SEUNG-EUN CHA   *The University of Suwon, Korea*
JINHEE KIM*   *University of Maryland, U.S.A.*
ELAINE ANDERSON**   *University of Maryland, U.S.A.*

Chronic Health Conditions, Depression, and the Role of Financial Wellbeing: How Middle Age Group (45-64) and Older Adults (65-79) Differ?

This study investigates the association between chronic health conditions (CHD) and depression with a focus on the mediating effect of financial strain. We tested if age makes any difference in the effect of CHD and financial strain on depression. The data comes from the 2006 Korea Longitudinal Study of Aging (KLoSA) collected by the Institute of Korean Labor Research. The sample consisted of information from 8,961 individuals ages 45-79. Separate analyses were done for middle-age (45-64) and older-adult groups (65-79). There were significant financial portfolio differences among CHD patients and non-CHD, for both age groups, that may constitute the impact of a health event on financial wellbeing; in addition, the associations of CHD on depressive symptoms were different by age groups. The mediating effect of financial wellbeing on the association between CHD and depressive symptoms was verified; in addition, the role of financial wellbeing on the association was especially strong for the older-adult group. The effect of CHD on depression was contingent on the amount of net assets and annual personal income. Implications are discussed based on the findings.

Full-Time Lecturer, Dept. of Child, Family and Welfare, The University of Suwon (secha@suwon.ac.kr)

*Associate Professor, Family Science, School of public Health, University of Maryland at College PArk (jinkim@umd.edu)

**Professor, Family Science, School of Public Health, University of Maryland at College Park (eanders@umd.edu)

Key Words: chronic health conditions, mental health, financial wellbeing, age group difference, stress model, population based data

This study investigates the empirical link between chronic health conditions (CHD), financial situations, and mental health outcomes for aging Koreans. For many years, scholars have documented the adverse consequences of CHD such as high blood pressure, cardiovascular disease, and diabetes that are classified as major threats to quality of life (Gisen, Hoeymans, Schellevis, Ruwaard, & Satariano, 2001; Katon & Sullivan, 1990). Having CHD affects not only an individuals' physical health, but also person's mental health (Feinstein, and Ho, 2000) that can subsequently affect a patient's attitudes toward treatment and the use of medical care. CHD increases psychological stress on individuals and family by altering work/ family roles and social relationships, as well.

Significant attention has been paid on the direct impact of CHD on physical health outcomes and on the health outcomes of caregivers; however, limited studies have been conducted to show the association of CHD with mental health (Anderson, Freedland, Clouse & Lustman, 2001; Katon & Sullivan, 1990). CHD often requires substantial financial resources, for there is an increased need for medical care/ services. Indeed, a number of studies found the negative impacts of CHD on wealth (Kahn & Pearlin, 2006; Lee, & Kim, 2003, 2008; McDonough, Sacker, & Wiggins, 2005), that CHD patients experience financial strain due to increased medical costs coupled with reduced income. Such financial strain has been associated with psychological stress

(Pearlin, 1999). Therefore, not only by physical symptoms or uneasiness, but by the path way of an increased financial stress attributed from CHD would also affect mental health.

CHD may be stressful; however, the total impact of CHD on psychological wellbeing is not equally stratified throughout the population. The difference in CHD impact may develop based on differences in the prevalence of illness and, more importantly, it may depend on individual health and wealth status. Some argue that government programs that provide health and long-term care insurance could affect such relationships. Still, there is limited research that explicitly examines the different context of CHD by sub-groups.

LITERATURE REVIEW

CHD and Health Outcomes

CHD vary from acute life-threatening illnesses (such as cancer or cardiovascular disease), to more general symptoms such as diabetes, high blood pressure, emphysema, or obesity. Such chronic conditions, accompanied by physical limitations and strain, often cause psychological stress to individuals and care givers (Aneshensel, 1992; Doherty & McCubbin, 1985). Therefore, stress theories argue that a diagnosis of CHD has severe physical and mental consequences on individuals (Kirmayer, 1988).

The effects of CHD on health outcomes have been tested with a variety of measurements, such as physical uneasiness, discomfort, and ADL, as well as series of physiological changes (Fried, Bandeen-Roche, Kasper, Guralnik, 1999; Rijken, *et al.*, 2005; Verbrugge, 1995). The effects of CHD on mental health were also examined through psychological wellbeing measures and depression episodes (Anderson, Freedland, Clouse & Lustman, 2001; Katon & Sullivan, 1990; Rijken, *et al.*, 2005).

The relationship between CHD and physical health has been clear, confirming the negative impact of CHD in relation to other physiological changes; however, the effects of CHD on mental health are complex with inconsistent findings. Some studies found that CHD was associated with psychiatric morbidity, such as depression or incidents of depressive symptoms (Anderson, Freedland, Clouse & Lustman, 2001; Katon & Sullivan, 1990), but others found the association was not significant (Rijken, *et al.*, 2005) or that the impact was contingent on the psychosocial-context of factors, like the availability of a caregiver or financial resources (Szinovacz & Davey, 2008).

The inconsistency of the mental health effect of CHD may be due to the measurement issue, for individual studies that tested different CHD types with depression (diabetes with depression, or cardiovascular disease with depression and so on). Co-morbidity problems and the duration of illness may produce a difference in impact as well (Gisen *et al.*, 2001); in addition, besides these methodological issues, some studies mentioned perception issues. Several qualitative studies report that a patient's perception over his/her conditions was important in CHD situations, therefore it is very much likely to fluctuate by the context (Hyder, Rotllant, & Morrow, 1998; Rijken et. al., 2005; Singer, 1993). Especially, Becker and Kaufman (1995) named this perception as a sense of control and the lack of such control is related to stress that is mostly about future anxiety, and uncertainty. Uncertainty emerges throughout an illness process by asking about the onset of certain symptoms or pain, the prognosis after an illness, and questioning how one will afford the medical services[1]. Uncertainty issue implies that this sense of control is closely connected with time and resources (Kaufman, 1986).

Stress theory had long been emphasizes the role of resources in crisis situations (Pearline, 1999). Resources can alleviate adverse consequences and reciprocally, while the lack of resources can result in devastating consequences (Ross & Sastry, 1999). Under the current medical payment system, financial means to support the illness is a critical problem for CHD patients or their families. The demand on financial resources and the duration of medical issues is likely to undermine everyday lives of CHD

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[1]Their research focused on cultural attitudes on stroke, biomedical concepts and the health policies that are reflected in a patient's views of illness. The results are informative on the perception of a patient and how that perception influences treatment and a patient's willingness to practice good health.

patients and their family (Hwang, Weller, Ireys, and Anderson, 2001). Significant research has been devoted to emotional and instrumental resources; however, not much of researches have done to examine the role of financial resources in illness context. Therefore, we argue that an investigation of an illness experience from a financial perspective is crucial in order to understand the dynamics and complexity of CHD on mental health.

The Role of Financial Wellbeing in the Chronic Health Condition context

This study focuses on the function of financial wellbeing for individuals with CHD and their experience with depression. Traditionally, studies have discovered a strong liner association of income and health that shows an increased income correlated with healthier lives (Bound, Stinebrickner, and Waidmann, 2010; Smith, 2007). The opposite correlation was also discovered by the associations of the loss in income over time with the onset of a new health event. In terms of social process, it was suggested that a major decrease in income may deplete savings and worsen the financial situation of CHD patient that results in increased anxiety and higher levels of psychological stress (Smith, 2007). This effect of loss in income gives strong implications for older adults who are obliged to retire from labor market. The shrinkage of income is evident among older adults and the loss of income (or job) may give rise to devastating health situation. However, the structure of elderly income source was far more complicated due to the retirement process, reception of pension scheme and within family transfers. For this reason, many researchers have tried to examine factors other than income or employment conditions.

Some studies tested assets (that include the house value, investments, pensions and insurance) to estimate the association of financial stress with health events (Feinstein & Ho, 2000; Lum, 2004). The others looked through the linkage between health and debt situation that may give us a hint of daily life financial hardship (Brown, Taylor, & Price, 2005; Reading & Raynolds, 2001). Other empirical studies reported that the credit card debt ratio to income default situation was associated with an increased anxiety level (Drentra, 2000). A combination of assets and debt was tested by using debt-asset ratios (Kim & Lee, 2008; Lee & Kim, 2003, 2008) or a separate examination of the relative importance of assets and debt was taken into account (Adams *et al.*, 2003).

Meer, Miller and Rosen (2003)'s study, reported that financial stress levels increase as a new health event occurs; however, asset levels remained relatively stable. We should consider two things in regards to Meer *et al* (2003)'s finding. First, as Kim and Lyons (2008) suggested, liquidating assets can take some time and patients (even those with significant assets) are inclined to experience financial difficulty. Second, the worries about how other family members will thrive with minimal wealth after their lifetime were the main sources of stress and anxiety for elderly patients (Hanratty *et al.*, 2007; McGarry & Scoeni, 20065; Stoller & Mirowski, 2008).

Therefore, other scholars also have focused on the money flow or subjective dimensions of financial wellbeing. Resent studies examined the direct medical expenses (out-packet money) and the influence of it on the mental health of CHD patients (Hwang, *et al.*, 2001; Paez, Zhao, & Hwang, 2009). Some have looked at the role of insurance programs or perceived financial hardship (difficulty making payments, monthly expenses, and running out of money) and anxiety level (Butterworth, Rodgers & Windsor, 2009).

As such, previous studies have provided valuable evidence of financial wellbeing or wealth depletion associated with CHD; however, there are still some information gaps on understanding the mental health consequences of CHD and associated financial decline. The relative importance of financial wellbeing on elderly depression has rarely been examined in the literature. Available studies that examined diagnosed CHD patients, have not verified the context of financial decline/insecurity, nor the possible link to depression. Therefore, this study attempts to tangle off the relationship between CHD, mental health (mostly depression) from the view point of financial stress. We will like to consider various financial dimentions that was verified from prior literatures in our study.

Age Group Difference

Such triad processes mentioned above are likely to fluctuate across a lifetime (Kahn & Perline, 2006; Kim & Durden, 2007). Age provides a different context for the incidents of CHD. Having a different lifetime frame contributes to the self-evaluation of health and if such health conditions can be considered a part of aging (Carstensen, 1992; Idler, 1993). The incidents of mental health are also systematically different by age. Studies on epidemiology have shown that about 10 to 20% of populations suffer from depression and the probability of depression or depressive symptoms tend to increase as one ages (Kessler & Zhao, 1999). Financial items tend to change over a lifetime as well (Crystal & Waehrer, 1996). Retirement, high medical expenses, and financial support from adult children may shape the type and characteristics of financial resources in later life (Lum, 2004; Moen, 1996).

Recent studies have tested the change of health status and the impact of SES on age trajectory of health (House, Lantz, & Herd, 2005; House *et al.*, 1994; Kim & Lee, 2005; Smith, 2004, 2007, Zimmerman, Kanton, 2005). Some researchers have argued the context of an illness may differ by life stage (O'rand , 2003; Ross & Wu, 1996). Others have shown that the aging process is a universal process; however, it has a converging effect on both health and wealth disparities (House, Lantz & Herd, 2005; House *et al*, 1994; Park, 2006).

Few researchers, however, have explicitly examined the difference in illness through the lens of an age group difference. Therefore, this study adds detailed knowledge by examining whether the impact of CHD on depression may differ between middle-aged and older-adult groups. We assume that the underlying social milieu that links the experience of CHD, depression and financial resources (or stress) may differ by age group.

Korean Context: Health and Financial Profiles of Middle to Older Koreans

Korea has observed a rapid increase in aging over the last few decades[2]. Corresponding to the aging population, the health and older adult care issues of this population have also changed over the last three decades.

Older Korean adults seem especially vulnerable compared to developed countries in regards to financial difficulties. The current older adult group (born between 1920 and 1941) are heavily dependent on adult children for financial matters (KNSO, 2008) because this group invested their lifetime and wealth toward their children's education and social achievement (Han & Yoon, 2000). They now rely on a small government pension and financial transfers from adult children. Recently, the older adult suicide rate has climbed dramatically, especially among those with a lower socio-economic status (KNSO, 2010). This high rate of older adult suicide is assumed to be related to poverty and unaffordable medical costs (Lee, 2006).

In Korea, scholars also are concerned with future older adults. After the 1997 Asian Financial crisis an early retirement trend forced the middle-age group at that time to leave their jobs. The current middle-aged group (1942-1961) was a major target of the 1998 company layoffs and the early retirement process. Many lost their primary income source after the layoffs and had no other financial options because the national pension is available only after age 60. Massive lay-offs and increased flexibility in the labor market have created a very vulnerable position for middle-aged workers (Bang, Shin, Lee, Han, Kim, and Shin. 2010). To deal with the urgent older adult financial and health issues, the Korean government recently launched vast health reform programs that directly target the financially fragile older adult population[3].

With the financial background of an aging Korean population we examine the relationship between CHD, financial situation, and depression. We investigated the difference in the prevalence of depression as well as the differences in the

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[2]The proportion of individuals ages 65 and over in the population in 1960 was 2.5%. This increased to 7.2% in 2000, and in 2009, the older adult population was over 11.3% of the total population (Korean National Statistical Office (KNSO), 2010).

[3]Those that receive income from public or private sectors are eligible for the national health insurance provided through an employer or through a local community. According to this program, dependent family members, either an adult 65 and older or a child (18 and younger), are automatically included in family health insurance.

determinants of depression between those who suffer from CHD and those who do not. In this paper, we focused on the function of financial wellbeing and addressed questions of how individual financial strain may play a role in the association between CHD and depressive symptoms. In addition, we tested whether the life-stage difference may influence this association differently.

METHODS

Data

The 2006 *Korea Longitudinal Study of Aging* (KLoSA) is used for analysis. Adults aged 45 to 79 were recruited from the original survey data. The data was designed to be used as a complete cross-sectional analysis even though it was the first wave of the panel study. All the past information (like the timing of the diagnosis) was retrospective. We limited the sample to those were diagnosed and received treatment for no longer than 15 years. The final data set consisted of 8,961 individuals.

Measurement

CHD is a medical diagnosis of one of seven major health problems (cancer, high blood pressure, diabetes, liver function, lung function, cardiovascular disease, and cerebral problems) that are proven responsible for older adult mortality in Korea. We used the question, "Have you ever been diagnosed by a doctor to have any of the following CHD and do you still receive medication or treatments related to such conditions?" According to the question, those who have been diagnosed (and are still receiving treatment) was categorized as the CHD group and others (never diagnosed or had any treatment related to 7 major chronic health conditions) were sorted as a non-CHD group. However, there is a possibility that these respondents may experience other health conditions not listed (i.g. arthritis).

A mental health condition was determined by using the CES_D-10 scale in this study. The depressive symptom scale consisted of 10 items (i.g. feeling blue, sleeplessness, anxiety etc.), and the decision of having a depressive symptom was made by the experience of at least four or more symptoms during the previous month.

Four indicators (income, net assets, medical expenses, and financial satisfaction) were used as measures of financial wellbeing. We summed up the Annual_Personal_Income based on income from work, financial income from bank, loans, pension, social security, and other government subsidies. Net_Assets were computed by subtracting total assets by total debt. The category was divided into 5 groups, making a separate group of (-) net asset as 'having debt'. Annual_Medical_Expense was estimated as summing up the total medical expenses and out-of pocket money spent per year. The cost of hospitalization was also included in medical expenses. A single-item measure of Financial_Satisfaction was used to estimate the subjective estimation of financial wellbeing. We used the item "How are you satisfied with your current financial condition?" (range Not satisfied=0 to Very satisfied=100) in the questionnaire. Except for the financial satisfaction, all other indicators were measured in monetary amounts (unit: 10,000 won, written as *man won*).

Age, gender, education level, marital status, employment status, region, living arrangement, number of children, SRH (self-rated health) and ADL might be related to the incidents of CD and depression; therefore, these variables were included in the regression analyses. Prior literature on depression has found that women report more depressive mood and symptoms than men (Annandale & Hunt, 2000; Chun *et al*, 2008). Age is also one of the important factors associated with depression. Normally depressive symptoms show a U shape curve as one ages that is high in both young and older adults, and relatively low among the middle-aged (Kessler & Zhao, 1999). Married individuals report less depressive symptoms compared to singles (Cha, 2007; Simon, 2002). Employment is also a protective factor in depressive symptoms that indicates that employed individuals may experience less depressive episodes (Cha, 2005). In previous statistics, living alone was associated with higher odds of negative moods, loneliness and elderly suicide rates (KNSO, 2009; Lee, 2006). Studies on

aging have reported that experiencing physical limitations is associated with negative moods and depressive symptoms (see Kim, 2007).

Family support may be inevitable and sometimes favored, in the Korean context (Han & Yoon, 2001; Park, 2006). The numbers of children and financial transfers from children, and kinship members were examined. We estimated the financial transfer from adult children by employing the item, "As a monthly-based or irregularly or as a gift, how much did you receive from your adult children last year?" Total amount of money that was received from children was divided by the number of children. For the support from family (in-laws, siblings and other relatives), the question "Have you ever received financial support from family last year" was used. We recoded it into dichotomous variables that distinguish whether or not there was any financial support from children/family the previous year.

Specific research questions and assumptions were as follows;

Hypothesis 1: We expect that CHD will be associated with financial difficulties (loss in annual personal income, loss in net assets, increased medical expenses, and decreased financial satisfaction), after covariates were considered. We expect these associations will differ by age (middle-age and older-adult groups).

Hypothesis 2: We expect CHD will be associated with depressive symptoms, after controlling socioeconomic variables and financial wellbeing measures. We expect the interaction effects of financial strains and CHD on depressive symptoms. We expect these associations will be different by age (middle- aged and older-adult groups).

Before running the analysis, we first tested whether there was the age group difference in the incidence of depressive symptoms (see Figure 1). Figure 1 showed that there seems to be a turning point in the trend of depression around mid 60's. Regarding these findings, respondents were divided into two age groups; those between ages 45-64 were named the middle-age group (n=5,831, women, 55.2%), and those aged 65 and older were named the older-adult group (n=3,130, women, 55.6%).
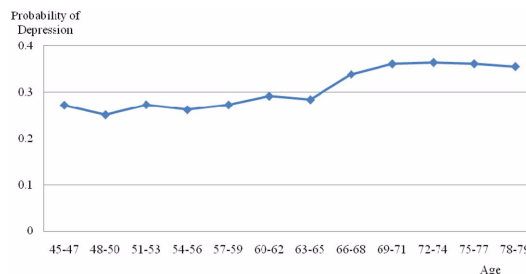

Figure 1. *Probability of Depression by Age Groups.*

RESULTS

Sample Description

We divided the age groups into two groups, middle-aged and older adult, and compared the CHD diagnosed and non-CHD diagnosed individuals within each age group. There were more middle-aged participants (5,831) than older adults (3,103) in this study. Yet, the proportion of CHD patients were more prevalent among the older-adult group when compared to the middle-aged group[4]. This confirms the morbidity difference in chronic health conditions by age. Sample descriptions are presented in Table 1 and Table 2.

In regards to depressive symptoms, the association between depressive symptoms and the incidents of CHD were found in both age groups that showed that nearly 14% of the middle-aged group and 15% of the older-adult group with CHD experienced depressive symptoms the previous month. The gap between the CHD and non-CHD group was higher among the middle-aged group (7% → 14%) rather than the older-adult group(12% → 15%). It tells us that older adults tend to experience more depressive symptoms compared to middle-aged adults.

Financial Wellbeing Difference Among CHD and Non-CHD Groups by Age Groups

We separately tested the multiple-ANOVA (MANOVA) model for each age group in consideration with covariates (see Table 3). From the middle-aged group analysis, the results revealed that

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[4]As presented in the bottom of the Table 1, co-morbidity of CHD was also evident among the older-adult group; 48 of the older adult reported they were diagnosed with more than 2 CHDs.

Table 1. *Descriptive of Sample by Sociodemografic, Health Factors, and Family Supoort*

		Middle aged (45-64)		Older adult (65-79)	
		n=5,831		n=3,160	
		No CHD n=4,268	CHD Patients n=1,563	No CHD n=1,558	CHD Patients n=1,572
Education Acheivement	Middle School and Less	45.5%	60.1%	81.2%	79.8%
	High School Grad	39.2%	29.6%	13.6%	13.9%
	College And +	15.2%	10.2%	5.2%	6.3%
Have Job	No	42.8%	57.3%	77.7%	83.6%
	Yes	57.2%	42.7%	22.3%	16.4%
Marital Status	Without Spouse	10.5%	15.4%	30.3%	32.3%
	With Spouse	89.5%	84.6%	69.7%	67.7%
Region	Urban	81.8%	81.4%	67.7%	74.2%
	Rural	18.2%	18.6%	32.3%	25.8%
Living Arrange	Live Alone	3.7%	6.2%	13.7%	14.0%
	Others	96.3%	93.8%	86.3%	86.0%
Numbers of Children	No Child	3.5%	3.2%	2.2%	2.5%
	One or Two	62.3%	50.9%	17.2%	16.7%
	More Than Three	34.1%	45.9%	80.6%	80.8%
Phyisical Health Limit	No Limits	99.3%	96.7%	96.8%	91.4%
	More Than One	0.7%	3.3%	3.2%	8.6%
Annual Financial Help from Kin	No	94.8%	95.6%	97.9%	98.6%
	Yes	5.2%	4.4%	2.1%	1.4%
Annual Financial Help from Children	No	69.6%	55.0%	25.9%	24.3%
	Yes	30.4%	45.0%	74.1%	75.7%

Table 2. *Descriptive of Sample by Financial Factors & Depression Symptoms*

		Middle Aged (45-64)		Older Adult (65-79)	
		n=5,831		n=3,160	
		No CHD n=4,268	CHD Patients n=1,563	No CHD n=1,558	CHD Patients n=1,572
Annual Outpocket Money	Low Range	66.6%	21.2%	58.3%	24.9%
	Middle Range	17.5%	37.0%	21.8%	33.0%
	High Range	15.8%	41.8%	20.0%	42.0%
General Financial Satisfaction	Low Range	22.4%	32.9%	36.0%	39.4%
	Middle Range	43.3%	41.3%	42.7%	39.9%
	High Range	34.3%	25.8%	21.3%	20.7%
Annual Net Asset	Under Debt	6.2%	6.5%	2.4%	3.6%
	Even	15.1%	17.9%	26.3%	28.1%
	25% Plus	25.4%	25.0%	29.8%	27.7%
	50% Plus	27.0%	25.7%	23.5%	21.9%
	75% Plus	26.3%	24.9%	18.0%	18.6%
Annual Personal Income	Less Than 25% P	68.8%	78.4%	83.2%	89.1%
	25-50% P	12.3%	8.9%	3.1%	3.4%
	50-75%	p 6.2%	2.7%	2.6%	1.2%
	75% Above	12.8%	10.0%	11.0%	6.3%
Depressive Symptoms	No	92.9%	85.7%	87.5%	85.0%
	Yes	7.1%	14.3%	12.5%	15.0%

Table 3. *The Associations between Chronic Health Condition and Financial Wellbeing: Mean Difference (unit: 10,000won)*

	Middle aged (45-64)					Older adult (65-79				
	No CHD n=4,268		CHD Patients n=1,563		F	No CHD n=1,558		CHD Patients n=1,572		F
	Mean	(S.E.)	Mean	(S.E.)		Mean	(S.E.)	Mean	(S.E.)	
Annual Outpocket Money	31.93	(2.62)	69.94	(4.41)	53.08***	51.37	(7.76)	71.59	(7.71)	3.38*
Annual Net Asset	13,235.01	(398.90)	13,757.66	(672.39)	0.43	10,480.82	(520.44)	10,608.56	(517.92)	0.03
Annual Personal Income	2,248.12	(84.20)	1,824.38	(141.92)	6.37*	1,528.44	(95.50)	1,252.46	(95.04)	4.15*
General Financial Satisfaction	52.28	(0.34)	48.21	(0.58)	35.42***	43.71	(0.59)	42.67	(0.59)	1.51

*p<.05, **p<.01, ***p<.001
Note: MANOVA was taken by controlling gender, age, education, employment status, marital status, region, living arrangement and health limits

there were some significant differences. Middle-aged CHD patients seemed to have gone through significant loss in annual personal income (about 400 *man won* on average) according to the Table 3. In addition, they had to spend about double the out-of pocket money associated with health conditions. They showed significantly low levels of financial satisfaction compared to counterparts who do not have CHD. This indicates that onset of CHD had been associated with income shrinkage and with more expenses. We may able to assume that the respondents may have gone through severe financial stress; however, net assets did not show any significant differences by CHD for the middle-age group.

As for the older-adult group, the direction of the relationship between CHD and financial resources was somewhat similar from what we observed in the middle-age group analysis. It showed that the out of pocket money for medical expenses and annual personal income differed by the incidents of CHD. Our findings were consistent to prior literature that showed that CHD leads to a loss of financial resources. However, the mean scores of net assets or financial satisfaction among the CHD and non-CHD group was not significantly different by the incidents of CHD.

Hierarchial Logistic Model

A three-step hierarchical logistic regression analyses was conducted to examine the effects of CHD and other factors on depressive symptoms. A separate analysis was run for the middle-aged and older-adult groups.

The results indicate that (for the middle-aged group) CHD patients that displayed the risk of depressive symptoms was almost double (OR=2.17), compared to non-CHD patients in Model 1. We have controlled the effects of socio-demographic factors and financial support from children and family (Model 2), the gap narrowed downed to reach the odds ratio of 1.79. The gap reduced significantly by the contributions of covariates, but still the gap was significant. It tells us that onset of CHD in middle age does explain great share of a risk of depressive symptoms.

Model 3 represents the inclusion of four financial variables added to Model 2. The odds ratio of CHD decreased significantly from 1.3 and the pseudo R square improved as well. Financial variables played key role to reduce the gap of depressive symptom between CHD patients and non-CHD group among the middle-aged.

By looking at the specific relationships of financial wellbeing and depression, as expected, having more medical expenses was associated with a greater risk of depressive symptoms. Those who view their financial situation as satisfactory were less likely to experience depressive symptoms. Net asset was also significant in our analysis and showed that increased net asset (compared to having debt) resulted in lower episodes of depression. The results

imply that the depressive symptoms for CHD patients can mostly be explained by middle-aged group financial difficulties. Financial well being factors were a powerful predictor of depression as well as mediator of CHD and depressive symptoms; however, the significant gap in depressive symptoms by CHD incident remained unexplained.

For the older-adult group, the initial depression gap between CHD group and non-CHD group was not as large as we observed from the middle-age group; however, the analysis still confirmed that older adult CHD patients were more likely to experience depressive symptoms (OR=1.37). This gap of depressive symptoms slightly decreased (OR=1.28) after important confounders were entered into the model (Model 2). Eventually, when we entered financial wellbeing variables into the model (Model 3), the odds ratio of depression difference in patients nearly disappeared (OR=1.15). Among other financial variables, financial satisfaction and medical expenses showed a significant linear association with symptoms of depression. It indicates that high levels of financial security could help diminish symptoms of depression, while spending more on medical expenses could dramatically increase depressive moods in older adults. Net assets were also significant with depressive symptoms. The highest asset group displayed a lower odds ratio of depressive symptoms.

The results of Model 3 (in each of age group analysis) displayed there is a chance of an indirect effect of CHD on depression based on financial factors. Additional analyses were conducted to examine if there is any interaction between CHD and financial wellbeing. Four interaction terms were created between CHD and net asset, medical expenses, financial satisfaction, and income.

The results found that CHD × Financial_satisfaction was significantly associated with depression for the middle-aged group while CHD × Net_asset, and CHD × Annual_personal_income was significantly associated with depressive symptoms among the older-adult group.

In Figure 2, Figure 3 and Figure 4, the odds ratios for different levels of financial satisfaction, net assets and annual personal income were calculated when
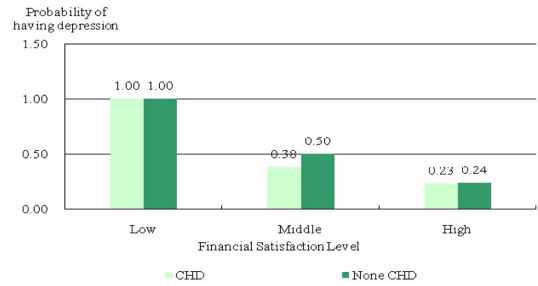

Figure 2. *Probability Difference in Depressive Symptoms by CHD Groups and Fianacial Satisfaction among Middle Age Group.*
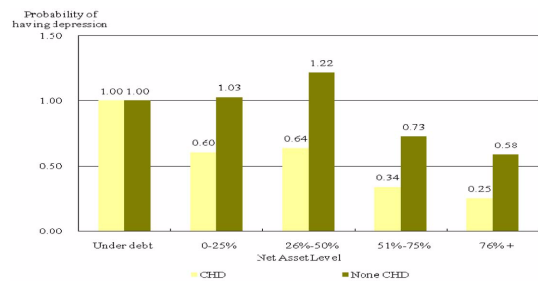

Figure 3. *Probability Difference in Depressive Symptoms by CHD Groups and Net Asset Level among Elderly Group.*

Figure 4. *Probability Difference in Depressive Symptoms by CHD Groups and Annual Personal Income Level among Elderly Group*

the odds ratios for the reference groups (lowest net assets and low financial satisfaction) were used as a reference. The probability of depressive symptoms is lower than the reference group if the odds ratio is less than 1.

Figure 2, 3 and 4 shows that the overall trends of financial satisfaction, net asset, and annual personal income were negatively associated with depressive symptoms and were consistent with the above

Table 4. *Results of Hirachial Logistic Regression of Depressive Symptom: Middle Age (45-64)*

	Model 1	Model 2	Model 3	Model 4
	Odds.Ratio	Odds.Ratio	Odds.Ratio	Odds.Ratio
Chronic Health Condition (ref. No CHD)	2.17***	1.79***	1.46***	3.91***
Male (ref. Female)		0.90	0.88	0.89
Age		1.00	1.00	1.00
Married (ref. Single)		0.47***	0.61***	0.61***
Numbers of Children		0.92	0.94	0.94
Education (Middle School)				
High School		0.58***	0.70***	0.70 ***
College and Above		0.40***	0.56***	0.56***
Have Job (ref. No job)		0.64***	0.70***	0.70***
Have Health Limit (ref. No health limits)		3.71***	2.64***	2.52***
Live with Spouse or Family (ref. live alone)		0.84	0.74	0.74
Received Financial Support From Kin		0.75	0.78	0.78
Received Financial Support from Children		1.02	1.08	1.08
Annual Net Asset (have debt)				
Even			0.77	0.78
25% p			0.83	0.87
50% p			0.72*	0.76
75% p			0.69*	0.75
Annaul Personal Income (less than 25%)				
25-50% p			0.81	0.85
50-75% p			0.72	0.76
75% above			1.17	1.33
Financial Satisfaction (Low range)				
Middle range			0.51***	0.51***
High range			0.28***	0.28***
Out pocket money (Low range)				
Middle range			1.26**	1.31***
High range			1.53***	1.82***
Net asset X CHD				0.93
Out pocket money X CHD				1.00
Financial Satisfaction X CHD				0.77 *
Annual personal income X CHD				0.86
Constant	0.35***	0.78	0.59	1.00
Nagelkerke R Square	0.03	0.12	0.18	0.18
Chi-square	132.99***	481.42***	736.34***	750.29***
df	1	12	23	27
n	5,831			

*p<.05, **p<.01, ***p<.001

Table 5. *Results of Hirachial Logistic Regression of Depressive Symptom: Older adult (65-79)*

	Model 1	Model 2	Model 3	Model 4
	Odds.Ratio	Odds.Ratio	Odds.Ratio	Odds.Ratio
Chronic Health Condition (ref. No CHD)	1.37***	1.28**	1.15	1.57
Male (ref. Female)		0.79***	0.78***	0.77 *
Age		1.01	1.02	1.02
Married (ref. Single)		0.61***	0.61***	0.61***
Numbers of Children		1.12	1.17	1.16
Education (Middle School)				
High School		0.46***	0.57***	0.56***
College and Above		0.35***	0.53**	0.53**
Have Job (ref. No job)		0.84	0.91	0.93
Have Health Limit (ref. No health limits)		4.08***	3.60***	3.63 ***
Live with Spouse or Family (ref. live alone)		0.92	0.99	0.99
Received Financial Support from Kin		1.12	1.19	1.20
Received Financial Support from Children		0.84*	0.89	0.89
Annual net Asset (have debt)				
Even			0.81	0.92
25% p			0.88	1.07
50% p			0.61*	0.81
75% p			0.63*	0.90
Annaul Personal Income (Less than 25%)				
25-50% p			0.74	0.83
50-75% p			1.21	1.37
75% above			1.05	1.33
Financial Satisfaction (Low range)				
Middle Range			0.49***	0.45***
High Range			0.26***	0.22***
Out Pocket Money (Low Range)				
Middle Range			1.22*	1.18
High Range			1.46***	1.32
Net Asset X CHD				0.86 *
Out Pocket Money X CHD				1.15
Financial Satisfaction X CHD				1.11
Annual Personal Income X CHD				0.81 *
Constant	0.73***	0.32	0.25	0.30
Nagelkerke R Square	0.01	0.12	0.20	0.21
Chi-square	18.49	308.81	521.22	530.95
df	1	12	23	27
n		3,160		

*:p<.05, **: p<.01 ***: p<.001

findings. Still there were group-differences in the slope by the CHD and non-CHD group. For middle-aged individuals with low levels of financial satisfaction (Figure 2), there was no difference in odds ratios between CHD and non-CHD groups. However, Figure 2 shows that for those with middle (OR=.36 vs. OR=.50) and higher levels of satisfaction (OR=.23 vs. OR=.24), the depression odds ratios significantly decreased in both CHD and non-CHD groups, and the magnitude of decrease were stronger especially for CHD group. It suggested that there are buffering effects from financial satisfaction. Maintaining financial security actually had lower odds of depression risk in the middle-aged CHD group.

In Figure 3, there were no differences in odds ratios between CHD and non-CHD groups for older adults with a net asset in the bottom two quartiles; however, there were differences in odds ratios between CHD and non-CHD groups for those with a net asset in the upper two quartiles. The odds ratios for depressive symptoms significantly decreased as net asset increased; however, this was evident in CHD group. It suggests that the net asset effect on depression was only valid in the CHD group of the older adult group and not in the non-CHD group.

A similar pattern was found with the annual personal income and CHD with symptoms of depression (Figure 4). Compared to the low-income group, having more income was associated with a lower risk of depression, yet it was only true for the CHD group. The buffering effects on annual personal income for depression were limited in those who did not suffer from CHD.

DISCUSSION

This study examines the impact of CHD on mental health. Hypothesis 1, that CHD may relate with financial wellbeing measures, was supported. For the middle-aged group, CHD was significantly associated with low levels of annual personal income, financial satisfaction and medical expenses compared to the non-diagnosed group. For the older-adult group, the pattern was similar (although modest) to the middle-

age group. CHD was significantly associated with negative cash flow (such as less personal income) while spending more on medical expenses. The results are consistent with previous findings that a negative health event may lead to a significant financial decline and result in stress on the financial wellbeing of households (Adams, Hurd, McFaden, Merrill, & Ribeiro, 2003; Lee & Kim, 2003). Contrary to expectations, net assets were not significantly associated with onset of CHD for both age groups. There is a possibility that most CHDs (like diabetes and high blood conditions) are associated with constant treatment and medical spending (sometimes coupled with income reduction); however, the effect of medical costs and income loss on net assets may take some time.

The older-adult group in Korea constantly reported that they possessed only limited assets. We need to consider the possibility that older adult individuals with CHD often live with their adult children (Kim, 2007), and their financial situation may be disguised by the financial wellbeing of their adult children.

Hypothesis 2 – That CHD is associated with depression, was supported in our analysis. As for the middle-aged group, CHD showed direct effect on depressive symptoms even after controlling for the effects of socio-demographics and financial wellbeing measures. This result confirmed the prior stress model that a negative health event is considered a crisis and is psychologically burdensome (Anderson *et al*, 1998, 2001; Pearlin, 1999; Verbugge, 1995). The reason for this strong relationship was partly explained by socio-demographic factors or family support (Staudinger & Bluck, 2001). However, the difference in the risk of depression by CHD was reduced considerably after successive financial variables were entered into the model.

In the older-adult model, the power of financial wellbeing was even stronger in the reduction of the risk of depression; in addition, the gap was no longer significant after financial wellbeing was factored into the model. Our findings suggest that financial strain (as a mediator) partly explains this association between CHD and depressive symptoms in the case of older adult.

What we found two things from the age group difference. First, older adult were more ill in terms of CHD, compared to middle aged group, yet they were less likely to be depressed due to the their CHD condition. The ADL index showed in general older adults had a relatively bad health status based on the additional analyses of the older-adult group and co-morbidity rate. The older-adult group may experience stressful physical situations accompanied with CHD. Yet, in the older-adult group the relationship between CHD and depression was rather weak (compared to middle-age group) and it was mostly explained by the financial situation. The diagnosis of CHD could lead middle-aged individuals to more severe stress and depression compared with healthier counterparts; however, we assumed that CHD was considered as a part of the aging process for the older adult.

Second, for our sample, the older-adult the within the group difference in the older-adult group seemed small in terms of SES difference compared to middle-aged group. In addition, the SES difference of the middle-age group was significantly associated with financial resources and depression; however, the SES effect on the older adult was somehow blurred in our sample.

The older adult sample was homogeneous in their SES status; however, it does not mean that they had similar response to depressive symptoms. The amount of financial resources varied within the older-adult group and the important effect of the financial resources (especially the amount of objective resources) was found in separate methods that directly lowered the risk of depression and indirectly influenced the CHD situation. First, net assets, medical expenses and financial satisfaction functioned to lower the odds of depressive symptoms. The indirect interaction results suggest that who had more net asset and income can be secure from the risk of depression even they had CHD problems. This benefit of financial resources (net assets and income) was strong in our analysis. Yet, we need to think about the fact that CHD is more common in the course of aging. We assume that the lack of assets and personal income may become more critical issue on the onset of depressive episodes, because older

adult patients are already aware that current medical treatment requires wealth.

Our findings indicate that the older adult group seems to be more focused on medical expenses and assets rather than their illness, this might result in the avoidance of treatment, the practice of healthy behavior, or health services, especially if they have very limited wealth.

This study is not without limitations. The analysis was based on a cross-sectional study and causal relationships cannot be assumed. We only concentrated on identifying the pattern of how CHD will associate with depression in the population. In addition, we would like to acknowledge that some CHD (like diabetes and cardiovascular disease) are more prone to depression, while other may have less impact on depressive symptoms. The seriousness of CHD was not considered as well. The issue of the co-morbidity problems needs to be charted in the context of health-related experiences and the quality of life. We hope future studies may test these differences and provide more detailed information.

Life events, like retirement and widowhood, may also influence depressive symptoms among CHD patients (Cha, 2007; Moen, 1996; Simon, 2002; Strully, 2009). Although we used employment status and marital status as a proxy of life events and stress, future studies could more precisely model the impact of life stress situations. Finally, the results imply that an underlying process of a type of family support may interact with the financial situation of a patient. A marginal point may exist where the patient and family members can secure financial resources. The joint effect of financial factors and the family support process among CHD patients should be uncovered for future research.

IMPLICATIONS

Financial resources served differently in terms of the patient's perception, which is tightly connected to age. In the middle-aged group, CHD and financial decline jointly created a p depression. However, for the older-adult group, the expenses and the sense of financial insecurity posit the top of the depression.

The results fit quite well into the western scenario that CHD leads to considerable wealth depletion and that existing CHD and earlier deprived wealth could create a worse financial and physical situation in later life (Lee & Kim, 2008).

The findings of this study provide important policy and research implications. The results of this study suggest that health studies need to pay more attention to the financial preparedness and financial education of CHD patients and families. For the middle-aged group, CHD can reduce income and increase debt; subsequently, financial planning and counseling may be of valuable support to those patients and families. Private and public disability insurance may well be considered to mitigate negative impacts. Income security policies that extend disability insurance coverage to more varieties of health conditions could help this population offset the high cost of medical expenses and maintain secure financial situations.

For the older-adult group, the results suggested that medical expenses and financial security are a major issue. Public policies should focus on subsidizing medical expenses of older adult and simultaneously prepare for the upcoming groups with very different health and financial profiles. Recent long-term care programs and public subsidies for the hospitalization of older adult seem to be focused in the right direction; however, such policies can be effective only when recipients feel the kind of social support is sufficient.

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