



January 2015

An Analysis Of The Factors Influencing Self-Rated Health In East Asia

William Charles Stangler

Follow this and additional works at: <https://commons.und.edu/theses>

Recommended Citation

Stangler, William Charles, "An Analysis Of The Factors Influencing Self-Rated Health In East Asia" (2015). *Theses and Dissertations*. 1838.

<https://commons.und.edu/theses/1838>

This Thesis is brought to you for free and open access by the Theses, Dissertations, and Senior Projects at UND Scholarly Commons. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of UND Scholarly Commons. For more information, please contact zeinebyousif@library.und.edu.

AN ANALYSIS OF THE FACTORS INFLUENCING SELF-RATED HEALTH IN
EAST ASIA

by

William Charles Stangler

Bachelor of Arts in Economics, University of Minnesota-Duluth, 2003

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Science in Applied Economics

Grand Forks, North Dakota

August

2015

Copyright 2015 William Charles Stangler

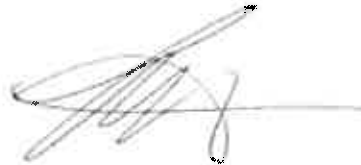
This thesis, submitted by William Charles Stangler in partial fulfillment of the requirements for the Degree of Master of Science in Applied Economics from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.



Dr. Cullen Goenner, Chairperson




Dr. David Flynn



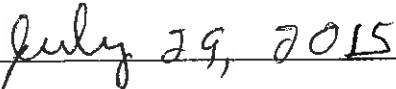
Dr. Kwan Yong Lee

This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the Graduate School at the University of North Dakota and is hereby approved.



Wayne Swisher

Dean of the Graduate School



Title An Analysis of the Factors Influencing Self-Rated Health in East Asia
Department Economics
Degree Master of Science in Applied Economics

In presenting this thesis in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised my thesis work or, in his absence, by the Chairperson of the department or the dean of the Graduate School. It is understood that any copying or publication or other use of this thesis or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my thesis.

William Charles Stangler
July 23, 2015

TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
ACKNOWLEDGMENTS	viii
ABSTRACT	ix
CHAPTER	
I. INTRODUCTION	1
II. RELIGION AND HEALTH	5
III. DATASET AND VARIABLES	10
IV. MODEL AND RESULTS	19
V. CONCLUSION	27
REFERENCES	28

LIST OF TABLES

Table	Page
1. Summary of Religions by Country	7
2. Religious and Non-Religious Groups	8
3. Difference in Health Between Religious and Non-Religious Groups By Country	8
4. Marital Status	12
5. Self-Rated Health	13
6. Spouse's Hours Worked	17
7. Trust and Health	17
8. Health and Refraining from Dr. Visits	18
9. Results of Ordered Logistic Regression to Estimate Self-Rated Health	21
10. Marginal Effects	24
11. Impact of Risky Behaviors on Model	25

LIST OF FIGURES

Figure	Page
1. Income and Education	16

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my advisory committee and all of the faculty of the Economics department for their guidance and support during my time in the MSAE program at the University of North Dakota. Also, a special thank you to Dr. Cullen Goenner for showing incredible generosity with his time and knowledge during my research.

To Chelsea, Charlotte, and Zachary

ABSTRACT

An accurate assessment of a population's health is a valuable tool for a nation in terms of planning and policy making. In this paper, I use cross-sectional data from the 2010 East Asian Social Survey to create a model for self-rated health. In this paper I pay particular attention to how factors that affect psychological well-being influence one's self-rated physical health. These factors include measures of religion, trusting other people, and refraining from visiting a doctor. What I find is that among the respondents of the East Asian Social Survey, non-religious people are 11% more likely to have a high subjective health rating than religious people. I also find a negative impact on subjective health for those who refrained from visiting the doctor and a positive impact on health for those who indicate that they generally trust other people.

CHAPTER I

INTRODUCTION

Self-rated health data are becoming increasingly popular in analyzing health and identifying the factors affecting health. Hamermesh (2004) and Paloyo (2014) opine that the rise in popularity stems from the relative ease and cost effectiveness of obtaining subjective data compared to conducting medical examinations to procure equivalent amounts of useable data. Ford, Spallek, and Dobson (2007) determined that self-rated health is an accurate approximation of actual health. The authors analyzed a study of elderly, Australian women and found that 52.3% of respondents who rated their health as “poor” died early, whereas only 11.5% of those who selected “good” died early. Early death was classified as dying within the first nine years following the survey, since the respondents were between the ages of 70 and 75 and had an average life expectancy of 14 years. The link between self-rated health and actual health levels supports the increased use of subjective health data as a measure of physical health. For this paper, I examine the factors that affect self-rated health using survey data from four East Asian countries (China, Japan, South Korea, and Taiwan). My approach was to include variables for socio-economic factors as well as factors that have an effect on mental health.

Several previous studies have employed social survey data from around the world for analysis, such as the European Social Survey, General Social Survey (U.S.) and the East Asian Social Survey, which is where the data for this paper were obtained. The previous studies used variables for socio-economic status (Hanibuchi, Nakaya, & Murata, 2010; Subramanian, Huijts, & Avendano, 2010), spousal characteristics (Egeland, Tverdal, Meyer, & Selmer, 2002), and many others (Eriksson, Unden, & Elofsson, 2001; Delaney, Harmon, Kelleher, & Kenny, 2008; Alvarez-Galvez et al., 2013; Mackenbach, Stirbu, Roskam, Schaap, Menvielle, Ieinsalu, & Kunst, 2008; Miller & Pylypchuck, 2014) in attempts to identify the overall health level of a society or how subjective health is affected by various factors.

With health care expenditures rising and taking a larger bite out of GDP for many developed countries (Squires, 2012), it is very valuable to identify the characteristics of a population that could potentially reduce need for elevated spending on health care. Hanibuchi et al. (2010) looked at income, education, occupational class, and class identification to model self-rated health in East Asia. Their results showed the strongest positive effect overall was from class identification (which is the respondents' rank of themselves in society from 1-10, 10 being the highest class status), while the weakest was from occupational class. Alvarez-Galvez et al. (2013) also looked at socio-economic factors and self-rated health, although they used data from the European Social Survey. They sought to measure the effects of the factors over time by looking at multiple years of the survey data. They found that over time the impact of income and education had each become greater, although for education the difference among countries had

narrowed. Delaney et al., (2008) analyzed data from Ireland and in their analysis they included caregiver status, marital status, and medical insurance coverage along with the typical socio-economic factors. They found the same results as previous studies for the socio-economic factors; there was also a negative impact from being a caregiver and a positive effect on health from being married and from having private insurance.

In this paper, I'm adding to the current literature by examining additional factors that have a significant impact on self-rated health. Identifying additional variables and their effect on self-rated health can be a valuable tool for attempting to assess the well-being and quality of life of a population. My analysis is focused on how certain factors affect mental well-being, which has been shown to influence physical health (Headey, Hoehne, & Wagner, 2013). I estimated an ordered logistic model to identify the effect that these variables have on self-rated health, which may help determine what, if anything, can be done in the way of policy to try and influence these factors and potentially guide behaviors to reduce the costs on society. Of course, policies that affect certain socio-economic factors, such as educational attainment and income are already at the forefront of many governments' agendas, particularly those of developed nations, as they have already addressed issues surrounding clean water, availability of food, infrastructure etc. Not that those problems don't still exist for developed nations, such as poverty, hunger, homelessness etc., but the percentage of the population struggling with these issues is small relative to those in developing nations. So, these nations will have moved much of their attention to relatively less pressing issues and they'll be more likely to have the resources to develop programs and enact policies that attempt to guide

behaviors to achieve the desired outcome. Mental wellness certainly will be affected by certain laws and policies. For example, labor and employment laws, safe working conditions, family leave/bereavement. None of these things would be a high priority for a nation that doesn't even have clean drinking water or enough food, but all of them may serve to mitigate stress and improve mental wellness. Beyond enacting policies, there is also value for a nation to know what factors are affecting health, so that a taxation or a spending policy can be adjusted to prepare for changes in health expenditures as a result of any changes to the population's health. The citizens may also look to the government and its policies when they are experiencing health related issues.

In my analysis, I've chosen to include variables and factors that I believe explain self-rated health levels from both a socio-economic perspective and a mental wellness perspective. The purpose of my research is to measure the effect that these variables and factors have on self-rated health in each of the countries in the East Asian Social Survey

CHAPTER II

RELIGION AND HEALTH

There has been a significant amount of research done on the relationship between religion and health, primarily with Christian religions in the west. The research finds a virtually universal consensus that religious people have better health outcomes than non-religious people. Levin (2010), studying religion in the U.S., found that religious people experience a protective effect from mental illness as certain religious rituals may allow individuals to ease anxiety and reduce individual or group tensions. Along the same line, Johnstone et al. (2012) point out that religion itself may not deserve the full credit for higher health levels, rather the lower incidence of mental health issues found in the religious population leads to higher physical health. The authors attribute this lower incidence of mental health issues to religious people having a stronger support system. Headey et al. (2013) examined this relationship outside the U.S. to see if the findings still hold true and found religious people in Germany to be healthier and live longer than non-religious people due to “a lifestyle that promotes longevity,” which they suggest leads to elevated life satisfaction.

Religious participation in East Asia has historically been much lower than in the rest of the world. According to a study from the Pew Research Center, in 2010 84% of

global population identifies with a specific religion, while the respondents in the East Asian Social Survey were far less likely to choose a specific religion. Only 38.6% overall chose a religion, while 61.4% selected “no religion,” although across the four countries in the survey there was significant differences as well, shown in table 1. China has the lowest religion rate at 12.8%, followed by Japan at 32.3%, South Korea with 56.7% and Taiwan has the highest rate in the sample with 77.7% of respondents selecting a specific religion. Each of the four countries in the survey have had government policies that prohibited or discouraged religious practice to varying degrees at some point in their recent history. According to Leung (2005), the Chinese Communist Party, which has been in power since the middle of the 20th century, has a strict policy of atheism for its members. China also has a policy of “religious freedom” that states any citizen is free to practice religion, which Leung (2005) suggests is intended to encourage those who practice religion to become non-religious. Sumimoto (2000) writes that in Japan the government’s policies promoted Shinto as the only religion during the early 1900s. The author also states that despite the religious freedom granted by the Japanese constitution after World War II, the government in Japan enacted the Religious Corporation Law which gave Japanese authorities strict regulatory power over religious organizations. For South Korea, religious regulation in the 20th century started as a result of being colonized under Japan from 1910-1945 (Choi & Schwekendiek, 2009). After that time, Protestant missionaries played a major role in suppressing indigenous religions, which meant as religious participation began to increase along with the economic growth of 1960s and 70s, Christian religions were well positioned and eventually became the second largest

religious group in the country behind Buddhism (Jung, 2014). Finally, Lu, Johnson, and Stark (2008) describe how Taiwan also experienced strict government regulation of religion from 1949-1987, which they suggest led to higher rates of the practicing of folk religions, since they can be practiced without the risks associated with being caught attending services. The authors show that in 1986, just before religious deregulation, there were 83 registered religious organizations in Taiwan and by 2004 there were 1,062, which shows the effects of true deregulation.

Table 1 Summary of Religions by Country

	China	Japan	S. Korea	Taiwan
No religion	87.18%	67.77%	43.27%	22.29%
Roman Catholic	0.21%	0.47%	7.55%	1.37%
Protestant	2.10%	0.09%	23.98%	5.29%
Buddhism	4.83%	25.67%	24.24%	25.30%
Other Eastern Religions	2.96%	5.32%	0.00%	45.72%
Other Religions	2.73%	0.68%	0.95%	0.05%

Between these two groups, religious and non-religious, there are some notable differences in characteristics. Table 2 highlights some of those differences between the groups. We can see that the religious group has, what would seem to be, a lot working in its favor for increasing health. They are more likely to have insurance and to do physical activity daily, they're less likely to refrain from visiting the doctor, and smoke cigarettes or drink alcohol on a daily basis. The non-religious group is younger by a relatively large amount, however, I did calculate the estimated response probabilities at each level of self-rated health while controlling for age. Table 3 contains the results of these

calculations, which show the difference in each level of health between the non-religious group and the religious group for each country. We can see that for China, Japan, and South Korea there is an increase in the probability of choosing the highest level of health (the highest two levels in Japan) for the non-religious group. The opposite is true in Taiwan where the non-religious group is less likely to report their health at the highest levels.

Table 2 Religious and Non-Religious Groups

	No Religion	Religion
Self-Rated Health	3.38	2.97
Median Age	46	50
Relative Income	2.63	2.65
No Insurance/Don't Know	10.51%	4.66%
Refrained from Visiting Doctor	34.25%	29.53%
Smokes Cigarettes	29.40%	20.85%
Drinks Alcohol Daily	11.63%	8.21%
Does Physical Activity Daily	13.86%	18.62%

Table 3 Difference in Health Between Religious and Non-Religious Groups By Country

	China	Japan	S. Korea	Taiwan
Poor	-0.11%	-0.25%	-0.12%	3.95%
Fair	-0.73%	-3.18%	-0.61%	6.43%
Good	-1.81%	-4.46%	-1.62%	-4.03%
V. Good	-2.71%	6.28%	-0.85%	-5.64%
Excellent	5.35%	1.60%	3.20%	-0.71%

While these results are somewhat contradictory to those in the previous studies of health and religion, what I believe this reveals is an increase in mental health resulting from social acceptance for each of these groups in their respective countries where they

represent the majority. As Potochnick, Perreira, and Fuligni (2012) found, there is a strong positive effect on psychological well-being for those who experience social acceptance. It is noteworthy that, even though in South Korea the majority of respondents chose a religion, there is a significant split between those who selected Buddhism and those who selected Protestant (24.24% and 23.98%, respectively). This leaves the “no religion” group being far and away the largest group at 43.27%, since the Buddhists and the Protestants likely don’t view each other as being in the same group due to fundamental differences in their respective religions.

CHAPTER III

DATASET AND VARIABLES

The data for this paper are from the East Asian Social Survey (EASS), Cross-National Survey Data Sets: Health and Society in East Asia, 2010 (Iwai, Li, Kim, & Chang, 2014). The survey is a biennial project that includes nationally representative samples from China (n=3866), Japan (n=2496), South Korea (n=1576), and Taiwan (n=2199), whose responses are collected as a collaborative effort with each country's own survey (The Chinese General Social Survey, The Japanese General Social Survey, The Korean General Social Survey and The Taiwan Social Change Survey). The 2010 version of the survey resulted in almost 200 variables that cover various aspects health and life with over 10,000 observations.

When analyzing survey data there are some things to consider, particularly when it is a cross-national survey. There have been multiple studies that examine the choice of wording for cross-national survey questions (Jurges, 2007; Weijters, Geuens, & Baumgartner, 2013). The analysis by Weijters et al., (2007) determined that there are two key points that may affect a respondent's answers for certain questions: familiarity and intensity of the response choices. Both of these cases can be affected by survey questions that are translated to other languages. Jurges (2007) notes that a survey that is conceived and written originally in English and then translated and administered in German may

contain questions, where it would make sense in English to choose “strongly agree,” but in the other language the literal translation sounds awkward or too forceful. Weijters et al., (2013) also found that this situation causes respondents to avoid these answer choices and therefore, potentially affect the results of the survey. The East Asian Social Survey does not address this potential issue directly, however, since the data are being collected by each nation’s own surveys, which have been written and administered by native speakers, it is believed that the wording is appropriate for each respondent’s specific language.

There are some points to consider regarding cultural and traditional differences between the Western culture and East Asian culture as well, when analyzing these data. For instance, as Jones (2013) observed, marriage and divorce rates are still quite a bit different in Asian than in western, developed countries. As countries such as China and South Korea continue to develop, educational opportunities for women continue to grow, and the age of first marriage has increased causing marriage rates to begin to trend toward a possible, future convergence with other developed countries. Despite the recent changes there is still a significant gap in the prevalence of marriage and divorce between these cultures. Table 4 illustrates the differences in marriage and divorce rates between respondents from each country in the East Asian Social Survey and those from the U.S. General Social Survey for the year 2010. It’s clear that even though there has been a shift in attitudes surrounding marriage and divorce in Asia, the differences are still pronounced and may take a generation or more to reach a significant level of homogeneity. Further

research is required to determine the significance and magnitude of these differences as they relate to self-rated health across different nations.

Table 4 **Marital Status**

	U.S.	China	Japan	S. Korea	Taiwan
Married	43.61%	79.57%	72.26%	63.27%	58.98%
Widowed	8.86%	7.25%	8.14%	8.08%	7.89%
Divorced	16.69%	2.55%	3.73%	3.88%	3.92%
Separated	3.18%	0.31%	0.24%	0.64%	0.59%
Never married	27.66%	9.72%	15.55%	23.3%	27.94%
Cohabiting ¹	-	0.60%	0.08%	0.83%	0.68%

¹ Category not present in U.S. survey

The dependent variable being examined in this paper is self-rated health. This variable is presented in the survey as five-category, Likert scale question. The English wording is: “In general, how would you say your health is?” The five response options are: “excellent,” “very good,” “good,” “fair,” and “poor.” Table 5 contains a summary of the responses for this variable. For this paper the variable is left in this form, with five separate categories. Hanibuchi et al., (2010) used the 2006 East Asian Social Survey in their analysis and decided to transform this question into a binary variable, with “excellent,” “very good,” and “good” equal to one and “fair” and “poor” equal to zero. This approach does facilitate a more straightforward interpretation, allowing for a logit/probit model, however, there is value in analyzing the likelihood of someone choosing each of the given categories. Although, for my analysis of the marginal effects, I do refer primarily to the changes in the two highest categories, since any increases in the top responses are met with equal, inverse changes in the remaining responses, collectively. As well, even though the choices do have a positive connotation in general,

the middle category, “Good,” could have just as easily been more neutral. The response options could be “Very Good,” “Good,” “Fair,” “Poor,” and “Very Poor” (again, the surveys were presented in each country’s language, but it is assumed that the translations carry the same positivity, neutrality or negativity as the English version). If this were the case, the respondents may not have seen the middle option as equally representative of their health rating. Another option for the response categories is to eliminate the neutral option and have an even number of choices, which is referred to as a “forced choice method” (Paul, 2010). This method forces respondents to choose an option that leans positive or negative and is used when a neutral response doesn’t result in any valuable information. An example would be if employees are asked to rate their supervisor, where the survey may be worded: “Your supervisor is an effective leader.” Response options may be: “strongly agree,” “agree,” “disagree,” or “strongly disagree.” There is still a good chance that the mean response will be close the middle, but without a neutral option, respondents will be more likely to put some thought into their answers. For the purposes of this paper, self-rated health will remain as it is in the survey (with five outcomes), and therefore, an ordered logistic model is used for analysis.

Table 5 Self-Rated Health

	Frequency	Percent
Excellent	1,393	15.37
Very Good	2,331	25.72
Good	2,924	32.26
Fair	1,849	20.4
Poor	566	6.25

The previous research on this subject has done well in identifying and measuring variables that affect subjective health (i.e. income, education, social status, etc.). The additional variables and factors I've chosen to include in my analysis represent characteristics of a population that should be considered when assessing health levels. The health and well-being of a population should be a priority for every country, therefore, it is certainly important to have policies to increase socio-economic levels, but it's also important to understand the other factors that affect health. These factors, such as religion and gender, are not typically the subject of government policy (although, the countries in this survey have historically had policies around these factors, to a certain extent), but it's important to understand how they affect overall health levels, nonetheless. With religion, I find that it's not the religion itself that affects health, rather what it does to one's mental well-being that ultimately affects health. For the same reason, I've included a variable for trust of other people, which has been shown to be positively correlated to mental well-being (Congdon, 2009). As well, the variable for spouse's hours worked each week, I contend will reflect on mental health. Having a spouse that works a lot of hours weekly gives a feeling of support for the family and will also affect household income. Finally, I've chosen to include refraining from visiting the doctor, since it represents both mental health and socio-economic status to certain degrees. When the respondents avoid visiting a doctor due to cost, a lack of insurance, or no transportation, these are all signs of low socio-economic status. Refraining due to an aversion to hospitals or, possibly, using any excuse to avoid a doctor could reflect on

mental health. With all of the factors and variables together, I can present a more complete assessment of subjective health.

The first explanatory variable is education, which is an ordinal variable indicating the highest level of education achieved by the respondent. For the purpose of the regression, I condensed this variable into three binary indicator variables with “No Formal Qualification,” “Elementary School,” and “Junior High” in one category, “High School” and “Junior College” as the second category and “University” and “Graduate School” in the final category. Education is an important variable to include when looking at self-rated health, since, as it has been proven in other studies, it is a good measure of socio-economic status and there is a strong, positive relationship between socio-economic status and health. Income is also a measure of socio-economic level and for that reason, when I calculated the marginal effects of the independent variables, I measured income and education together. Figure 1 shows mean value of the responses to the income question at each education level (income response options are “far below average,” “below average,” “average,” “above average,” and “far above average” with associated values of 1-5, respectively). We can see that there is clearly an increase in income with each increase in education.

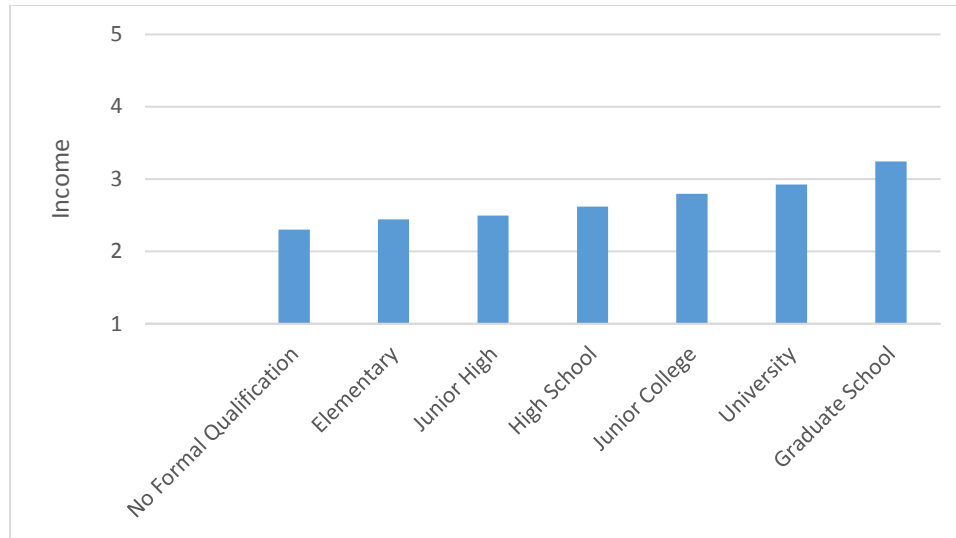


Figure 1. Income and Education

The next variable is for the number of hours worked by the respondent's spouse each week. As mentioned in the previous discussion, I feel that this variable is a reflection of the respondent's home life; having a spouse that works many hours will give the respondent a feeling of support and partnership that can improve mental well-being. It, of course, will also affect household income, which has been shown to influence health. Table 6 shows the mean number of hours worked by the spouse each week at each level of self-rated health¹. The numbers indicate that when spouses work more hours, there is an increase in self-rated health.

¹ In Taiwan the respondents had a response choice of "irregular working hours" and those responses were given a value of 666, which affected the mean value, so those 31 observations were dropped.

Table 6
Spouse's Hours Worked

	Mean Hours
Poor	45.83
Fair	48.47
Good	46.64
Very Good	50.48
Excellent	51.29

The next few variables that I examined are the ones that have been selected for their potential to add valuable insights to what has already been explored in the previous studies. The first of these is a binary variable indicating whether the respondent indicates that, in general, they are trusting of other people. Congdon (2009) explains that the level of trust a person has for those around them is a proxy for social capital and represents the relationships one has with others and how they feel about their community. All of which ultimately affects psychological distress and therefore, affects physical health. Table 7 shows how trust relates to subjective health for each of the countries in the survey. We can see that there is an overall increase in the highest two levels of health for each country (Japan has a slight decrease in responses of “excellent” but a fairly large increase in “very good” a fewer responses of “poor” and “fair”).

Table 7 **Trust and Health**

	China	Japan	S. Korea	Taiwan
Poor	-1.97%	-3.04%	-2.65%	-5.78%
Fair	0.36%	-5.15%	-1.07%	-3.23%
Good	-2.60%	1.83%	-4.62%	7.84%
V. Good	2.70%	6.51%	3.19%	0.13%
Excellent	1.51%	-0.14%	5.16%	1.04%

The next question turned variable is for whether the respondent refrained from visiting a doctor during the previous year for any reason. The reasons in the survey for refraining were: long waiting time, cost , distance, not knowing the appropriate hospital, transportation, aversion to hospital, no time, no need, no active health insurance or others. I chose to use this variable in a binary form as either “refrained from visiting the doctor” or “did not refrain from visiting the doctor.” I included this variable because I believe that it is a measure of both socio-economic factors and mental health. Table 8 shows the relationship between refraining from visiting the doctor and self-rated health. It’s clear that in this case, those who refrained from visiting a doctor rated their health as lower than those who did not in each of three highest categories and then, of course, more often chose the two lowest categories. There is a substantial difference with the health ratings of all respondents, most notably the propensity to rate one’s health as “excellent” was nearly 3% higher overall than that of the group that refrained from visiting a doctor.

Table 8 **Health and Refraining**

From Dr. Visits		
	Did not Refrain	Refrained
Poor	5.73	7.34
Fair	18.86	23.7
Good	32.46	31.83
Very Good	26.24	24.6
Excellent	16.7	12.53

CHAPTER IV MODEL AND RESULTS

The ordered logistic regression produced the estimates shown in table 9. The equation for the probability of a given observation in an ordered logistic regression is

$$p_{ij} = \Pr(y_j = i) = \Pr(k_{i-1} < x_j\beta + u \leq k_i) = \frac{1}{1 + \exp(-k_i + x_j\beta)} - \frac{1}{1 + \exp(-k_{i-1} + x_j\beta)}$$

Where the explanatory variables are given by the vector x for individual j and the vector of coefficients is given by β . The estimated values of k represent the cut-points of transitioning between one outcome and another. k_0 is defined as $-\infty$ and k_5 as $+\infty$.

$$\begin{aligned} x_j\beta = & \text{Education1} * \beta_1 + \text{Education2} * \beta_2 + \text{Income2} * \beta_3 + \text{Income3} * \beta_4 + \text{Income4} * \beta_5 + \\ & \text{Income5} * \beta_6 + \text{Religion} * \beta_7 + \text{Trust} * \beta_8 + \text{Refrain_Dr} * \beta_9 + \text{Spouse_Hours} * \beta_{10} + \\ & \text{Age} * \beta_{11} + \text{Gender} * \beta_{12} + \text{China} * \beta_{13} + \text{Japan} * \beta_{14} + \text{SKorea} * \beta_{15} + \text{China_Religion} * \beta_{16} + \\ & \text{Japan_Religion} * \beta_{17} + \text{SKorea_Religion} * \beta_{18} \end{aligned}$$

The coefficients for k and β are estimated by maximum likelihood estimation. The signs of the β coefficients indicate whether the variable has a positive or negative effect on self-rated health, but the coefficients themselves do not convey the magnitude of the effects of any of the explanatory variables. To determine the magnitude of the effects of each of the independent variables for each possible outcome of self-rated health would require numerous calculations, the results of which would be far too convoluted to add any value.

Instead, the focus was on religion, trust, and visiting the doctor, along with changes in select levels of income and education. Calculations were made for different age groups as well as differences between genders. I used the STATA command for margins after an ordered logistic regression to find the predicted probabilities of each outcome for self-rated health (the results are summarized in table 10 near the end of the chapter), which allowed me to look at changes in health while one independent variables changes and all others are held constant (Torres-Reyna, 2014). All of the independent variables were statistically significant at the 5% or 1% levels (I tested education and it showed that all of the categories were jointly significant), with the exception of spouse's hours worked. I regressed spouse's hours worked on the income variable and determined that there was a strong correlation between these two variables, which caused it to be insignificant. The likely reason for the correlation is having a spouse that works many hours will tend to increase household income.

Table 9 **Results of Ordered Logistic Regression to Estimate Self-Rated Health**

	Coefficients	S.E.
Education 1	-0.2573**	0.1109
Education 2	-0.0879	0.0926
Income 2	0.7121***	0.1444
Income 3	1.2662***	0.1412
Income 4	1.5503***	0.1636
Income 5	2.1961***	0.3617
Religion	0.6399**	0.2690
Trust	0.2011***	0.0685
Refrained from Dr. Visit	-0.3601***	0.0671
Ln of Spouse Hours Worked	-0.0083	0.0685
Age	-0.0396***	0.0032
Gender	-0.2842***	0.0690
China	2.5208***	0.2565
Japan	1.1742***	0.2563
South Korea	2.1397***	0.2745
China*Religion	-0.8500***	0.3060
Japan*Religion	-0.8019***	0.2982
South Korea*Religion	-0.7247**	0.3117

***P<.01 **P<.05

The results support what has been found by others regarding the socio-economic factors of education and income, which is a positive effect on self-rated health. I decided to calculate the effect of an increase of education and income together as they tend to coincide in the real world, as education increases typically so does income. The effect measures an increase in income from average to far above average and a simultaneous increase of education from the high school/junior college level to the university/graduate school level. The effect of increasing these levels is quite large, there is an increase of over 24% in the probability of having “very good” or “excellent” health at these higher education and income levels. While this is an obvious goal for most nations to increase

income and education, in East Asia there is a significant opportunity to increase both of these categories, particularly in China as its development continues. Of the respondents in this survey the highest level of education for 16.8% was a four-year degree and for 2.8% was a graduate degree. For comparison, in the U.S. from 2009-2013 28.8% of the population had a bachelor's degree or higher, nearly 10% more people with those degrees than in East Asia (United States Census Bureau, State & County QuickFacts, 2015). So as the East Asian economies continue to grow and develop, especially in China, educational opportunities will increase as well.

The effects of aging on health are quite obvious and well known. While there is, of course, nothing that can be done to prevent aging, from a planning perspective, it is important to understand the effect of aging on health, so that a health system can be in place to accommodate changing demographics. In this case, I calculated the effect of aging from 30 to 50. While this is a substantial jump in age, these different ages provide more insight than would a true marginal effect of a one-unit (single year) change in age. The difference in health between a person aged 24 years and one aged 25 years (or 64 and 65 years) is minimal and the health at each age falls within the next year's 95% confidence interval. As for the effect between these ages, as would be expected, there is a steep decline when moving from a younger age to the older. The level of self-rated health from age 30 to 50 drops by 23.2% at the two highest levels, "very good" and excellent."

The difference between genders for self-rated health are also a bit surprising. As Harris, Jenkins and Glaser (2006) have outlined, men are more likely to engage in a wide variety of risky behaviors, including health related, than are women. The respondents in

this survey indicate that more than 43% of men smoke cigarettes daily versus less than 6% of women and more than 38% of men drink several times a week or daily and only 9.5% of women reported doing so. So either there are additional health related factors that are not covered by this survey or there are cultural norms that are affecting the responses to some of these questions. Another factor, as outlined by Hatfield, Rapson, & Aumer-Ryan (2008), is that an imbalance in the appreciation one feels they've received versus the amount of effort they put in at home causes psychological distress. In Japan at least, this has been a well-documented issue, according to North (2009), where wives do upwards of 10 times the amount of domestic work than their husbands, even those wives who are employed full-time. So with all of that in mind, males rated their health as "very good" or "excellent" 7% more often than females. Which tells us that the mental health factor is strong enough to outweigh these seemingly poor health choices of men. Females with higher income and education than males are 3% more likely to respond with the two highest categories of health. So as educational opportunities continue to grow for women in East Asia then, perhaps health levels may start to line up with health related activities².

Refraining from visiting the doctor and being trusting of others both have higher than anticipated magnitudes. Indicating that in general one trusts others has a positive impact on the likelihood of selecting the two highest categories of self-rated health of 5%. The impact is even greater for "refraining from a doctor visit" with a 10% reduction in those highest responses for those who refrained. Again, trust is shown to be correlated

² According to UNESCO Institute for Statistics (2015), the ratio of females to males in higher education for China was 24.29, Japan was 54.73 and South Korea was 84.96 in 2010. Taiwan is not a member of the UN, but the Ministry of Education in Taiwan shows a ratio for 2010-11 of 97.28.

to mental well-being and is reflected in this positive effect. Refraining from the doctor reflects both mental health and socio-economic status, which explains the large margin effect.

Looking at religion and its effect on subjective health, my findings seemed to contradict those of previous researchers, since the overall effect of being religious reduced self-rated health by more than 11% in the highest two categories. However, a closer look at the breakdown of religious participation in the four countries from the survey shows that in the one country where the religious group is the majority, Taiwan, being religious has a positive effect on self-rated health of more than 6% for the highest two categories (see table 3). These results lead me to the conclusion that what is actually influencing physical health, from a religion standpoint, is the elevated mental well-being from being part of the societal majority and the social acceptance that accompanies that status, as Potochnick et al. (2012) discovered.

Table 10 **Marginal Effects**

	Male	Trust	Refrain	Income & Education	Age
Poor	-0.55%	-0.45%	1.02%	-1.40%	1.60%
Fair	-3.07%	-2.39%	5.15%	-8.54%	9.19%
Good	-3.38%	-2.12%	3.81%	-14.84%	12.39%
V. Good	2.89%	2.31%	-4.96%	3.76%	-7.06%
Excellent	4.11%	2.65%	-5.01%	21.01%	-16.11%

Finally, in order to address any concerns of an omitted variable bias, I've included the results of an alternate model that examines the potential effects of two variables that represent risky health behaviors. The omission of a variable that is correlated to the other

regressors will lead to a bias in the estimators that are included (McCallum, 1972). There is a variable that indicates if the respondent smokes daily/several times per week or not and one that indicates drinking alcohol daily/several times per week or not. Table 11 contains the results of both the original model and the model including the risky behaviors, specifically the odds ratios, standard errors, and statistical significance of each variable.

Table 11 Impact of Risky Behaviors on Model

	<u>Original Model</u>		<u>With Smoking/Drinking</u>	
	Odds Ratio	Std. Error	Odds Ratio	Std. Error
Education1	0.7462***	0.0825	0.7640**	0.0847
Education2	0.8856	0.0816	0.8957	0.0829
Income2	2.0590***	0.2972	1.9828***	0.2864
Income3	3.5198***	0.4969	3.3664***	0.4764
Income4	4.6591***	0.7622	4.3757***	0.7178
Income5	9.2679***	3.3259	8.3928***	3.0328
Religion	1.9013**	0.5115	1.8606**	0.5014
Spouse Hours Worked	0.9402	0.0632	0.9558	0.0646
Age	0.9631***	0.0030	0.9623***	0.0030
Refrain from Dr.	0.6958***	0.0467	0.6867***	0.0462
Trust	1.2157***	0.0831	1.2214***	0.0836
China	12.3597***	3.1709	11.7881***	3.0302
Japan	3.0993***	0.7938	2.6804***	0.6917
South Korea	8.3893***	2.3029	7.0998***	1.9640
China*Religion	0.4229***	0.1294	0.4353***	0.1334
Japan*Religion	0.4491***	0.1339	0.4550***	0.1360
South Korea*Religion	0.4554**	0.1418	0.4914**	0.1534
Drinking	-	-	1.4340***	0.1057
Smoking	-	-	0.9606	0.0786

***P<.01 **P<.05

The results clearly show that there is little or no impact from the addition of these variables for smoking and drinking behaviors. Smoking is not statistically significant and the addition of the drinking variable does not have any meaningful impact on the statistical significance nor the odds ratios of the variables from my original model. The lack of impact from these variables on the original specifications of my model does indicate a level of robustness (Woodward, 2006). With this additional measure I have taken to address this possible bias, I believe that my results are meaningful and significant.

CHAPTER V CONCLUSION

The data and the results presented in this paper reveal some important findings about the factors that affect self-rated health. First, my analysis on the socio-economic factors, education and income, supports the previous research that investigated the effects of these variables. These factors are strong indicators of the level of self-rated health and successful efforts to increase their levels will result in meaningful increases in overall health. Second, the impact of aging on health is powerful and inevitable, although, there seems to be an opportunity to delay its impact through increasing education and income. The most impactful finding is how many of these variables and factors affect mental well-being, which then affects one's rating of their overall health. Religion, gender, and to some extent income and education, all have an effect on mental health.

Overall, this paper offers a different and more thorough look at self-rated health and its influences in East Asia. My findings reveal that there is a significant effect on self-rated health from one's state of mental well-being and factors that affect mental well-being.

REFERENCES

- Alvarez-Galvez, J., Rodero-Cosano, M. L., Motrico, E., Salinas-Perez, J. A., Garcia-Alonso, C., & Salvador-Carulla, L. (2013). The impact of socio-economic status on self-rated health: Study of 29 countries using european social surveys (2002–2008). *International Journal of Environmental Research and Public Health*, *10*, 474-761. doi:10.3390/ijerph10030747
- Chang, W. C. (2010). Buddhism, taoism, folk religions, and rebellions: Empirical evidence from taiwan. *Journal of Asian and African Studies*, *45*(4), 445-460. doi:DOI: 10.1177/0021909610372770
- Congdon, P. (2009). A multiple indicator, multiple cause method for representing social capital with an application to psychological distress. *Journal of Geographical Systems*, *12*, 1-23.
- Delaney, L., Harmon, C., Kelleher, C., & Kenny, C. (2008). *The determinants of self-rated health in the republic of ireland : Further evidence and future directions*. (Working Paper No. WP08/11).University College Dublin. School of Economics.
- Egeland, G., Tverdal, A., Meyer, H., & Selmer, R. (2002). A man's heart and a wife's education: A 12-year coronary heart disease mortality follow-up in norwegian men. *International Journal of Epidemiology*, *31*, 799-805.

- Eriksson, I., Unden, A. L., & Elofsson, S. (2001). Self-rated health. comparisons between three different measures. results from a population study. *International Journal of Epidemiology*, 30, 326-333.
- Ford, J., Spallek, M., & Dobson, A. (2007). Self-rated health and a healthy lifestyle are the most important predictors of survival in elderly women. *Age and Aging*, 37, 194-200. doi:10.1093/ageing/afm171
- Hanibuchi, T., Nakaya, T., & Murata, C. (2010). Socio-economic status and self-rated health in east asia: A comparison of china, japan, south korea and taiwan. *European Journal of Public Health*, 22(1), 47-52. doi:10.1093/eurpub/ckq174
- Harris, C., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men? *Judgement and Decision Making*, 1(1), 48-63.
- Hatfield, E., Rapson, R., & Aumer-Ryan, K. (2008). Social justice in love relationships: Recent developments. *Social Justice Research*, 21, 413-431.
- Headey, B., Hoehne, G., & Wagner, G. G. (2014). Does religion make you healthier and longer lived? evidence for germany. *Social Indicators Research*, 119(3), 1335-1361. doi:<http://dx.doi.org.ezproxy.library.und.edu/10.1007/s11205-013-0546-x>

- Iwai, N., Li, L., Kim, S. W. & Chang, Y. H. (2014). East asian social survey (EASS), cross-national survey data sets: Health and society in east asia, 2010. Retrieved from <https://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/34608?classification=ICPSR.IX.&paging.startRow=26>
- Johnstone, B., Yoon, D. P., Cohen, D., Schopp, L., McCormack, G., Campbell, J., & Smith, M. (2012). Relationships among spirituality, religious practices, personality factors, and health for five different faith traditions. *Journal of Religion and Health*, 51, 1017-1041. doi:10.1007/s10943-012-9615-8
- Jung, J. H. (2014). Religious attendance, stress, and happiness in south korea: Do gender and religious affiliation matter? *Social Indicators Research*, 118, 1125-1145. doi:10.1007/s11205-013-0459-8
- Jurges, H. (2007). True health vs response styles: Exploring cross-country differences in self-reported health. *Health Economics*, 16, 163-178. doi:10.1002/hec.1134
- Leung, B. (2005). China's religious freedom policy: The art of managing religious activity. *The China Quarterly*, 184, 894-913. doi:10.1017/S030574100500055X
- Levin, J. (2010). Religion and mental health: Theory and research. *International Journal of Applied Psychoanalytic Studies*, doi:10.1002/aps

Levin, J., Markides, K., & Ray, L. (1996). Religious attendance and psychological well-being in mexican americans: A panel analysis of three-generations data. *The Gerontologist*, 36(4), 454-463.

Mackenbach, J., Stirbu, I., Roskam, A. J., Schaap, M., Menvielle, G., leinsalu, M., & Kunst, A. (2008). Socioeconomic inequalities in health in 22 european countries. *The New England Journal of Medicine*, 358, 2468-2481.

McDougle, L., Handy, F., Konrath, S., & Walk, M. (2014). Health outcomes and volunteering: The moderating role of religiosity. *Social Indicators Research*, 117(2), 337-351. doi:<http://dx.doi.org.ezproxy.library.und.edu/10.1007/s11205-013-0336-5>

Miller, G. E., & Pylypchuck, Y. (2014). Marital status, spousal characteristics, and the use of preventive care. *Journal of Family and Economic Issues*, 35, 323-338. doi:10.1007/s10834-013-9375-y

Ministry of education - republic of china (taiwan). (2015). Retrieved from <http://english.moe.gov.tw/ct.asp?xItem=14508&CtNode=11431&mp=1>

North, S. (2009). Negotiating what's 'natural': Persistent domestic gender role inequality in japan. *Social Science Japan Journal*, 12(1), 23-44. Retrieved from <http://search.proquest.com.ezproxy.library.und.edu/docview/56943488?accountid=28267>

- Paloyo, A. R. (2014). Co-pay and feel okay: Self-rated health status after a health insurance reform. *Social Science Quarterly*, 95(2), 507-522. Retrieved from <http://search.proquest.com.ezproxy.library.und.edu/docview/1550988744?accountid=28267>
- Potochnick, S., Perreira, K., & Fuligni, A. (2012). Fitting in: The roles of social acceptance and discrimination in shaping the daily psychological well-being of latino youth. *Social Science Quarterly*, 93(1) doi:10.1111/j.1540-6237.2011.00830.x
- Subramanian, S. V., Huijts, T., & Avendano, M. (2010). Self-reported health assessments in the 2002 world health survey: How do they correlate with education? *Bulletin of the World Health Organization*, 88, 131-138. doi:10.2471/BLT.09.067058
- Sumimoto, T. (2000). Religious freedom problems in japan: Background and current prospects. *The International Journal of Peace Studies*, 5(2)
- Torres-Reyna, O. (2014). Predicted probabilities and marginal effects after (ordered) logit/probit using margins in stata. Retrieved from www.princeton.edu/~otorres/Margins.pdf
- UNESCO institute for statistics. (2015). Retrieved from <http://data.uis.unesco.org/Index.aspx?queryid=134#>
- United states census bureau, state & county QuickFacts. (2015). Retrieved from <http://quickfacts.census.gov/qfd/states/00000.html>

Weijters, B., Geuens, M., & Baumgartner, H. (2013). The effect of familiarity with the response category labels on item response to likert scales. *Journal of Consumer Research*, 40(2), 368-381

Woodward, J. (2006). Some varieties of robustness. *Journal of Economic Methodology*, 13(2), 219-240. Retrieved from <http://ezproxy.library.und.edu/login?url=http://search.proquest.com/docview/56495838?accountid=28267>