THEY SAY THAT THEY ARE HEALTHY, BUT ARE THEY? HEALTH PERCEPTIONS IN THE U.S.

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Abstract

Public health initiatives are the result of strategies developed to address current health issues facing a population that are posing a significant concern to the public. This concern is primarily driven by the economics of health care. The objective of this study is to provide a contemporary analysis of how socio-economic and behavioral factors influence subjective health status. By understanding how these factors influence perceived health status, we can develop successful policies and strategies to target those groups who have a gap between their perceived and real health status and significantly lower health care costs. This analysis makes use of the socio-economic and behavioral data from the 2005-2006 NHANES and an extension of the traditional economic model for ordered data. Results indicate that higher education and an individual's perceived diet quality have a significant effect on influencing an individual's health perception. Strategies to improve health status may include incorporating valid health education into the formal education system.

Keywords: Self-perception, health status, education, ordered logit

JEL classification: I10, D03

1. Introduction

Numerous health campaigns such as "MyPyramid" and "Let's Move" in the United States (U.S.) and "The Global Strategy on Diet, Physical Activity and Health" in Member States of the World Health Organization (WHO), "World Diabetes Day" sponsored by International Diabetes Federation, and the "Heart Health Roadshow" in the United Kingdom have been developed to address concerns about the prevalence of lifestyle related health conditions such as obesity and Type II diabetes. In general, these campaigns are focused on promoting better eating habits and living a healthier lifestyle.

These concerns are warranted because of the economics of health care costs associated with these health conditions. For example, the estimated total cost of obesity in the U.S. in 2000 was $117 billion, of which $61 billion were related to direct medical costs, such as services provided by health care professionals, and $56 billion for indirect costs, such as income lost from decreased productivity and future earnings lost resulting from premature death (Wellman and Friedberg, 2002). Finklesten et al. (2009) estimate the cost of obesity to be as high as $147 billion in 2008. The American Heart Association (2010) and the National Heart, Lung, and Blood Institute estimated the direct and indirect cost of cardiovascular diseases (CVD) and

stroke, in the U.S. in 2009, was $475.3 billion (American Heart Association, 2010). The Centers for Disease Control and Prevention (CDC) projects that these costs will increase by approximately six percent to $503 billion in 2010 (CDC, 2010). For diabetes, the estimated total cost in 2007 for diagnosed diabetes in the U.S. was $174 billion with direct costs accounting for 67 percent of this (CDC, 2008).

Two perspectives may define how individuals see their health status: subjective and objective. Subjective perspective encompasses the individual's sensemaking of their health situation based on all available information that influence them. The objective perspective, on the other hand, involves the application of medical and other measures to determine the individual's health status through professional diagnoses. It is expected that these two perspectives will reinforce each other to create a single coherent health status perception for an individual. Unfortunately, there is evidence that this is not always the case. For example, Hardley and Cunningham (2005) observe that people without health insurance are as likely to perceive a need for care but only half as likely to get care.

The success of the intervention programs in ameliorating the prevailing and emerging conditions depends on the willingness of those targeted by the programs to avail themselves to the programs. What happens if the target audience does not define itself as belonging to the characteristics defined by the programs? How the target audience defines itself is based on their self perceptions. Perception is the process by which humans arrange sensory stimulation into organized, meaningful experiences (Lindsay and Norman, 1977). It is a complex outcome of past experiences, culture, environment, and sensemaking (Weick, 1995). By definition, perception is subjective. Thus, they are likely to deviate from reality more frequently than not (Fiske and Taylor, 1984; Nisbett and Ross, 1980). The gap between perception and reality could make a difference in the success of these programs in ameliorating the identified health conditions.

Both subjective and objective health statuses are assumed to be functions of socio-economic and behavioral factors. The objective of this study is to provide a contemporary analysis of how socio-economic and behavioral factors influence subjective health status. By understanding how these factors influence perceived health status, we can develop successful policies and strategies to target those groups who have a gap between their perceived and real

health status and address these lifestyles related health conditions. This could lead to an increase compliance in early detection programs and significantly lower health care costs. We use the socio-economic and behavioral data from the National Health and Nutrition Examination Survey (NHANES) and an extension of the traditional economic model for ordered data.

In the next section, a relevant literature review is given. Following this, we provide a description of the conceptual model that supports our empirical approach, an explanation of the econometric method, a discussion of the NHANES 2005-2006 data, and an account of our results. We conclude with a summary of our notable findings and a discussion of their relevance and possible policy strategies.

2. Literature Review

The concept of health is complicated (Blaxter, 1990; Brannon and Feist, 2010). Evaluating health statuses can be intricately complicated because of the effect of asymptomatic as well as psychological challenges, e.g., hypochondriacs. The challenge is exacerbated by the incongruent health status opinions between individuals and their health care providers (Sen, 2002) and by their economic and social status (US DHHS, 2000). In order to accurately measure health, the concept of health must be defined. Defining health, let alone good health, is a difficult task because it is multi-faceted and multi-dimensional. Previous research has indicated that self-reported health status is dependent on morbidity associated with a disease, mental state, functional limitations, and interactions with health care professionals (Heidrich et al., 2002; Miilunpalo et al., 1997; Idler and Kasl, 1995). Self-reported health status is also dependent on subjective factors such as personal expectations of good health, which may stem from social and cultural factors. This variety of factors may be a driving force for the dissonance between internal and external views of one's health status (Sen, 2002).

In general, there are two distinct concepts of health: one negative and one positive. The negative concept of health relates to the absence of disease or illness and is predominately the way health is viewed within the western scientific medical model (Brannon and Feist, 2010). A positive concept of health involves defining health as a state of well-being. In its constitution,

the WHO defines health as 'a state of complete physical, mental and social well-being, not merely the absence of disease and infirmity' (WHO, 1946).

According to the Healthy People 2010 initiative (US DHHS, 2000), the leading health indicators used to measure Americans' health are physical activity, overweight and obesity, tobacco use, substance abuse, responsible sexual behavior, mental health, injury and violence, environmental quality, immunization, and access to health care. These indicators reflect the key factors that influence the health of individuals. In previous research studies, health has been measured by indicators such as mortality, morbidity, and self-perception (US DHHS, 2000; Vazire and Mehl, 2008). Although there are issues of reliability and validity (Vazire and Mehl, 2008), using self-perception as a health indicator instead of mortality or morbidity enables the researcher to adopt a broader definition of health such as the one defined by the WHO.

Previous research on health found that certain socio-economic factors and health behaviors contribute to an individual's health status perception. We will incorporate this information into our economic model. As indicated, health is a multi-dimension concept, and consequently, there are a variety of factors that influence health status and self reported health status. Innate factors such as gender and genetics are key health determinants (US DHHS, 2000; Labonte, 1998; Bergner, 1985). Also, lifestyle choices and subjective factors play an important role in influencing individuals' health. Self-rated health is influenced by preferences and personal values (Haveman-Nies, de Groot, and van Staveren, 2003a), by self-rated physical and mental health, and to a lesser degree, by perceived and available social support and performance of health-related behaviors (Bailis, Segall, and Chipperfield, 2003). Unlike the innate factors, these lifestyle choices are influenced by environment, experiences, cultures, and other factors. Physiological factors and behavioral decisions have a direct affect on health status and an impact on social and physical environments, which also affect their health status (US DHHS, 2000).

2.1 Factors Influencing Health Status

With respect to gender, women tend to view their health status in a more negative manner than men (Goldberg et al., 2001; Tolliver, 2007; Kwaśnewska et al., 2007). Previous studies have consistently shown a clear negative correlation between self-rated health status and age (Morris-Tries, 2004; Havenman-Nies, de Groot, and van Staveren, 2003b; Silventoinen and Lahelma, 2002; Miilunpalo et al., 1997). According to the Healthy People 2010: Understanding and

Improving Health report (US DHHS, 2000), high poverty rates and low education levels are associated with low health status. With higher incomes, individuals and families have access to medical care, are able to afford higher quality living conditions, such as better housing and safe neighborhoods, and have the opportunity to participate in healthy lifestyle behaviors, such as joining a fitness gym (US DHHS, 2000).

Ren (1997) found that individuals who are widowed or never married had a very small and insignificant positive relationship with health status compared to married individuals, suggesting that widowed or never married individuals reported having better health than married individuals even after adjusting for all the control variables. Cohabitation did not increase an individual's health or well-being. Similarly, Tolliver (2007) discovered that married and never-married individuals report higher health statuses more often than those who were divorced, separated, widowed, or co-habiting. In contrast to Ren's (1997) study, Kwaśniewska, Bielecki, and Drygas (2004) in their study of a Polish urban community found that widowed or divorced individuals tend to have a lower level of self-reported health status than those who are single or married.

From her mail survey in Fort Erie, Ontario, Canada, Morris-Tries (2004) found that individuals engaged in regular or occasional physical activity did not view their level of physical activity as being harmful to their health while inactive individuals perceived their activity level as having adverse effects on their health. She also discovered that non-smokers and former smokers had a statistically significant and positive correlation with current and previous year's self-rated health status. In regards to alcohol and health, Morris-Tries (2004) found that over 90 percent of the individuals who consume alcoholic beverages believed that alcohol was not harmful to their health; seven percent and less than one percent of the respondents stated that alcohol posed a moderate to high health risk, respectively.

The number of physician visits was negatively correlated with self-rated health status, where a high number of physician visits are associated with low health status (Miilunpalo et al., 1997). This result supports the expectation set by Kerkhofs and Lindeboom (1995), who used visits to a general physician as a proxy for an objective measurement of health status. They assumed that frequent visits per year to a general physician are associated with less healthy individuals compared to individuals who visit a general physician less frequently.

3. Methods and Data

3.1 Conceptual Model

An individual's (*i*) self-reported health status (*H*) is assumed to be explained in a two dimensional space by socio-economic (*SE*) and behavioral (*B*) factors. The socio-economic factors include demographic variables (θ) such as gender and socio-economic factors (σ) like marital status and education. Behavioral factors (α) include such variables as diet, physical activity, and alcohol consumption.

$$H_i = f(SE(\theta, \sigma), B(\alpha)) \qquad (1.1)$$

In reality, a person's perception about their health status is dynamic; however, for simplicity and data availability, a static framework is used.

Suppose that the health status, H_i, is a linear function of *K* factors whose values, for individual *i*, are X_{ik}, $k = 1, \ldots, K$, then structural model is as follows:

$$\begin{aligned} H_i &= \sum_{k=1}^{K} \beta_k X_{ik} + \varepsilon_i \\ &= Z_i + \varepsilon_i \end{aligned} \qquad (1.2)$$

where β_k is the coefficient associated with the k^{th} variable, $Z_i = \sum_{k=1}^{K} \beta_k X_{ik}$, and ε_i is the error term. The error term, ε_i , is assumed to have a standard logistic distribution with a mean of zero and a variance of $\pi^2/3$. H_i is the latent variable or the unobserved dependent variable.

3.2 Empirical Model

There are a number of different modeling approaches associated with ordinal dependent variable analysis: cumulative, stage, and adjacent (Fullerton, 2009; Menard, 1995). The data and the type of comparison required among the categories determines which approach is appropriate for the research. Since the self-reported health status follows an ordinal scale, which represents an underlying continuous measure, Fullerton (2009) recommends using the cumulative approach. Traditionally, the cumulative approach represents the classic ordered logit model approach[1] . Implicit in this classic ordered logit model is that the parallel line assumption holds and the

[1] McCullagh (1980) refers to this model as the proportional odds model. It derives its name from its inherent assumption, the proportional odds assumption, in which the coefficients are equal across all cut points.

errors are homoskedastic (Williams, 2008). The parallel line assumption implies that the ordinal variable can be fit by one set of regression parameters. That is, the β's are equal for each equation.

Prior to fitting the ordered logit model, the parallel line assumption can be tested. If the assumption is not met, then at least one of the parameters differs across the equations. Violation of the parallel line assumption can lead to results being incorrect, incomplete, or misleading (Boes and Winkelmann, 2004; Williams, 2006). In regards to this model, the parallel line assumption is violated. Consequently, the partial constrained ordered logit model (PCOL) is estimated instead of the classic ordered logit model (Long and Freese, 2003; Williams 2009, Fullerton, 2009).

3.3 Partial Constrained Ordered Logit Model

The PCOL model is written as follows:

$$P(Y_i > j) = g(X\beta) = \frac{\exp(\alpha_j + X_{1i}\beta_1 + X_{2i}\beta_2 + X_{3i}\beta_{3j})}{1+\exp(\alpha_j + X_{1i}\beta_1 + X_{2i}\beta_2 + X_{3i}\beta_{3j})}, \quad j=1,2,..., M\text{-}1. \tag{1.3}$$

where *i* represents the individual, *j* is the different health status categories, and *M* is the number of health status categories. In the PCOL model, the parallel line assumption is relaxed for only those variables that violate the assumption; this means that some of the β's can be the same for all values of *j*, while other β's can differ across the different health categories (*j*'s) (Williams, 2006). For instance, equation (1.3) indicates that the coefficients for variables X_1 and X_2 are constant for all values of *j*, while X_3's coefficient can vary across the different values of *j* (Williams, 2006). The software Stata® 10.0 is used to conduct the analysis.

3.4 Data

The NHANES data for 2005-2006 were used for this study (CDC, 2009a). It is a cross-sectional, nationally representative health and nutrition examination survey. The purpose of the survey is to evaluate the health and nutritional status of the American population of all ages. Behavioral and demographic data are collected from the household interviews while the medical data were drawn from the mobile examination center survey data. Although the survey covered a very large population segment (n=10,348), this study is limited to respondents age 20 years and over

and who participated in both the household interviews and mobile examination center data collection, which means that only a segment of the respondent sample is used in the study (n=4,900).

Based on the literature and theory, the following factors represent explanatory variables in the model: gender, marital status, education, income, diet, physical activity, physical fitness comparison, smoking, alcohol consumption, and frequency of doctor visits. Inclusion of the physical fitness comparison has a dual function. For one, it is another variable to capture the physical activity and lifestyle component, and second, it serves as a measurement for the potential self-perception bias in which people tend to view themselves more favorably than others.

3.5 Dependent Variable

The dependent variable in this categorical outcome analysis is the current health condition. This self-reported variable is measured by the question "*Would you say your health in general is excellent, very good, good, fair or poor?*". Higher scores correspond to higher perceived health status. Due to the relatively small number of respondents indicating poor health category, the category was merged with the fair health status category to create the poor-fair health category. This decision was based on Fullerton (2010) suggestion that categories less than five percent of the sample be combined with other categories to avoid statistical issues with the model.

3.6 Demographic and Socioeconomic Variables

The demographic variables included in the study are gender and age. Respondent's socioeconomic status (SES) is evaluated by three variables. Education is divided into five dummy variable categories of less than grade nine, greater than grade nine but less than high school, high school graduate or equivalent, some college or Associates in Arts (AA) degree, or at least a college degree. Total annual household income has values ranging from $0 to more than $75,000, with the income categories increasing in increments of approximately $10,000. The third variable is marital status, which is represented by six dummy variables; married, widowed, divorced, separated, cohabiting and single.

3.7 Behavioral Variables

Behavioral variables included in the study are diet quality, physical activity, smoking status, alcohol consumption, and frequency of doctor's visits. Diet quality is assessed using a similar question as the self-reported health status (five dummy variables represent poor, fair, good, very good, and excellent diet quality).

Measurement of physical activity is based on self-reported data on participation in physical activity. An overall exercise variable is developed to determine an individual's average level of physical activity. According to the US DHHS's *2008 Physical Activity Guidelines for Americans*, to be considered physically active, an individual must engage in: (1) 150 minutes per week of moderate activity (metabolic equivalent, MET, value of 3 to 5.9); (2) 75 minutes per week of vigorous activity (MET value of 6 or more); or (3) some combination of moderate or vigorous activity (US DHHS, 2008)[2]. An individual's exercise score is the product of an activity's MET value, number of times participated in the activity per month and the duration of the activity, which is summed for all of the individual's activities. Scaling of the exercise variable was performed by dividing the exercise score by the minimum US DHHS requirement score to be considered physically active. A binary variable was created to designate those individuals who meet the US DHHS requirement (i.e., they are considered active) and those who do not (i.e., they are considered to be inactive). Additionally, how a person compares herself to their peers in terms of physical fitness was included in the study. An individual can perceive herself as being more physically fit, less physically fit, or at the same fitness level as others their own age. Individuals who view themselves as being less physically fit than their peers are designated as having unfavorable physical fitness perceptions, and individuals who view themselves as being more physically fit than their peers are thought of as having favorable physically fitness perceptions.

The smoking status variable is based on cigarette smoking only. Participants who have never smoked or smoked less than 100 cigarettes in their lifetime are labeled as "never smokers", participants who have smoked at least 100 cigarettes in their lifetime but are not currently

[2] In addition to aerobic activity, to be considered physically active by US DHHS standards, an individual must participate in muscle strengthening activities at least 2 times per week (US DHHS, 2008). The muscle strengthening component is not included in the total exercise variable.

smoking are labeled as “former smokers”, and participants who smoked at least 100 cigarettes in their lifetime and are currently smoking are referred to as “current smokers”.

Alcohol consumption categories are based on a study conducted by Sink and her colleagues from Wake Forest University School of Medicine (Sink et al., 2009). Individuals who consume less than twelve alcoholic beverages per year are considered to be non drinkers or “abstainers”. Light drinkers are individuals who consume at most one drink per day, and moderate drinkers are those that consume two or less drinks per day. For those individuals who consume more than fourteen drinks per week, they are classified as heavy drinkers.

Frequency of doctor visits per year is represented by six dummy variables; no visits, one visit, two to three visits, four to nine visits, ten to twelve visits, or thirteen or more visits are included in the model. Annual visits to the doctor are considered to be part of a good health maintenance program; however, frequent visits to the doctors suggest poor health (Kerkhofs and Lindeboom, 1995).

The summary statistics shown in Table 1 provide an overview of the respondents involved in this sample. A correlation analysis was performed to address the possible multicollinearity issues between the independent variables. In each pair-wise comparison, the correlation coefficient is less than 0.70, which suggests that multicollinearity is not a large issue in this analysis. Also, the Variance Inflation Factors are less than 10 and have a tolerance level greater than 0.10, suggesting that no severe multicollinearity issues are present within the model.

4. Results

Over 60 percent of the individuals report good or very good health status. Individuals are least likely to report a poor/fair health status (13.27 percent). The likelihood ratio chi-square test indicates that the fitted model is significantly different from the null model, meaning that we can reject the null hypothesis that all of the predictor effects are zero. The parallel line assumption is violated by the following five variables: college graduate or higher (*ed5*) and all four diet quality variables. Table 2 shows the estimated marginal effects from the PCOL model, with excellent self-reported health status (Health Status = 4) being treated as the reference health status category. The reference category for this model is female, single, with less than a grade nine education, a self-reported excellent diet quality, a same perceived fitness level as her peers, is

Table 1: Summary Statistics

Summary Statistics	Code	Definition	Obs.	Mean, (%)[a]	Std. Dev.	Min.	Max.
Dependent Variables							
Self Reported Health Condition			4,895	3.33	1.07	1.00	5.00
	HS1	1= Poor	208	0.043			
	HS2	2=Fair	876	0.179			
	HS3	3= Good	1,707	0.35			
	HS4	4= Very Good	1,318	0.27			
	HS5	5= Excellent	786	0.16			
Body Mass Index		n/a	4,600	28.94	6.47	18.50	76.07
Waist Circumference		cm	4,429	98.73	15.41	64.00	175.00
High Density Lipoprotein (HDL)		mg/dL	4,409	54.90	16.59	17.00	188.00
Fasting Blood Glucose		mg/dL	2,131	105.30	33.94	45.00	418.00
Comparison Groups							
Health Risk Group	*MRISKWC*	1 = if have at least a Health Risk associated with waist circumference and 0 if otherwise	2,037	0.57	0.50	0.00	1.00
	INFORM1		3,301	0.62	0.49	0.00	1.00
Informed Group		1 = if informed of a potential Health Risk and 0 if otherwise					
Independent Variables							
Socio-Economic Factors							
Gender	*gend1*	1 if Male and 0 if Female	4,900	0.48			
Age	*ridageyr*	Years	4,900	48.39	19.08	20.00	85.00
Marital Status			4,894	2.42	1.82	1.00	6.00
Marital Status -Married	*MS1*	1 if Married and 0 if Single	2,650	0.54			
Marital Status - Widowed	*MS2*	1 if Widowed and 0 if Single	456	0.09			
Marital Status - Divorced	*MS3*	1 if Divorced and 0 if Single	464	0.09			
Marital Status - Separated	*MS4*	1 if Separated and 0 if Single	153	0.03			
Marital Status - Cohabitation	*MS6*	1 if Cohabitation and 0 if Single	402	0.08			
Education			4,893	3.29	1.29	1.00	5.00
Education - Less than High School	*ed2*	1 if Less than High School Degree and 0 if Less than Gr. 9	748	0.15			
Education - High School Graduate or Equivalent	*ed3*	1 if High School Graduate and 0 if Less than Gr. 9	1,164	0.24			
Education - Some College or AA Degree	*ed4*	1 if Some College or AA Degree and 0 if Less than Gr. 9	1,399	0.29			
Education - College Graduate or More	*ed5*	1 if College Graduate or More and 0 if Less than Gr. 9	958	0.20			
Household Income	*Hhinc*	US Dollars	4,607	43,859.34	23,861.48	2,500	75,000
Behavioral Factors							
Diet Quality			4,889	3.06	1.03	1.00	5.00
Diet Quality -Poor	*DQ1*	1 if Poor and 0 if Excellent	291	0.06			
Diet Quality - Fair	*DQ2*	1 if Fair and 0 if Excellent	1,144	0.23			
Diet Quality - Good	*DQ3*	1 if Good and 0 if Excellent	1,895	0.39			
Diet Quality - Very Good	*DQ4*	1 if Very Good and 0 if Excellent	1,101	0.23			
Exercise			2,957	3.30	1.54	1.00	6.00
Inactive	*ex1*	1 if Inactive and 0 if Extremely Active	531	0.18			
Low Activity Level	*ex2*	2 if Low Activity level and 0 if Extremely Active	418	0.14			
Active by US DHHS Standards	*ex3*	3 if Active and 0 if Extremely Active	576	0.19			
Moderately Active	*ex4*	4 if Moderately Active and 0 if Extremely Active	756	0.26			
Highly Active	*ex5*	5 if Highly Active and 0 if Extremely Active	413	0.14			
Physical Fitness			4,826	2.05	0.88	1.00	3.00
Physical Fitness Comparison - Less	*fit2*	1 if Less and 0 if Same	1,067	0.22			
Physical Fitness Comparison - More	*fit1*	1 if More and 0 if Same	1,750	0.36			
Smoke			4,894	1.68	0.80	1.00	3.00
Smoke - Former	*smk2*	1 if Former Smoker and 0 if Non-Smoker	1,241	0.25			
Smoke - Current	*smk3*	1 if Current Smoker and 0 if Non-Smoker	1,055	0.22			
Alcohol Consumption			3,803	2.38	1.22	1.00	4.00
Alcohol Consumption - Light	*drink2*	1 if Light Drinker and 0 if Abstainer	733	0.19			
Alcohol Consumption - Moderate	*drink3*	1 if Moderate Drinker and 0 if Abstainer	702	0.18			
Alcohol Consumption - Heavy	*drink4*	1 if Heavy Drinker and 0 if Abstainer	1,032	0.27			
Doctor Visits			4,893	2.17	1.48	0.00	5.00
Doctor Visits - 1 Time/Yr	*doc2*	1 if Visit 1 Time/Year and 0 If No Visits/Yr	855	0.17			
Doctor Visits - 2-3 Times/Yr	*doc3*	1 if Visit 2 to 3 Times/Year and 0 If No Visits/Yr	1,218	0.25			
Doctor Visits - 4-9 Times/Yr	*doc4*	1 if Visit 4-9 Times/Year and 0 If No Visits/Yr	1,187	0.24			
Doctor Visits - 10-12 Times/Yr	*doc5*	1 if Visit 10-12 Times/Year and 0 If No Visits/Yr	370	0.08			
Doctor Visits - 13 or More Times/Yr	*doc6*	1 if Visit 13 Times or More/Year and 0 If No Visits/Yr	461	0.09			

[a] When reporting the individual binary variables, the percentage of the sample exhibiting the specific characteristic is reported instead of the sample mean.

physically active by US DHHS standards, is a non-smoker, abstains from alcohol, and does not visit a doctor annually.

4.1 Notable Findings

Key factors[3] influencing self-reported health status are gender, education, diet quality, fitness comparison, light and moderate alcohol consumption, and visiting the doctor more than once a year. According to the estimated results, holding all other variables constant, the probability of males reporting a poor/fair or good health status is 0.0147 and 0.0327, respectively, more than females. Also, men have a lower probability of reporting a very good or excellent health status than women by 0.0233 and 0.0241, respectively. Based on our expectations, women would self-report a lower health status than men. However, our results indicate that the converse is true; men have a lower perceived health status than women, supporting Morris-Tries' (2004) findings. Our expectation was based on the belief that women are more critical of themselves and their health, particularly their body and body composition (Gregory, 2008). Thus, we hypothesized that women would be more likely to have a negative perception of their health status. Nevertheless, it is possible that women being more critical of their health status led them to have a higher level of awareness of their health than men. As a result, they may be more likely to engage in healthier lifestyle behaviors to maintain or improve their health status. Women might exercise more or eat a healthier diet, leading them to have a higher self-reported health status than men. Additionally, this result that women have a higher health status is further supported by the fact that women, on average, have a longer life expectancy than men. In 2006, the life expectancy at birth for a male and female living in the U.S. was 75.1 years and 80.2 years, respectively (CDC, 2009b).

Consistent with previous literature citing a positive relationship between education and health status (US DHHS, 2000; Morris-Tries, 2004; Silvenroinen, Lahelma and Kaprio, 2006; Tolliver, 2007), our results indicate that higher education leads to an increased probability of individuals perceiving their health status as being high. Interestingly, one of the education variables (*ed5*) and all of the diet quality variables violate the parallel line assumption.

[3] Key factors are those that are significant and have unexpected influences on the dependent variable or have non-parallel characteristics. Estimated marginal effects are reported for only some of the notable findings; however, all of the estimated marginal effects are represented in Table 2.

Table 2: Estimated Marginal Effects of the PCOL Model

Variable	Health Status = 1	Health Status = 2	Health Status = 3	Health Status = 4
Gender - Male	**0.0147** **	**0.0327** **	**-0.0233** **	**-0.0241** **
Age (in yrs)	**0.0017** ***	**0.0037** ***	**-0.0026** ***	**-0.0027** ***
Marital Status -Married	-0.0019	-0.0042	0.0030	0.0031
Marital Status - Widowed	-0.0033	-0.0076	0.0053	0.0056
Marital Status - Divorced	**0.0286** *	**0.0543** **	**-0.0446** *	**-0.0383** **
Marital Status - Separated	0.0258	0.0487	-0.0403	-0.0342
Marital Status - Cohabitation	0.0203	0.0403	-0.0320	-0.0286
Education - Less than High School	**-0.0514** ***	**-0.1549** ***	**0.0651** ***	**0.1412** ***
Education - High School Graduate or Equivalent	**-0.0715** ***	**-0.2047** ***	**0.0873** ***	**0.1889** ***
Education - Some College or AA Degree	**-0.0965** ***	**-0.2424** ***	**0.1210** ***	**0.2179** ***
Education - College Graduate or More	**-0.1389** ***	**-0.3088** ***	**0.1864** ***	**0.2613** ***
Household Income	**-0.0052** ***	**-0.0118** ***	**0.0084** ***	**0.0087** ***
Diet Quality - Poor	**0.1217** **	**0.2672** ***	**-0.2378** ***	**-0.1510** ***
Diet Quality - Fair	**0.1017** ***	**0.3042** ***	**-0.2207** ***	**-0.1853** ***
Diet Quality - Good	-0.0136	**0.2811** ***	-0.0616	**-0.2059** ***
Diet Quality - Very Good	-0.0234	**0.1414** ***	0.0052	**-0.1232** ***
Physical Fitness Comparison - Less	**0.0685** ***	**0.1112** ***	**-0.1014** ***	**-0.0783** ***
Physical Fitness Comparison - More	**-0.0377** ***	**-0.0869** ***	**0.0587** ***	**0.0659** ***
Exercise - Inactive	**-0.0129** **	**-0.0298** *	**0.0204** **	**0.0223** *
Smoke - Former	-0.0013	-0.0029	0.0020	0.0021
Smoke - Current	0.0059	0.0129	-0.0094	-0.0094
Alcohol Consumption - Light	**-0.0146** *	**-0.0347** *	**0.0231** *	**0.0263** *
Alcohol Consumption - Moderate	**-0.0165** **	**-0.0397** *	**0.0261** **	**0.0301** *
Alcohol Consumption - Heavy	0.0045	0.0099	-0.0071	-0.0073
Doctor Visits - 1 Time/Yr	0.0033	0.0072	-0.0052	-0.0053
Doctor Visits - 2-3 Times/Yr	**0.0197** *	**0.0413** *	**-0.0312** *	**-0.0298** *
Doctor Visits - 4-9 Times/Yr	**0.0443** ***	**0.0834** ***	**-0.0684** ***	**-0.0593** ***
Doctor Visits - 10 -12 Times/Yr	**0.1104** ***	**0.1299** ***	**-0.1470** ***	**-0.0934** ***
Doctor Visits - 13 or More Times/Yr	**0.1517** ***	**0.1452** ***	**-0.1859** ***	**-0.1109** ***

*** p<0.01, ** p<0.05, * p<0.1

Interpretation of the violating variables provides unique insight into the relationship between the independent variables and the dependent variable that would have been hidden in the ordered logit model. The violating education variable (*ed5*) reveals that there is a strong effort pushing highly educated people's perception of their health status away from the lower end of the health status spectrum. Thus, higher education has a strong positive effect on health status. Furnée, Groot, and Maassen van den Brink (2008) discovered that the level of education, itself, can act as a biasing factor since it can influence an individual's ability to evaluate their own health status. It may be that highly educated individuals are more informed about the multi-dimensional nature

of health and have a better understanding of how various factors interact to affect their health status.

Individuals with poor or fair diet quality are less likely to report a high health status, but they are especially unlikely to report an excellent health status. This suggests that those individuals perceive a strong correlation between diet and health status and acknowledge that their perceived poor dietary habits are adversely affecting their health status. Compared to those with a high self-perceived diet quality, individuals with good or very good perceived diet qualities are less likely to report a higher level of health, but they are also less likely to report a low level of health. That is, individuals with these neutral to positive perceptions about their diet quality tend to be less at the extremes of the health status spectrum, and thus have a more neutral view of their health status. This pattern suggests that individuals have a fairly balanced view of the relationship between diet and health status. For instance, they do not tend to downplay or inflate the effect of diet quality on their health status.

In spite of having a realistic view of the influence of diet quality on self-reported health status, compliance with dietary recommendations is still low. In addition to being one of the Healthy People 2010 initiatives, healthy eating has been the focus of numerous public health campaigns such as "5-A-Day" and "MyPyramid". However in 2005, approximately a third of the U.S. adult population consumed at least the recommended amount of fruit per day and 27 percent consumed at least the recommended amount of vegetables per day (CDC, 2007a). These statistics indicate that there is room for improvement regarding these public health initiatives.

How a person compares their physical fitness level to others has a strong impact on their self-reported health status. The majority of individuals in this research report having the same fitness levels as their peers (41.63 percent). However, more individuals report having a fitness level greater than their peers (36.26 percent) rather than reporting a lower fitness level (22.11 percent). This tendency supports the notion that individuals tend to be overly optimistic about themselves (Varize and Mehl, 2008; Dunning, Heath, and Suls, 2004).

Holding all other variables constant, individuals that view themselves as being less physically fit than their peers have a higher probability of reporting a poor/fair and good health status by 0.0685 and 0.1112, respectively, compared to individuals who perceive their physical

fitness level as being the same as their peers. Also, individuals with an unfavorable physical fitness perception have a lower probability of reporting a very good or excellent health status by 0.1014 and 0.0783, respectively.

For those individuals that view themselves as being more physically fit than their peers, the probability that they will report a poor/fair or good health status is 0.0377 and 0.0869, respectively, less than individuals in the reference category, holding all other variables the same. Additionally, individuals with a favorable physical fitness perception have a higher probability of reporting a very good or excellent health status by 0.0204 and 0.0223, respectively. These results for both unfavorable and favorable physical fitness perceptions are consistent with our expectations on how an individual compares themselves to others and how it reflects their health status.

Based on these results, it is apparent that there is a strong, direct relationship between an individual's perceived health status and their fitness comparison. Of those that said that they were more physically fit than their peers, less than a third of them were considered to be inactive. The other two physically fit comparison categories were fairly split between inactive and active respondents. These results indicate the individuals' view of their physical fitness compared to their peers somewhat coincides with their physical activity level based on the US DHHS standards. However, depending on their peer group, individuals in the same physical fitness comparison group may be overly optimistic about their physical fitness level. Also those individuals in the less physically fit category may be overly critical of their fitness level compared to other groups.

Our results indicate that inactive people are more likely to report a higher health status than active people. Although this is contrary to what we expected, this result is not unreasonable. Active individuals may be physically active because they believe that they are unhealthy or that they will become unhealthy in the future. Thus, they have a negative view of their health, and they are reacting to this perception by engaging in physical activity. However, the act of engaging in physical activity may not completely negate their negative health status perception. Consequently, they may still perceive themselves as having a lower health status.

It is important to note that the physical activity variable in this model does not take into consideration the energy expenditure associated with performing daily activities such as cleaning the house or performing job-related tasks. Therefore, it is possible that an individual who has a physically demanding job such as a construction worker may not participate in leisure time physical activities, but that they are considered to be in excellent physical shape as a result of the physical energy exerted at their job.

From another perspective, an inactive individual's decision not to engage in physical activity may be based on a simple cost-benefit analysis. They have evaluated the benefits of physical activity against the costs involved such as time and energy, and they have determined that the costs outweigh the benefits. In addition to this cost-benefit analysis, inactive individuals may have convinced themselves that no amount of physical activity will improve their health status and, given their current health situation, they perceive themselves as being healthy. In a 2007 report from the CDC, fewer than half of U.S. adults took part in enough physical activity to gain any significant health benefits (CDC, 2007b). Based on this statistic and the abundance of public health campaigns promoting the health benefits of physical activity, it is possible that many individuals view the costs of exercising as being higher than the known health benefits gained from exercise.

Regarding the effects of alcohol consumption on self-reported health status, not only do our results support Morris-Tries' (2004) findings that alcohol consumption does not have an adverse effect on perceived health status, but they go one step further. Our results also suggest that an individual's light or moderate alcohol consumption has a positive effect on reporting a high health status. Compared to individuals who abstain from alcohol, the probability of light drinkers reporting poor/fair and good health status is decreased by 0.0146 and 0.0347, respectively, ceterus paribus. Light drinkers also have a higher probability of reporting a very good and excellent health status by 0.0231 and 0.0263, respectively. Holding all else constant, the probability that moderate drinkers will report a poor/fair or good health status is 0.0165 and 0.0397, respectively, less than non-drinkers. Also, moderate drinkers have a higher probability of reporting a very good and excellent health status by 0.0261 and 0.0301, respectively.

A study by Theobald, Johansson, and Engfeldt (2003) suggests that the positive effect between health status and alcohol consumption may be due in part to a reduced risk of fatal,

coronary heart disease, which can be attributed to functional food components like resveratrol and antioxidants found in alcoholic beverages, particularly in red wine. Poikolainen, Vartiainen, and Korhonen (1996) discovered a J-shaped relationship between alcohol intake and suboptimal health, average or poor, when controlling for several socio-economic variables. Moderate drinkers had the highest self-reported health status, followed by abstainers. Heavy alcohol consumers had the lowest self-perceived health status.

Individuals who visit the doctor more than once a year have a higher probability of reporting a lower health status level than individuals who do not visit the doctor annually. This finding is consistent with previous research (Miilunpalo et al., 1997). It is evident that individuals associate negative perceptions with the frequency of doctor visits per year. Interestingly, visiting a doctor once a year such as for an annual check-up has no discernable effect on a person's health status perception, but visiting the doctor more than once a year does have an adverse effect on their self-perceived health status. We agree that frequent doctor visits may be an indication of poor health, but visiting a health care professional more than once a year is not necessarily something that should be viewed negatively particularly if the reason for the visits are to engage in preventive behavior such as early detection programs.

5. Discussion

Based on our results, the more education you have, the healthier you perceive yourself to be. The significant positive effect that formal education has on self-perceived health status suggests that increasing health literacy and health awareness through initiatives within the formal education system would have a strong positive impact on self-reported health status. In fact, improving health education and literacy is one of the initiatives in the CDC's Healthy People 2010 program. Health literacy is defined as " the degree to which individual's ability to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzan and Parker, 2000). Based on their 2004 report, the Institute of Medicine states that over 89 million adults in the U.S. from all ages, races, incomes and education levels are estimated to have limited health literacy skills. Having limited health literacy often results in the consumption of medicines on erratic schedules, not following treatment instructions, and miss follow-up appointments. The consequences of limited health literacy such as unnecessary doctor visits and hospital stays have significant economic effects. An individual with limited health

literacy incur medical costs that are four times greater than patients with adequate health literacy. Many individuals feel that there is a negative stigma attached to having limited health literacy and as a result, many hide their confusion from their doctors instead of asking for clarification (American Medical Association, 2009).

A prior study found that education along with taxation, and restrictive legislation have a positive impact on shaping individuals' choices for healthier behavior, which in turn impacted their health (Jochelson, 2005). The positive relationship between education and health status is not a new finding, but, to our knowledge, the insight into the effect of higher education driving perception away from the low health status levels is a new finding.

Although the positive relationship between health and education present tremendous individual and public health opportunities, developing successful public policies initiatives involving education and health can be a challenge. These two domains, health and education, tend to be governed by separate agencies that are highly compartmentalized and engage in little to no inter-agency policy development, despite there being a large spill-over effect among the policy initiatives. Though education and health policies may be somewhat successful in their respective domains, these policies are generally not all encompassing, and thus, they fall short of them reaching full potential. Given the strong relationship between health and education, it is recommended that policies aimed at improving health through education be developed not in isolation of one another, but in a comprehensive or integrated approach to education and health (Furnée, Groot, and Maassen van den Brink, 2008).

6. Conclusion

The objective of the study was to determine which socio-economic and behavioral factors influence subjective health status. Results from the study indicate that gender, education, diet quality, physical fitness comparison to others, light and moderate drinking, and two or more doctor visits per year have a significant impact on an individual's self-reported health status. One of the education variables (*ed5*) and all four of the diet quality variables violated the parallel line assumption. Therefore, the parallel line assumption is relaxed for these violating variables. Information from the education variable suggests that higher education has a significant effect on moving an individual's health perception away from the lower health status categories. The

results from the diet quality variables suggest that individuals have an accurate understanding of the relationship between diet quality and health status.

In order for individuals to evaluate their health status more effectively, incorporation of valid health education into the formal education system is recommended. Also, we recommend that health and education agencies combine efforts to form a single, probably more successful, policy approach. Additionally, we suggest that public initiatives be developed and aimed at increasing the health literacy rate and encouraging participation in preventative behaviors such as early detection programs.

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