted education gradient. This gradient was stronger for women than men.

From this base model, we introduce eight sets of variables and ascertain whether they account for educational gradients in Model 2. These groups of variables are on (1) income and assets, (2) work-related variables, (3) health, (4) children, (5) other informal social networks such as parents, siblings, and close friends, (6) involvement with organized social activities (e.g., club), (7) the quality of the relationship with spouse, and (8) spouse's educational attainment.

Model 2 in Table 4 indicates that (5) other informal network such as parents, siblings, and close friends does not explain any significant part of the education gradient in depression for either men or women. The following groups of variables have relatively similar impacts on reducing education gradients in depression for both men and women: (1) income and wealth, (3) health, (4) children and (7) quality of the relationship with spouse. On the other hands, (2) work-related variables and (6) involvement with organized social activities only explain education gradients for men, but not for women, whereas (8) spouse's educational attainment only reduces the effect of education on depressive symptoms of women, but not for men.

Within two of the four groups of variables that help explain the effect of the education gradients, there are multiple measures we can assess for reductions in education gradients. We do so by individually introducing each specific variable within the subset. In the child category, childlessness and relationship with children accounted for most of the reduction in the education gradients. Within the health group, pain made the biggest contribution to explaining education gradients.

Model 3 presents education coefficients in depressive symptoms simultaneously estimated for husbands and wives from seemingly unrelated regression models (SUR) model after introducing all covariates introduced in Model 2. As shown in Table 4, most of education gradients are explained for both husbands and wives. Accounting for couple-level correlation and all covariates, we find that husbands with high school and college education report less depressive symptoms than husbands with no formal schooling and that wives with elementary school education report less depressive symptoms than wives without any formal schooling. However, education coefficients between husbands and wives are not significantly different in SUR model.

Discussion

We found strong age-adjusted education gradients in depressive symptoms for both married men and women. Among both men and women, a significant fraction of education gradients were explained by the proposed risk factors, especially income and assets, children, health, and spousal satisfaction. Consistent with previous literature, we find family income and assets are important contributors to education gradients in depressive symptoms.

The role that children play in linking education to mental health is relatively unknown, however. We find empirical evidence that children, particularly their presence and the quality of relationships, strongly influence parents' educational gradients. More educated parents tend to be more satisfied with their relationship with their children. In addition, having children and being satisfied with the relationship with them not only protects one from depressive symptoms but also explains the educational gradients in depression.

Another interesting finding concerns the impact of children's educational achievement, especially the educational achievement of sons. As discussed earlier, Korean family life is based on patriarchal Confucianism, and the pressure of bearing sons and raising them successfully is extremely high for Korean parents. In this study, we find empirical evidence that son's education matters greatly for both fathers' mental health.

Not surprisingly, we find that poor health explains the educational gradients in depressive symptoms. Those with less education tend to have poor health, which is strongly associated with depressive symptoms. Pain in particular affects depression. The more educated a person is, the less likely that person reports suffering pain. Having pain, particularly that limiting daily activities, is a significant risk factor for depressive symptoms.

We also find that the more educated a person is, the more satisfaction that person has in relationship with spouse; such satisfaction protects one from depression and helps explain the educational gradients in depressive symptoms for both spouses.

As hypothesized we find some gender differences in pathways linking education to mental health. For men, work and organized social activities are important pathways linking education and less depressive symptoms, while they do not account for women's educational gradient. This findings support our hypothesis that work would not be an important pathway for Korean women due to low levels of female labor participation and traditional women's role defined within home. We also find that social activities, including engaging in social organizations such as church and clubs, help explain educational gradients for men, but not for women.

We also find that spouse's educational attainment explains women's educational gradients, but not men's, providing empirical support that assortative mating is an important pathway linking education to better mental health for Korean women. As discussed earlier, in Korea married women's socioeconomic status is largely decided by her husband's, and we found empirical evidence that a woman's husband's SES, particularly his education, affects women's mental health more than her own education.

In this study, we find strong evidences in gender differences in pathways linking education to depressive symptoms, using the nationally representative sample of married couples. While we find robust education gradients in depressive symptoms for both men and women, prior literature has found that behavioral responses to psychological distress vary between men and women, but our findings do not speak to other behavioral responses. Moreover, causality cannot be established from a descriptive study using a cross-sectional data, so further studies are needed to establish causality. In this paper, we find the role of culture in

explaining gender differences in education gradients, and with increasing education for women and narrowing gender gap, it is worthwhile to further research cohorts effects.

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Figure 1. Population that has attained at least upper Secondary education (2006)

Countries are ranked in descending order of the percentage of the 25-to-34-year-olds who have attained at least upper secondary education.

1. Year of reference 2002

2. Year of reference 2004

Source: OECD. Table A1.2a. See Annex 3 for notes (www.oecd.org/edu/eag2008).

Table 1

Suicides rates by age in Korea, the U.S., and the U.K.

	General population	Age 45 – 54	Age 55 - 64	Age 65 – 74	Age 75+
U.S.	11.0	16.4	13.8	12.5	16.8
U.K.	6.7	10.1	8.0	5.7	6.8
Korea	21.9	29.5	38.1	59.8	97.3

Source: WHO, all statistics are 2005 for U.S. and U.K. and 2006 for Korea http://www.who.int/mental_health/prevention/suicide/country_reports/en/index.html all statistics are 2005 for U.S. and U.K. and 2006 for Korea.

TABLE 2

Mean CESD for Husbands and Wives

	Husbands		Wives	
	weighted %	mean CESD	weighted %	mean CESD
Education				
No school	5.94%	8.00	13.66%	8.43
ES	20.45%	6.13	31.69%	6.47
MS	18.71%	5.63	20.86%	5.62
HS	35.30%	5.63	27.24%	4.95
BS	19.59%	4.53	6.55%	4.41
F-statistics (*)		27.18 ***		41.16 ***
No of Children				
0	1.65%	7.14	1.64%	8.77
1~3	76.68%	5.08	73.29%	5.51
4 or more	21.67%	6.65	25.07%	7.29
F-statistics		35.91 ***		44.44 ***
Living arrangement with children				
Co-reside with children	57.31%	5.09	53.56%	5.49
At least one child living within 30 min	13.71%	5.73	15.51%	6.68
All children living away	28.98%	6.03	30.93%	6.58
F-statistics		14.13 ***		19.10 ***
Satisfied with relation w/ children (0~100)				
0~50	13.76%	7.46	12.08%	8.75
60~80	54.66%	5.50	52.78%	6.09
90~100	29.92%	4.35	33.50%	4.76
Correlation coefficients		-0.28 ***		-0.30 ***
Highest educated child being				
Son	41.60%	5.76	41.60%	6.05
Daughter	21.25%	5.06	21.25%	5.77
Same yrs of schooling for son and daughter	37.15%	5.70	37.15%	6.11
F-statistics		4.51 ***		1.06
Work status				
Currently working	63.69%	4.68	29.74%	5.49
Retired	22.92%	6.42	13.10%	6.34
Unemployed	4.65%	6.09	3.35%	6.70
Never in labor force	8.75%	8.22	53.81%	6.18
F-statistics		62.42 ***		7.10 ***
Frequency of organized social activities				
Less than once a week	80.31%	5.62	74.35%	6.17

	Husbands		Wives	
	weighted %	mean CESD	weighted %	mean CESD
Once a Week	14.15%	4.80	17.71%	5.50
More than Once a week	5.54%	4.69	7.95%	5.63
Correlation coefficients		-0.10 ***		-0.06 ***
Satisfied with relation w/ spouse (0~100)				
0~50	15.20%	7.06	23.81%	7.78
60~80	57.46%	5.57	55.94%	5.77
90~100	27.34%	4.31	20.25%	4.61
Correlation coefficients		-0.25 ***		-0.26 ***

Table 3

Descriptive Statistics by Education

	Husbands						Wives					
	No school	ES	MS	HS	BS	Test stat	No school	ES	MS	HS	BS	Test stat
% childless	3.65%	1.47%	1.54%	2.07%	0.55%	1.72	1.62%	1.59%	1.71%	1.93%	0.55%	0.89
Mean number of children	4.0	3.3	2.8	2.5	2.4	77.69 ***	4.1	3.3	2.7	2.3	2.1	198.64 ***
% having son	97.67%	92.06%	91.96%	84.51%	85.87%	19.88 ***	95.81%	92.91%	89.20%	84.16%	79.07%	18.19 ***
% having daughter	87.86%	82.49%	77.22%	74.02%	72.49%	11.10 ***	87.53%	82.71%	77.12%	69.28%	72.91%	18.67 ***
% co-residing with children	26.09%	45.86%	55.95%	66.53%	68.08%	40.64 ***	21.02%	21.76%	12.88%	72.37%	73.50%	72.98 ***
% living close by children	24.33%	18.34%	15.30%	11.55%	9.29%	6.92 ***	22.55%	23.24%	14.28%	6.57%	8.43%	29.82 ***
Mean satisfaction with relation w/ children	64.97	72.86	74.22	76.85	79.95	20.48 ***	69.62	75.64	77.71	79.24	82.21	20.54 ***
% father alive	1.32%	3.86%	6.17%	10.80%	19.07%	28.03 ***	3.05%	5.13%	12.31%	21.16%	31.50%	44.03 ***
% mother alive	5.62%	18.23%	24.46%	35.75%	43.03%	59.23 ***	14.58%	23.07%	37.35%	52.20%	55.11%	72.73 ***
% co-residing with parents, among those with living parent	18.15%	13.37%	10.06%	9.33%	9.31%	0.91	2.18%	0.39%	1.48%	0.87%	2.35%	1.18
% living close by parents, among those with living parent	13.29%	0.75%	2.47%	6.07%	6.89%	3.55 **	0.00%	2.08%	1.72%	3.86%	4.98%	8.28 ***
Mean no of siblings	2.2	2.8	3.3	3.5	3.5	31.24 ***	2.8	3.5	3.7	3.8	3.8	25.13 ***
% having close friends	83.64%	88.78%	90.51%	89.59%	90.48%	2.25	88.14%	89.59%	92.36%	90.19%	92.15%	2.72 *
% involving organized social activities	48.57%	64.34%	75.07%	79.70%	86.45%	39.21 ***	50.17%	71.85%	79.48%	81.50%	87.59%	35.18 ***
% currently working	32.83%	50.95%	64.30%	71.74%	71.26%	34.71 ***	21.30%	30.35%	33.70%	30.49%	28.70%	6.56 ***
% currently unemployed	2.36%	6.07%	5.20%	5.12%	2.50%	3.07 *	1.74%	2.77%	3.34%	4.78%	3.67%	1.98
% currently retired	26.83%	26.30%	22.07%	19.90%	24.45%	3.35 **	13.20%	14.74%	10.27%	12.57%	16.12%	1.76
% currently never worked	37.99%	16.68%	8.43%	3.25%	1.80%	42.99 ***	63.76%	52.14%	52.70%	52.16%	51.51%	4.89 ***
Mean no of working hours among workers	41.17	48.95	51.53	50.05	44.52	10.60 ***	41.11	49.56	49.50	50.05	40.25	4.60 **
% stressed at work among workers	40.89%	45.88%	43.11%	34.24%	22.11%	6.07 ***	49.75%	45.76%	36.19%	34.95%	23.20%	3.17 *
% dissatisfied with job among workers	55.57%	46.46%	45.36%	36.11%	16.30%	26.09 ***	58.31%	47.55%	37.96%	37.48%	16.61%	9.68 ***
% diagnosed with chronic diseases	10.72%	12.78%	14.32%	11.74%	9.66%	1.47	16.08%	13.02%	8.35%	3.76%	1.72%	27.08 ***
% diagnosed with hypertension	25.29%	24.80%	24.89%	22.37%	22.74%	0.51	35.50%	31.24%	24.38%	15.90%	12.79%	29.18 ***
% diagnosed with cancer	2.30%	4.13%	1.82%	1.63%	2.36%	1.87	2.71%	3.18%	2.65%	2.70%	1.14%	1.47

	Husbands						Wives					
	No school	ES	MS	HS	BS	Test stat	No school	ES	MS	HS	BS	Test stat
% diagnosed with lung disease	5.60%	4.04%	2.20%	1.63%	1.34%	3.01 **	1.73%	1.24%	0.98%	0.50%	0.00%	8.71 ***
% diagnosed with heart problem	4.88%	4.44%	6.28%	3.67%	3.99%	0.48	5.23%	6.61%	3.07%	1.23%	1.77%	10.71 ***
% diagnosed with stroke	6.77%	5.24%	4.38%	3.73%	1.09%	5.22 ***	4.09%	3.51%	2.09%	0.39%	0.00%	19.83 ***
% having ADL difficulties	8.84%	2.90%	2.69%	2.99%	1.92%	2.85 *	5.51%	2.05%	0.72%	0.37%	0.39%	6.86 ***
% reporting pain	37.23%	26.03%	18.35%	8.50%	5.23%	41.78 ***	53.53%	38.11%	18.99%	10.41%	5.94%	99.70 ***
Mean satisfaction with relation w/spouse	65.34	73.98	72.69	74.35	78.16	14.53 ***	63.34	67.74	69.80	71.50	75.58	15.61 ***
Spouse's mean years of schooling	3	5	7	10	13	572.3 0 ***	6	8	11	13	16	701.80 ***

Table 4

Regression coefficients of education: What explains the education gradients?

	Husbands				Wives				Difference in Education Coefficient.
	ES	MS	HS	BS	ES	MS	HS	BS	
Base Model controlling for age only from OLS model									
(Model 1)	-1.619 ***	-1.787 ***	-2.364 ***	-2.837 ***	-1.719 ***	-2.180 ***	-2.725 ***	-3.388 ***	
After controlling for each set of covariates from OLS model									
(Model 2)									(Model 1 vs 2)
Income & wealth	-1.518 ***	-1.632 ***	-2.100 ***	-2.449 ***	-1.544 ***	-1.919 ***	-2.338 ***	-2.885 ***	21.90 ***
Work	-1.357 ***	-1.342 ***	-1.872 ***	-2.247 ***	-1.700 ***	-2.227 ***	-2.776 ***	-3.278 ***	5.20
Health	-1.347 ***	-1.438 ***	-1.438 ***	-2.161 ***	-1.433 ***	-1.536 ***	-1.914 ***	-2.402 ***	71.83 ***
Children	-1.142 ***	-1.191 ***	-1.604 ***	-1.820 ***	-1.137 ***	-1.361 ***	-1.736 ***	-2.256 ***	37.91 ***
Parents, sibs & friends	-1.530 ***	-1.684 ***	-2.248 ***	-2.713 ***	-1.617 ***	-2.048 ***	-2.623 ***	-3.250 ***	8.13
Social activities	-1.612 ***	-1.727 ***	-2.268 ***	-2.694 ***	-1.701 ***	-2.139 ***	-2.659 ***	-3.310 ***	4.93
Satisfaction with spouse	-1.215 ***	-1.458 ***	-1.951 ***	-2.206 ***	-1.460 ***	-1.824 ***	-2.254 ***	-2.698 ***	36.28 ***
Spouse's education	-1.306 ***	-1.464 ***	-2.037 ***	-2.429 ***	-1.370 ***	-1.471 ***	-1.588 ***	-1.883 ***	23.00 ***
After controlling for all of the above covariates from seemingly unrelated regression model									
(Model 3)	-0.622	-0.609	-0.929 *	-1.037 *	-0.783 **	-0.612	-0.619	-0.676	1.57
(husband = wife)									

* p<.05;

**

p<.01;

p<.001