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Whereas health disparities by socioeconomic status (SES) have become an inarguable fact with the decades of research, health differences by gender are still inconclusive or even more disagreeable now than before. While earlier studies observe that women have—or report—more health problems, more recent studies do not find consistent gender patterns and conclude that they vary by the measures of health and life-course stages (MacIntyre 1993; MacIntyre, Hunt, and Sweeting 1996; Strauss et al. 1993). An explanation for this discrepancy between earlier and more recent conclusions may be improvements in research methods, including more rich data and more sophisticated analysis differentiating subgroups and health measures. Another interpretation of the discrepancy is the possibility that women's health status has actually improved over the past few decades with increases in women's socioeconomic status (Arber and Cooper 1999).

This study explores gender differences in health, in a different social context from the West where most previous studies were conducted. Korea is a rapidly developing country in East Asia. Although the Confucian traditions are transforming, patriarchal relationships still persist in many spheres of life in the country. While various indicators of women's socioeconomic status—most notably educational attainment and occupational positions—are improving rapidly among younger cohorts, gender differences in socioeconomic indicators are still substantial for the overall adult population (Brinton, Lee, and Parish 1995; Lee and Cho 1999). If women's lower

socioeconomic status were the main reason for poorer health status in earlier decades in the West, such gender disparities in health may still hold in Korea. Then the next question is whether gender differences in health would disappear when socioeconomic status indicators are controlled. This study will examine these questions.

The findings will have important implications for future trends in women's health status given the rapid improvement in women's socioeconomic status in the country. For example, by the late 1990s, advancement rates to 2-year and 4-year colleges and universities among high school graduates are almost equal between the two genders at about 70 percent, with only a few percentage point lead by male students in advancement to 4-year universities. Middle school advancement rates among primary-school graduates were approximately 84 and 60 percent among male and female students, respectively, in 1976, but they were both close to 100 percent by the mid 1980s. Advancement to high schools among middle school graduates has never shown any significant gender gap since the 1960s (Lee and Cho 1999).

There have been two approaches in the study of socioeconomic status of women, one focusing on women's own characteristics and the other highlighting their husbands' or fathers' characteristics. The rationale for the latter is that the male household heads' socioeconomic characteristics may better represent women's living circumstances than do women's own socioeconomic traits (Arber and Ginn 1993). The sociological literature has discussed the issue; social prestige or class positions of family members may best be represented

by the characteristics of the male household head. For health outcomes of family members, however, wives' socioeconomic characteristics may be as important as husbands' characteristics. This is because various decisions in daily living would affect members' health outcomes as much as the family's access to resources. Supporting this, research has shown that mother's education is an important factor determining infant and child mortality (see Desai and Alva 1998). Thus, the third and fourth research questions of this study will be whether the SES of male and female respondents affect their health outcomes differently or not and whether the socioeconomic characteristics of respondents' spouses affect respondents' health outcomes. In the following, we briefly review the previous studies on gender differences in health and on associations between SES and health outcomes.

Old Paradox: More Health Problems among Women?

Earlier research, most notably that by Verbrugge and her collaborators, found that morbidity is higher among women than among men (Verbrugge 1983, 1989; Verbrugge and Winward 1987; Waldron 1980). Given the nearly universal pattern of longer life expectancy among women than among men across the societies, some label this finding of women's poorer health a paradox. Researchers proposed a few explanations why women would have poorer health than men. The first is related to women's reproductive roles; such biological traits as menstruation, child bearing, and menopause are the

sources of women's health problems. The second focuses on women's social roles and status; women occupy generally lower positions in the society and suffer disadvantages in access to resources, including medical care. The third explanation also emphasizes women's social positions but highlights women's psychosomatic symptoms; women suffer more psychosocial troubles and they are detrimental to physical health also (Nazroo, Edwards, and Brown 1998; Popay, Bartley, and Owen 1993). Another hypothesis points out women's reporting behavior, arguing that reporting of health problems is socially more acceptable for women than for men (Daltroy et al. 1999; Verbrugge 1989). On the other hand, Manton (1990) finds the paradox itself containing an answer to the gender health disparity. That is, women are more likely to survive than men at any level of impairment at any age, which means that there will be more frail women than frail men among survivors.

Related to the explanation that focuses on women's social roles as the reason for women's health disadvantage, there have been two contrasting hypotheses. One argues that women's multiple social roles are detrimental to their mental and physical health, whereas the other states that women's lack of social roles is harmful to their health. The trend of increase in women's labor force participation provides the context for both arguments. The former states that women are burdened with housework even when employed outside home, and the total work hours in and outside home is much longer for working women than any other group, working men or non-working women. This burden is particularly severe when young children are present in

the households (Arber, Gilbert, and Dale 1985; Bartley, Popay, and Plewis 1992; Macran, Clarke, and Joshi 1996). On the other hand, as more women participate in the labor force, women who do not work outside home may suffer from lower self-esteem, and related psychosomatic problems. Both men and women with multiple roles show better physical health (Verbrugge 1983).

Thus evidence on the earlier explanations for women's excess of morbidity has not been conclusive. For example, Strauss et al. (1993) find that the experience of childbirth or the number of children that women gave birth is not correlated with women's health status. Also two contrasting hypotheses on women's roles and health have not provided a consistent perspective. In the meantime, more recent research has refuted the earlier generalization of poorer health status among women than among men.

Inconsistent Gender Differences in Health

Recent research finds that there may not be any systematic differences between health status of women and men. Gender differences may vary by the measures of health and over the stages of life course (Arber and Cooper 1999; MacIntyre, Hunt, and Sweeting 1996). For example, MacIntyre (1993) find that elderly women in Britain report more functional difficulty than elderly men, but self-rated general health was not different between the two genders. In Jamaica, women's excess health problems tend to increase with age (Strauss et al. 1993).

Gender patterns of the associations between SES and health are also inconsistent across the data. In her study of British adults MacIntyre (1998) concludes that SES-health associations are generally weaker among women than among men, while a Canadian study (Veenstra 2000) concludes that, whatever the gender patterns of illness prevalence, relationships between SES and health outcomes are virtually the same for the two genders.

Associations between SES and Health

Much research shows strong associations between SES indicators and a variety of health measures (Adler and Ostrove 1999; Smith 1999). Two obvious explanations for the effect of SES on health status may be the standard of living and access to quality medical care. Poor nutrition, inadequate sanitation, and limited access to medical care may be the reasons for worse health status among lower-income people. A third explanation may be differential tendencies to engage in health risk behaviors by SES. For example, less-educated people are more likely to engage in deleterious behaviors, such as smoking, drinking, and sedentary lifestyles (James, Keenan, and Steve 1992; Lantz et al. 1998).

However, data show that these seemingly obvious mechanisms do not well explain the associations between SES and health, at least in industrial countries (Adler et al. 1993; Adler and Ostrove 1999; Lantz et al. 1998). While these material reasons partly explain the

SES-health associations, psychosocial factors may be the key pathways between SES and health. Individuals who occupy low positions in the social stratification system face more disruptions and struggles in their daily lives. If these life stresses are repeated, the cumulative toll makes it too difficult for the body to return to its normal health state, eventually giving rise to such pathologies as high blood pressure, high cholesterol, and diabetes (McEwen and Seeman 1999; Ryff and Singer 2000; Smith 1999). The most typical hierarchical distress originates from work environments, including work involving ill-defined or demanding tasks and lack of control over one's work (Marmot 1999; Marmot et al. 1991). However, psychosocial health consequences of SES may be broader. The inability to fully participate in the society overall is a source of poor health outcomes (Marmot 1999). Knowledge on health and health care systems may also benefit health outcome of more educated persons (Smith 1999).

Research Issues: Gender Differences in Health in Korea

This study first examines whether women show poorer health status than men, using three measures of health outcomes—number of chronic diseases, difficulty in activities of daily living, and self-rated general health—among two age groups, 30-59 and 60 and older. Then it examines whether such differences are explained by introduction of socioeconomic characteristics, such as educational attainment, occupational status, and family income. The third and fourth research

questions are whether SES affects health outcomes differently between male and female respondents and whether the SES of respondents' spouses affects respondents' health status.

There are myriad ways how SES is associated with health outcomes, as discussed above, and the findings on the net effects of various SES indicators, both respondents' and their spouses' SES, will provide some insights on likely pathways. To further explore the pathways, the analysis will also consider some mediating factors that are believed to be the pathways between SES and health, including health risk behaviors, physical exam results, and family disease history.

Data and Methods

Data: The Korean Institute for Health and Social Affairs (KIHASA) has conducted the National Health and Health Behavior Surveys (NHHBS) every three years from 1989, using nationally representative cross-sectional samples of households. Data of this study are from the 1998 survey, which contain a sample of 12,189 households with 39,060 household members (KIHASA 1999). The survey asked questions about health status of all members. The questionnaire consists of two parts: the first part asks respondents' health status (disease and disability status) and socioeconomic status. The second part includes in-depth questions, including self-rated general health status, health risk behaviors, physical exam of blood and urine tests, and a brief description of parents' and other relatives'

disease history. For in-depth questions, 4,135 households with 10,808 members were randomly selected. The analysis will focus on people aged 30 or older, divided into two age groups 30-59 and 60 and older.

Based on cross-sectional data, this study is limited in isolating the two directions of causal influences between SES on health. Inclusion of family disease history in the analysis may control at least partly for this reverse causal influence. In general, education is considered less influenced by health problems developed in adulthood (Elo and Preston 1996). This seems particularly the case in Korea, where adults' returning to colleges is rare (Lee and Cho 1999). Occupational status is more likely than educational attainment to be influenced by health problems developed in adulthood. The associations between spouses' SES and respondents' health are less likely to be contaminated with reverse causality.

Findings

Gender Differences in Health:

First, descriptive data show that socioeconomic characteristics differ clearly by gender and age groups (Table 1). Respondents aged 30-59 are better educated, more likely to work, and earning higher incomes than people aged 60 and older. In each age group, men show higher socioeconomic status. Percentage unmarried is similar between men and women in the younger age group at about 10 percent, but it is much higher among women in the older age group, 58 versus 11 percent among women and men, respectively. The mean age is

virtually the same between men and women in the younger age group, but women are older than men by about two years in the older age group.

A comparison of unadjusted health status in Table 2 show that in both age groups women have poorer health status in all three measures—number of chronic diseases, disability (difficulty in activities of daily living, ADL), and self-rated general health. Only one exception is disability among the younger age group. In each age group, women report a greater number of diseases and poorer self-rated general health status than men. Approximately two thirds of Koreans aged 30-59 had one or more chronic diseases that lasted more than three months during the one-year period prior to the survey.[1] More than half of those who had at least one disease had two or more chronic diseases. On average, men had 1.2 diseases and women had 1.5 diseases. For people aged 60 or older, the mean number of diseases among men and women is 1.8 and 2.5, respectively. Self-rated general health is also significantly worse among women than among men. For each measure of health, gender gap is larger among older age group as their health status deteriorates.

The next analysis further explores gender differences in health by their marital status in four different model specifications (Table 3). The statistical models used are the linear regression for number of

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[1] This analysis is based on the classification of diseases given in the survey. The most common chronic diseases include tooth problems, skin diseases, arthritis, back pain, stomach or intestine problems, and hypertension.

diseases and the ordered probit for disability and self-rated general health statuses. In each health measure, the first model does not control for any other factors, and then we add variables in the order of health condition, age, and SES. Health condition refers to the conditions of prior stages in the disablement process—disease status in the disability (i.e., difficulty in ADL) equation and disease and disability statuses in the equation of self-rated general health (Verbrugge and Jette 1994). The literature documents that marital status affects health differently by gender; that is, health benefit of being married is greater among men than among women. The results in Table 3, however, show that interaction effects between gender and marital status are not large, whether or not controlling for other factors. Except for the measure of difficulty in ADL, the two gender groups show consistent health patterns with only some magnitude variations by marital status.

Gender gaps are most conspicuous and consistent in disease status. Women report a significantly larger number of diseases across the age groups and model specifications. For self-rated general health also, women report significantly poorer health status than men when not controlling for SES. After controlling for SES, this poorer status among women remains significant for the younger age group, with the coefficient of gender somewhat smaller. For the older age group, women's disadvantage in self-rated general health status disappears after SES is controlled.

Gender and marital status patterns in disability (i.e., difficulty in ADL) are more complex, showing different results as model

specification changes. But those differences are common in the two age groups. When not controlling for any other factors, the unmarried shows significantly greater disability than the married for each gender whereas gender does not have any effect. As we add the control variables of health condition, age, and SES in the equation, each time women's disability score tends to decrease for both marital statuses. After all controlled, women show lower levels of disability than do men. Women experience less difficulty in ADL given the circumstances, but due to their lower socioeconomic status, older age, and unmarried status, unadjusted data in Table 2 showed excess disability among women in the older age group.

To summarize, for disease status, the gender gap in health status is large and consistent regardless of controls. The gender gap in self-rated general health is most sensitive to SES; that is, after controlling for SES, women's disadvantage in self-reported general health status weakens substantially. On the other hand, for each marital status, women show no more disadvantage in activities of daily living than men when not controlling for age and SES; further, as we take into account these control variables, women demonstrate significantly better command in activities of daily living than do men. These findings of three health measures are generally consistent in the two different age groups. In conclusion, except for disease status, gender gaps in disability and self-rated health statuses vary depending on whether other factors are controlled or not. In general, the observed health may appear poorer for women than for men, because of women's lower SES.

These Korean results show some similarity to the findings in the West. For example, Arber and Cooper (1999) find in Britain that elderly women report more disability than elderly men, but their self-rated general health was no different from men's. In Korea, after controlling for SES, women report similar level of self-rated general health as men (controlling for disease and disability status), whereas women's disease status is significantly poorer and their disability status is somewhat better as compared to men.

Thus the data indicate that SES plays an important role in explaining gender differences in health in Korea. In Table 3, however, we constrain the model to assume that the SES-health associations are the same for the two genders. In the following, we relax this assumption and examine whether the associations are different between the two genders. We further elaborate the analysis by considering the socioeconomic characteristics of respondents' spouses in the model.

Gender Differences in the Associations between SES and Health:

The next analyses separate male and female samples, and examine the effects of SES indicators on health. Each of Tables 4 through 8 shows results for each measure of health in each age group, except for disability for the younger age group. Any degree of disability is a rare event among people aged 30 to 59, comprising less than 5 percent of the sample, and disability in that age range is likely to be an outcome of accidents or congenital problems rather than

consequences of socioeconomic status. Each analysis presents two models, one, without and, the second, with spouse's socioeconomic characteristics

Comparisons of the short and long models in Tables 4 through 8 reveal some important gender differences. Among men, the significant effects of SES on their health outcomes in the short models seem to be largely due to the indirect effects through their spouses' SES. That is, once spouses' socioeconomic indicators are included in the long models, the effects of men's own socioeconomic indicators on their health outcomes decrease considerably whereas wives' socioeconomic indicators tend to show significant effects. Among women, the effects of their own SES remain the same after including husbands' SES in the long models and those husbands' SES shows little effect on women's health outcomes. In the following, we discuss this gender pattern in each table.

In Table 4, among men aged 30-59, education and occupational statuses have significant effects on the number of chronic diseases in the short model. The more educated the less the number of diseases, and agricultural workers and non-working men report a larger number of diseases than do all other workers, including white collar, sales and service, and blue collar workers. But, as wives' education and occupation are controlled, men's own occupational effects disappear. It is wives' working in agriculture that brings about a larger number of diseases among men. The effect of men's education remains significant in the long model although the magnitudes clearly decrease. Higher educational attainment among wives means significantly

smaller number of diseases among men.

In women's analysis of Table 4, on the other hand, women's own education and occupation show strong significant effects on disease status in the short model, and those effects remain virtually the same after controlling for husbands' education and occupation. The more educated the less the number of diseases; women with college or more education report, on average, .71 smaller number of diseases than women with primary school or less education. The mean number of diseases in this younger women sample is 1.5 and the gap between college education and primary school education accounts for about half of that number. As was the case for their husbands' disease outcomes, women with agricultural occupation report a larger number of diseases than women of any other occupational groups including those who are not working. Husbands' education and occupation show so effect at all. It is noteworthy, however, that family income has a strong negative effect on women's number of diseases. As the family income may largely consist of husbands' income, we may conclude that husbands' income has a significant negative effect on women's disease status. Overall, the coefficient of determination, R^2, is low, 5 percent among men and 10 percent among women. This may be because the model does not take into account any immediate causes of diseases, such as health behaviors (diet, smoking, drinking, and exercise), medical care, or living environments in work, family and community. Also, the large number of cases tends to lower the value of R^2.

These results require some speculations: why do the effects of

spousal education and occupation differ sharply between the two genders; why women's agricultural work is particularly detrimental to disease status for both women and their spouses; why does family income affect men and women differently. Overall the findings seem to suggest that SES is more important for women's than men's disease status in Korea. Education may represent knowledge and behaviors regarding health and health care systems among both genders, but the system of gender role division in Korea may be responsible for the two contrasts between genders in the effects of education. First, stronger effects of education on women than on men may be related to women's status. High education among women may mean greater autonomy and power in the society and in the family, thus promoting their health. Second, a significant effect of wives' education on men's health, but not vice versa, may be due to women's roles in the family. That is, wives play a more important role for the wellbeing of family members, and thus wives' health knowledge and behaviors matter more. Family income also seems to influence life chances of women more than those of men. Farming among women may involve strenuous work that does not leave women time for family or personal care.

To further explore the mechanisms how spouses' SES affect men's disease status, we introduce the mediating variables in the regression, including health risk behaviors and some physiological measures (Table 9 left panel). One potential shortcoming with this analysis comes from the fact that information on these mediating variables is limited to a sub-sample, a much smaller sample, 2594 as

compared to 8122 cases, which reduces significance levels. Thus, in the same regression model with men's own and their spouses' SES, significance levels are generally lower in this sub-sample than those shown in Table 4. Possibly because of this generally lower levels of significance, introduction of mediating variables makes little changes in the effects of men's own or their wives' SES, except for one finding that the gap between wives' white collar and agricultural work becomes not significant. The effect of wives' college education remains significant; in fact, the coefficient slightly increases. This suggests that the effects of wives' education on men's disease status is not through men's risk behaviors, such as smoking, alcohol consumption, and exercise, nor through such physiological measures as BMI, blood pressure, and blood sugar level. In addition, controlling of family disease history, measured by the number of serious chronic diseases that respondents' parents, grandparents, and siblings had before their ages 50, does not affect the SES-health associations. These various mediating variables also do not affect the coefficients of men's own education, though not significant first of all in this sub-sample (Table 9 left panel).

The ordered probit results for self-rated general health among ages 30-59 are quite similar to the findings for chronic diseases (Table 5). As we control for disease and disability statuses in this analysis, these same patterns of results are not a simple repetition of the same facts that were found in the analysis of chronic diseases. First in men's equations, effects of men's SES all but disappear as wives' SES enters the equation; this time, however, only wives' education is

significant but not their occupation. Men who have wives with primary school education report particularly poorer general health status compared to men with more educated wives. Men's own education is not significant once wives' SES is controlled. In women's equations, their own SES and family income have significant effects but not their husbands' SES. Again, as was the case for their husbands' self-rated health outcomes, women with primary school education report particularly poorer self-rated general health than do women with middle school education or above.

Again, as was the case for disease status, controlling of mediating variables does not change the coefficients of men's and their wives' SES (Table 9 right panel). This means that the effects of wives' education on men's self-rated general health status is not through men's risk behaviors nor through physiological measures, such as BMI, blood pressure or blood sugar level.

The results for people aged 60 and older in Tables 6 through 8 are similar to those for the younger age group, although significance levels are generally lower among the elderly. First, the results for number of chronic diseases show many similarities to the younger age group (Table 6). Wives' agricultural work increases men's number of diseases. Among women, higher education and larger family income decrease the number of diseases.

Results on factors affecting difficulty in ADL again follow the general pattern (Table 7). For men's disability outcome, spousal education and occupation are the major determining force. In contrast, women's education is not a determinant of their own disability status,

although their occupation is. A finding unique to this analysis is that elderly persons whose spouses are retirees (not working) show lower probability of disability than persons whose spouses are currently agricultural workers. This is found, despite the opposite direction of effect of elderly respondents' own retiree status on both men and women's disease statuses. As was the case for young age men's health outcomes, introduction of the mediating variables does not change the coefficients of SES indicators for older men's disability (Table 10).

The multivariate models do not well explain the self-rated general health of elderly persons for either gender group (Table 8). After controlling for disease and disability statuses, SES of both spouses have limited effects on self-rated general health status. However, for the first time for men, family income is significant. As compared to no schooling, primary schooling improve self-rated general health among women. Women who are not working show poorer self-rated general health than do other women.

Discussion and Summary

The findings are summarized as follows. First, among the two age groups of Korean adults, 30-59 and 60 and older, unadjusted health status of women are worse than those of men in all measures, number of diseases, difficulty in activities of daily living (disability), and self-rated general health, with one exception of disability among ages 30-59. Second, some of those observed differences in the

population, namely, self rated general health status for both age groups, can be explained by socioeconomic status (SES) differences between men and women. Gender gaps in disease status, however, remain strong even after SES is controlled. On the other hand, excess in disability among elderly women compared to elderly men seems to be mostly due to population composition, that female elderly population is more likely to be unmarried and is generally older than their male counterpart. SES differences also contribute to the gender gap in disability among the elderly. Thus, after controlling for age and SES, disability seems even lower among women than men in both age groups.

Third, with regard to the association between SES and health, there are important gender differences. Women's education, and to a lesser extent women's occupation, are the major determining force of their health outcomes. This seems to suggest that education bolster women's social positions in the society and in the family, and it may be responsible for their health outcomes. Influences of husbands' SES are limited, possibly except for the incomes that they bring in. Husband's education has no independent effect, and occupation also has little effect on women's health outcomes. Family income has consistently strong effects on women's health outcomes. Fourth, for men's health, wives' SES is a major determining force. Men's own SES, including family income, has little independent effect on their health outcomes. Evidence on the mechanisms how wives' SES affects men's health is limited. Men's health risk behaviors or some physiological characteristics, such as high blood pressure or blood

sugar levels, do not explain those linkages. Future analysis may explore the following possibilities. Future research may further elaborate the mediating variables. Even the risk behaviors considered here are not detailed enough. Smoking and alcohol consumption are highly prevalent among Korean men, comprising a vast majority of the sample, 70 percent or more, and the simple question of use or not does not distinguish much of the lifestyle variation among men. Another possibility for the association between spousal education and men's health is some kind of selectivity; healthier men marry more educated women. Yet another possibility is response bias, i.e., social desirability. It appears that interviewees, who are usually women, also provided self-rated general health of their spouses in the survey. More educated wives may have consistently underreport their husbands' health problems.

Fifth, the effects of SES are generally weaker among the older age group than among the younger sample. But it is not clear with our data whether this is a statistical artifact because of the smaller number of cases of the older sample or it reflects diminishing importance of SES at older ages. In our analysis, the measurement of SES is also less appropriate for the older age group; lifetime occupation could better represent older persons' SES than current occupation. Lastly, women's agricultural work seems to be detrimental to their own and their husbands' health outcomes.

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Table 1. Sample Characteristics

	30-59 Men	30-59 Women	60+ Men	60+ Women
Age	42.6	42.8	67.7	69.4
Unmarried	10.3	11.3	11.2	58.5
Spouse absent	12.1	14.4	12.7	60.2
Education				
No schooling	---	---	23.8	61.0
Primary school	14.3	28.8	38.1	29.3
Middle school	16.3	21.2	13.6	5.3
High school	41.5	36.6	16.4	3.5
College	27.9	13.4	8.2	0.9
Current occupation				
White collar	26.1	6.8	3.4	0.1
Sales and service	18.7	19.2	5.4	3.0
Agriculture	12.1	12.7	10.0	4.7
Blue collar	31.7	12.8	37.5	23.5
Not working	11.5	48.5	43.7	68.7
Household income	63.0	61.0	30.2	31.1
Household income, logged	3.8	3.8	3.1	3.1
Spouse's education				
No schooling	---	---	33.7	9.9
Primary school	17.6	15.7	37.4	15.7
Middle school	18.1	14.9	9.2	5.1
High school	37.9	33.2	5.9	6.1
College	14.3	21.8	1.1	3.1
Spouse's current occupation				
White collar	6.3	20.8	0.3	1.0
Sales and service	15.8	15.7	5.1	1.6
Agriculture	9.8	25.7	5.4	2.7
Blue collar	9.2	13.0	32.8	16.8
Not working	46.7	10.4	43.7	17.6
Number of cases	8122	8230	2130	3097

Note: The numbers are percentages except for age and income.

The unit of income is 10,000 won, approximately 8 US dollars.

The value of income represents monthly amount per adult aged 20 or older in the household.

Table 2. Summary Statistics of Respondents' Health Status

	30-59 Men	30-59 Women	60+ Men	60+ Women
Number of Chronic Diseases				
Mean number	1.2	1.5 *	1.8	2.5 *
Percentage distribution				
0	36.3	31.4	17.3	8.8
1	32.4	28.8	29.4	24.2
2	18.2	18.8	26.7	25.0
3	8.3	10.3	14.1	18.5
4	2.9	5.1	6.9	11.3
5	1.2	3.0	3,5	6.7
6	0.4	1.3	1.2	2.8
7	0.2	0.7	0.6	1.4
8	0.0	0.3	0.2	0.7
9	---	0.1	0.0	0.5
10-14	---	0.1	0.1	0.3
Total	100.0	100.0	100,0	100.0
Number of cases	8122	8230	2130	3097
Difficulty in Activities of Daily Living				
Mean score	0.1	0.1 NS	0.4	0.5 *
Percentage distribution				
0. No difficulty	95.8	95.5	75.3	66.4
1. Some minor problems	2.4	3,4	16.0	22.5
2. Restrictions in major activities	1.3	0.8	5.5	7.7
3. Unable to perform major activities	0.5	0.2	3.2	3.5
Total	100.0	100.0	100.0	100.0
Number of cases	8122	8230	2130	3097
Self-Rated General Health Status				
Mean score	1.6	1.9 *	1.9	2.3 *
Percentage distribution				
0. Very good	6.8	3.8	4.3	2.0
1. Good	38.0	33.8	37.8	30.9
2. Average	39.4	34.6	24.8	17,6
3. Poor	14.0	24.0	25.2	37.8
4. Very poor	1.8	3,8	7,9	11.7
Total	100,0	100.0	100.0	100.0
Number of cases	2594	2758	699	977

* Gender difference in the mean is statistically significant.

Table 3. Gender and Marital Status Differences in Three Health Measures

	Number of Diseases		Difficulty in ADL		Self-Rated General Health	
Age 30-59						
	Not controlling for any other variables					
(Married men)						
Unmarried men	-0.31 **	-5.93	0.48 **	7.64	-0.12	-1.90
Married women	0.27 **	11.69	-0.02	-0.51	0.25 **	8.09
Unmarried women	0.66 **	13.30	0.51 **	8.34	0.39 **	6.68
	Controlling for health conditions[a]					
(Married men)						
Unmarried men	---		0.58 **	9.02	-0.11	-1.59
Married women	---		-0.13 **	-3.04	0.20 **	6.38
Unmarried women	---		0.35 **	5.54	0.21 **	3.39
	Controlling for health conditions and age					
(Married men)						
Unmarried men	-0.13	-2.59	0.71 **	10.58	-0.08	-1.14
Married women	0.30 **	13.31	-0.10 *	-2.31	0.21 **	6.64
Unmarried women	0.50 **	10.36	0.29 **	4.58	0.18 **	2.87
	Controlling for health conditions, age, and SES					
(Married men)						
Unmarried men	-0.27 **	-5.19	0.46 **	6.38	-0.17 *	-2.35
Married women	0.18 **	6.76	-0.48 **	-10.10	0.09 *	2.53
Unmarried women	0.36 **	7.33	-0.07	-0.99	0.08	1.23
Age 60 or older						
	Number of Diseases		Difficulty in ADL		Self-Rated General Health	
	Not controlling for any other variables					
(Married men)						
Unmarried men	-0.04	-0.38	0.42 **	5.28	0.04	0.35
Married women	0.71 **	11.82	0.05	1.13	0.36 **	5.22
Unmarried women	0.56 **	10.39	0.42 **	10.20	0.27 **	4.45
	Controlling for health conditions					
(Married men)						
Unmarried men	---		0.44 **	5.43	0.00	-0.02
Married women	---		-0.03	-0.63	0.25 **	3.54
Unmarried women	---		0.36 **	8.75	0.08	1.20
	Controlling for health conditions and age					
(Married men)						
Unmarried men	0.07	0.65	0.16 *	1.99	0.10	0.78
Married women	0.68 **	11.46	0.06	1.21	0.21 **	3.01
Unmarried women	0.68 **	11.99	0.04	0.85	0.17 **	2.59
	Controlling for health conditions, age, and SES					
(Married men)						
Unmarried men	0.07	0.57	0.06	0.75	0.09	0.68
Married women	0.57 **	8.89	-0.08	-1.51	0.11	1.45
Unmarried women	0.60 **	9.21	-0.16 **	-3.23	0.06	0.76

a) Health conditions refer to health measures of prior stages in the process of disablement. Thus, the equaltion of difficulty in ADL considers number of chronic diseases, and the equation of self-rated general health considers both number of chronic diseases and difficulty in ADL.

Table 4. OLS Analysis of Number of Chronic Diseases Among Persons Aged 30-59

	Men				Women			
	b	t-ratio	b	t-ratio	b	t-ratio	b	t-ratio
Constant	1.34 **	20.55	1.44 **	20.58	1.92 **	25.46	1.90 **	23.71
Age	0.79	1.30	0.74	1.22	0.34	0.35	0.44	0.49
Age squared	0.04	1.82	0.03	1.49	0.09 **	3.56	0.09 **	3.53
Spouse absent	-0.25 **	-5.87	-0.52 **	-6.06	0.10 *	1.96	0.10	1.05
(Primary school)								
Middle school	-0.10 *	-2.00	-0.06	-1.20	-0.34 **	-6.53	-0.33 **	-5.66
High school	-0.20 **	-4.47	-0.11 *	-2.16	-0.58 **	-11.13	-0.56 **	-8.73
College or more	-0.31 **	-5.82	-0.21 **	-3.19	-0.78 **	-11.13	-0.71 **	-8.11
(Current Occupation, Agriculture)								
White collar	-0.25 **	-4.62	-0.11	-1.59	-0.49 **	-5.38	-0.50 **	-4.52
Sales/Service	-0.18 **	-3.52	-0.05	-0.76	-0.36 **	-5.63	-0.36 **	-4.02
Blue collar	-0.19 **	-4.09	-0.06	-0.91	-0.35 **	-5.20	-0.40 **	-4.36
Not working	-0.04	-0.69	0.09	1.25	-0.28 **	-4.95	-0.30 **	-3.57
Family income, logged	0.00	-0.04	0.00	0.20	-0.05 **	-2.70	-0.06 **	-2.93
(Spouse education, primary school)								
Middle school			-0.08	-1.44			-0.05	-0.71
High school			-0.16 **	-2.79			0.01	0.13
College or more			-0.16 *	-2.25			-0.01	-0.09
(Spouse Occupation, Agriculture)								
White collar			-0.23 *	-2.42			-0.07	-0.70
Sales/Service			-0.15	-1.93			-0.04	-0.40
Blue collar			-0.20 *	-2.41			0.12	1.36
Not working			-0.16 *	-2.19			-0.01	-0.12
R^2		0.05		0.05		0.11		0.11
Mean of dependent variable				1.15				1.50
Number of cases				8122				8230

Note: Family income represents the amount per adult member aged 20 or older.

Coefficients of age and age squared are multiplied by 100 throughout the tables, Tables 3 to 7.

Table 5. Ordered Probit Analysis of Self-Rated General Health Among Persons Aged 30-59

	Men				Women			
	b	t-ratio	b	t-ratio	Coeff.	t-ratio	Coeff	t-ratio
Constant	0.86 **	5.87	0.91 **	6.04	1.32 **	8.73	1.36 **	8.78
Number, chronic diseases	0.19 **	11.55	0.19 **	11.44	0.23 **	18.69	0.23 **	18.62
Disability score	0.54 **	9.97	0.55 **	9.95	0.50 **	7.18	0.51 **	7.16
Age	-0.69	-0.73	-0.53	-0.55	0.14	0.15	0.12	0.14
Age squared	0.03	1.07	0.02	0.56	0,00	-0.05	0.00	0.12
Spouse absent	-0.14 *	-2.15	-0.34 *	-2.45	-0.05	-0.85	-0.18	-1.63
(Primary school)								
Middle school	0.00	0.06	0.08	0.99	-0.18 **	-2.93	-0.15 *	-2.20
High school	-0.22 **	-3.10	-0.07	-0.91	-0.19 **	-2.77	-0.10	-1.22
College or more	-0.29 **	-3.39	-0.14	-1.42	-0.33 **	-3.59	-0.26 *	-2.31
(Current Occupation, Agriculture)								
White collar	0.02	0.20	0.05	0.43	-0.01	-0.05	0.08	0.58
Sales/Service	0.08	0.95	0.13	1.06	-0.10	-1.28	-0.02	-0.15
Blue collar	0.09	1.26	0.12	1.02	-0.21 *	-2.60	-0.14	-1.33
Not working	0.25 **	2.72	0.28 *	2.22	0.07	1.01	0.15	1.51
Family income[a], logged	0.00	-0,04	0.00	0.14	-0.04 *	-2.02	-0.05 *	-2.26
(Spouse education, primary school)								
Middle school			-0.20 **	-2.57			0.02	0.21
High school			-0.28 **	-3.26			-0.13	-1.67
College or more			-0.26 **	-2.21			-0.08	-0.79
(Spouse Occupation, Agriculture)								
White collar			-0.01	-0.08			-0.07	-0.56
Sales/Service			-0.04	-0.33			-0.09	-0.81
Blue collar			0.02	0.14			-0.04	-0.41
Not working			0.01	0.11			-0.16	-1.40
Mu(1)	1.41 **	35.57	1.41 **	35.48	1.55 **	32.89	1.56 **	32.78
Mu(2)	2.64 **	54.16	2.64 **	54.06	2.56 **	49.09	2.57 **	48.91
Mu(3)	3.91 **	47,06	3.92 **	46.59	3.96 **	58.58	3.96 **	58.24
Chi-square		315		326		536		544
(Degrees of freedom)		(13)		(20)		(13)		(20)
Mean of dependent variable								
Number of cases[b]				2594				2758

Note: a) Family income represents the amount per adult member aged 20 or older.

b) The survey asked about self-rated general health only for a randomly selected subsample.

Table 6. OLS Analysis of Number of Chronic Diseases Among Persons Aged 60 and Older

	Men				Women			
	b	t-ratio	b	t-ratio	b	t-ratio	b	t-ratio
Constant	1.95 **	18.54	2.00 **	18.45	2.80 **	30.32	2.81 **	21.88
Age	2.46	1.81	2.53	1.81	0.58	0.38	0.50	0.28
Age squared	-0.13 *	-2.43	-0.14 *	-2.45	-0.19 **	-4.22	-0.19 **	-4.07
Spouse absent	0.03	0.26	-0.24	-1.79	0.06	0.87	0.06	0.41
(No schooling)								
Primary school	-0.02	-0.22	-0.02	-0.23	-0.11	-1.45	-0.10	-1.21
Middle school	-0.15	-1.31	-0.12	-0.95	-0.36 *	-2.46	-0.29	-1.88
High school	-0.23 *	-2.03	-0.13	-1.05	-0.49 **	-2.80	-0.40 *	-2.08
College or higher	-0.11	-0.79	0.03	0.15	-0.42	-1.24	-0.32	-0.93
(Agriculture)								
Non-Agriculture	-0.36 **	-3.72	-0.11	-0.84	-0.24	-1.80	-0.26	-1.78
Not working	-0.05	-0.66	0.20	1.78	-0.04	-0.52	-0.06	-0.59
Family income, logged	-0.05	-1.41	-0.05	-1.45	-0.09 **	-2.94	-0.09 **	-2.79
(Spouse education, No schooling)								
Primary school			0.02	0.23			0.00	-0.03
Middle school			-0.19	-1.34			-0.13	-0.74
High school			-0.27	-1.51			-0.14	-0.81
College or higher			0.40	1.17			-0.29	-1.23
(Spouse occupation, Agriculture)								
Non-Agriculture			-0.30 *	-2.09			0.05	0.30
Not working			-0.34 **	-2.98			0.08	0.59
R^2		0.02		0.02		0.04		0.04
Mean of dependent variable				1.84				2.47
Number of cases				2130				3097

Note: Family income is income per adult member aged 20 or older.

Table 7. Ordered Probit Analysis of Factors Affecting Difficulty in ADL, Persons Aged 60 or Older

	Men				Women			
	b	t-ratio	b	t-ratio	b	t-ratio	b	t-ratio
Constant	-1.59 **	-14.50	-1.50 **	-13.04	-1.57 **	-17.48	-1.42 **	-12.52
Number, chronic diseases	0.20 **	9.59	0.20 **	9.43	0.15 **	10.70	0.15 **	10.72
Age	3.30 *	2.53	3.26 *	2.40	3.57 **	3.81	3.49 **	3.62
Age squared	0.03	0.55	0.03	0.58	0.09 **	2.85	0.09 **	2.94
Spouse absent	0.00	-0.03	-0.34 **	-2.89	-0.10	-1.78	-0.35 **	-3.30
(No schooling)								
Primary school	-0.11	-1.33	-0.01	-0.14	-0.03	-0.47	0.00	0.07
Middle school	-0.31 **	-2.88	-0.13	-1.09	-0.20	-1.68	-0.14	-1.15
High school	-0.39 **	-3.68	-0.15	-1.24	-0.12	-0.96	-0.08	-0.53
College or higher	-0.50 **	-3.68	-0.15	-0.90	-0.09	-0.35	-0.04	-0.16
(Agriculture)								
Non-Agriculture	0.14	1.27	0.30	2.33	0.14	1.22	0.26 *	2.07
Not working	0.75 **	9.78	0.96 **	10.31	0.50 **	7.28	0.62 **	8.00
Family income, logged	-0.09 **	-2.79	-0.09 **	-2.69	-0.05 *	-2.33	-0.05 *	-2.27
(Spouse education, No schooling)								
Primary school			-0.23 **	-2.73			-0.12	-1.16
Middle school			-0.40 **	-2.64			-0.16	-1.16
High school			-0.59 **	-3.35			-0.09	-0.68
College or higher			-0.43	-1.12			-0.12	-0.65
(Spouse occupation, Agriculture)								
Non-Agriculture			-0.04	-0.35			-0.28	-1.89
Not working			-0.30 **	-3.11			-0.24 *	-2.45
Mu(1)	0.82 **	19.26	0.83 **	19.12	0.93 **	28.23	0.93 **	28.03
Mu(2)	1.41 **	21.90	1.44 **	21.37	1.64 **	32.66	1.64 **	32.51
Chi-square		435		463		595		603
(Degrees of freedom)		(11)		(17)		(11)		(17)
Mean of dependent variable								
Number of cases				2130				3097

Note: Family income is income per adult member aged 20 or older.

Table 8. Ordered Probit Analysis of Self-Rated General Health Among Persons Aged 60 or Older

	Men				Women			
	b	t-ratio	b	t-ratio	b	t-ratio	b	t-ratio
Constant	1.43 **	6.51	1.42 **	6.33	1.65 **	9.62	1.68 **	8.37
Number, chronic diseases	0.15 **	5.38	0.16 **	5.48	0.15 **	7.48	0.14 **	7.46
Disability score	0.43 **	6.45	0.44 **	6.50	0.46 **	8.74	0.47 **	8.65
Age	-3.58	-1.77	-3.96	-1.91	-3.10	-1.80	-2.81	-1.58
Age squared	0.05	0.59	0.07	0.72	-0.02	-0.58	-0.03	-0.72
Spouse absent	0.04	0.34	0.08	0.50	-0.08	-0.94	-0.18	-1.04
(No schooling)								
Primary school	0.14	1.16	0.11	0.87	-0.21 *	-2.54	-0.22 *	-2.44
Middle school	0.20	1.29	0.14	0.88	-0.13	-0.81	-0.03	-0.17
High school	-0.07	-0.45	-0.11	-0.66	-0.27	-1.14	0.00	0.00
College or higher	-0.14	-0.75	-0.03	-0.14	-0.33	-1.04	-0.15	-0.45
(Agriculture)								
Non-Agriculture	-0.10	-0.79	-0.10	-0.58	0.03	0.19	0.10	0.65
Not working	0.12	1.14	0.10	0.70	0.23 *	2.41	0.29 *	2.55
Family income, logged	-0.10 *	-2.56	-0.10 *	-2.44	-0.06	-1.90	-0.07	-1.88
(Spouse education, No schooling)								
Primary school			0.04	0.39			0.07	0.43
Middle school			0.20	1.06			0.04	0.18
High school			-0.20	-0.85			-0.18	-0.85
College or higher			-0.54	-0.75			-0.49	-1.84
(Spouse occupation, Agriculture)								
Non-Agriculture			-0.10	-0.53			-0.05	-0.24
Not working			0.05	0.37			-0.11	-0.70
Mu(1)	1.63 **	16.76	1.63 **	16.65	1.76 **	16.98	1.76 **	16.83
Mu(2)	2.32 **	22.13	2.33 **	22.04	2.26 **	21.37	2.27 **	21.14
Mu(3)	3.45 **	27.06	3.47 **	27.06	3.60 **	30.51	3.61 **	30.03
Chi-square		124		129		192		200
(Degrees of freedom)		(12)		(18)		(12)		(18)
Mean of dependent variable								
Number of cases		699		699		977		977

Note: Family income is income per adult member aged 20 or older.

Table 9. Mediating Variables between Family SES and Health Outcomes among Men Aged 30-59

	Chronic Diseases (Linear regression)				Self-Rated General Health (Ordered probit)			
	Coeff.	t-ratio	Coeff.	t-ratio	b	t-ratio	Coeff.	t-ratio
Constant	1.62 **	9.99	1.49 **	8.42	0.91 **	6.04	0.75 **	4.59
Number, chronic diseases					0.19 **	11.44	0.20 **	11.59
Disability score					0.55 **	9.95	0.55 **	10.00
Age	0.02	1.93	0.02	1.61	-0.53	-0.55	0.00	0.10
Age squared	0.00	0.05	0.00	0.29	0.02	0.56	0.00	0.01
Spouse absent	-0.61 **	-3.70	-0.57 **	-3.46	-0.34 *	-2.45	-0.38 **	-2.67
(Primary school)								
Middle school	-0.04	-0.46	-0.06	-0.57	0.08	0.99	0.09	1.19
High school	-0.08	-0.82	-0.09	-0.87	-0.07	-0.91	-0.05	-0.63
College or more	-0.11	-0.92	-0.11	-0.86	-0.14	-1.42	-0.11	-1.12
(Current Occupation, Agriculture)								
White collar	-0.06	-0.39	-0.04	-0.24	0.05	0.43	0.11	0.84
Sales/Service	0.02	0.11	-0.02	-0.18	0.13	1.06	0.21	1.61
Blue collar	-0.04	-0.34	-0.05	-0.38	0.12	1.02	0.15	1.31
Not working	0.00	-0.01	-0.04	-0.30	0.28 *	2.22	0.32 *	2.44
Family income[a], logged	-0.02	-0.68	-0.02	-0.64	0.00	0.14	0.00	0.19
(Spouse education, primary school)								
Middle school	-0.08	-0.84	-0.09	-0.93	-0.20 **	-2.57	-0.20 *	-2.53
High school	-0.15	-1.43	-0.16	-1.51	-0.28 **	-3.26	-0.27 **	-3.20
College or more	-0.27 *	-2.02	-0.29 *	-2.11	-0.26 **	-2.21	-0.24 **	-2.05
(Spouse Occupation, Agriculture)								
White collar	-0.36 *	-2.01	-0.32	-1.80	-0.01	-0.08	-0.03	-0.20
Sales/Service	-0.26	-1.68	-0.23	-1.53	-0.04	-0.33	-0.06	-0.47
Blue collar	-0.25	-1.57	-0.21	-1.32	0.02	0.14	-0.02	-0.15
Not working	-0.25	-1.73	-0.21	-1.45	0.01	0.11	0.00	-0.02
Employer health plan			-0.07	-1.24			0.04	0.70
Smoking, current			0.15 *	2.12			0.18 **	2.84
Smoking, past			0.12	1.29			0.07	0.87
Alcohol consumption, current			-0.08	-1.30			0.02	0.32
Alcohol consumption, past			0.29 *	2.44			0.08	0.90
Exercise			0.02	0.34			-0.40 **	-6.40
Physical exam missing			0.00	0.06			0.01	0.11
BMI, low			-0.03	-0.15			0.45 **	2.98
BMI, high			0.17 **	2.84			-0.16 **	-3.03
High blood pressure			0.03	0.51			0.05	1.03
High blood sugar level			0.04	0.47			0.01	0.15
Family disease history			0.08 *	2.03			0.02	0.54
Mu(1)					1.41 **	35.48	1.44 **	34.94
Mu(2)					2.64 **	54.06	2.69 **	53.49
Mu(3)					3.92 **	46.59	3.99 **	46.56
R^2/Chi-square(df)		0.07		0.08		326(20)		409(32)
Number of cases				2594				2594

Table 10. Mediating Variables between SES and Difficulty in ADL, Men Aged 60 or Older (Ordered Probit Analysis)

	b	t-ratio	b	t-ratio
Constant	-1.60 **	-5.46	-1.78 **	-4.90
Number, chronic diseases	0.20 **	5.46	0.20 **	5.00
Age	0.06 *	2.18	0.05	1.69
Age squared	0.00	-0.59	0.00	-0.30
Spouse absent	-0.26	-1.13	-0.17	-0.70
(No schooling)				
Primary school	0.06	0.37	0.07	0.38
Middle school	-0.07	-0.32	-0.09	-0.39
High school	-0.09	-0.39	-0.09	-0.37
College or higher	-0.40	-1.20	-0.43	-1.20
(Agriculture)				
Non-Agriculture	0.45 *	2.17	0.42 *	2.00
Not working	0.87 **	5.19	0.83 **	4.43
Family income, logged	-0.09	-1.34	-0.07	-1.02
(Spouse education, No schooling)				
Primary school	-0.13	-0.85	-0.12	-0.75
Middle school	-0.47	-1.57	-0.44	-1.46
High school	-0.58	-1.39	-0.41	-0.89
College or higher	-0.54	-0.53	-0.49	-0.42
(Spouse occupation, Agriculture)				
Non-Agriculture	0.15	0.68	0.28	1.17
Not working	-0.28	-1.68	-0.21	-1.17
Employer health plan			-0.08	-0.60
Smoking, current			0.03	0.16
Smoking, past			-0.17	-0.78
Alcohol consumption, current			0.13	0.84
Alcohol consumption, past			0.52 *	2.67
Exercise			-0.31	-1.04
Physical exam missing			0.09	0.36
BMI, low			0.09	0.54
BMI, high			-0.12	-0.58
High blood pressure			0.16	1.17
High blood sugar level			0.05	0.25
Family disease history			-0.15	-1.04
Mu(1)	1.01 **	10.48	1.04 **	9.96
Mu(2)	1.51 **	10.29	1.57 **	9.16
Chi-square		145		164
(Degrees of freedom)		(17)		(29)
Number of cases		699		699