

Stress, Self-Evaluated Health and Health Care Costs of Japanese Workers:

Does Psychological Stress Affect Self-Evaluated Health and Health Care Costs?

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1 . Introduction

Almost everyone who has spent time sending and collecting survey questions will agree that individuals seldom fail to respond to questions dealing with their own health, and that take these questions very seriously. But just how good is the self-evaluated health (SEH) as an indicator of individual health? One of the first critical works in this regard is that of Haberman (1969), who demonstrated that the self-reported data from individual surveys are simply not accurate enough to be used in epidemiological studies. He has shown that answers to questions dealing with specific diseases should not be used to compute the incidence rates, and that answers on hospital visits or treatments have modest reliability if they are either recent or very serious episodes.

On the other hand, Maddox et al (1973) have shown that even if there are apparent inconsistencies between the self-reported rates and the objective incidence rates of diseases or their treatment rates, the self-reported health status is still a useful measure of individual health. Using a small panel data of patients, they have shown that (1) in many instances, self-evaluated health

actually agrees with physician's evaluation, (2) when the two differ, the patient's evaluation tends to have upward-bias, and (3) patients evaluation is a good leading indicator of physician's, but not vice-versa.

These findings by Maddox have been confirmed by many subsequent studies, and now most agree that self-evaluated health is an excellent predictor of mortality or incidences of major diseases for individuals (Ferraro • Farmer 1999; Idler • Benyamini 1997; Kaplan and Camacho 1983). Furthermore, self-evaluated health is found to be a very good predictor of patient behavior regarding treatment as well. This agrees perfectly with the Health Belief Model, which claims that the initiation or the continuation of the treatment depends, not so much on the objective medical necessity, but on the perceived seriousness of the disease by the patients.

In spite of these predictive proficiencies, however, most studies have found that the coefficients of correlation between the self-evaluated health and most summary measures of diseases and disabilities are around 0.3 (Marco et al, 1991). What are the other factors that determine the remaining 70 percent? The leading hypothesis on this question at the moment seems to be social reference hypothesis (Mechanic et al 1987).

According to this hypothesis, individuals evaluate their own health not by their innate scales, but by the relative standings within their social reference groups. For instance, many studies have found that the elderly are too optimistic about their own health, given their medical conditions, but

according to this hypothesis, the elderly may be simply reporting their relative health standings among themselves (Idler 1993).

Furthermore, the upward bias in self-evaluated health pointed out by Maddox and others can be explained by the social reference hypothesis. For example, according to Groot (2000), the patients hospitalized for chronic diseases evaluate their own health relative to other patients in their hospitals, which makes their reported health higher than one expects from their objective conditions. The upward-bias, however, may result from the conscious selection of the individuals (Wood 1985): People tend to select individuals who are worse-off in health than themselves as the reference group. This tendency is more pronounced for individuals who are either seriously ill or with severe handicaps (Hoeymans et al. 1997).

We should note that not all the biases in SEH regarding race, sex, socio-economic status can be explained by the social reference hypothesis. For example, it is well-known that individuals with higher income and/or higher education enjoy better objective health than those with less income and/or less education, but SEH of the former is known to be better than those of the latter (Liu et al. 2004). In fact, according to a recent study on this subject, most of the differences in SEH between socio-economic groups can be explained by the differences in such subjective factors as pains and discomforts, as well as the differences in the incidence of such objective factors as life-style diseases or functional limitations (Simon et al. 2000). According to Hirdes • Forbes (1993),

lifestyles can affect the functional limitations, which in turn can affect the SEH. Therefore, it seems reasonable to expect for SEH to be correlated with health across individuals.

We also point out that in the last 25 years, an enormous amount of research has established the link between stress and diseases (Clark et al 1999). We now know that psychological stress induces physical and physiological changes in our body, lowers immunity and allows infections and tumors to grow (Stein • Miller 1993). In addition, we know that stress worsens such chronic diseases as rheumatoid (Affleck et al. 1994), or makes it much harder to control hypertension (Brody 1980). In diabetic patients, psychological stress is often associated with such behavioral changes as increased drinking or smoking, decreased compliance to blood-sugar controls, thereby increasing the risk of serious incidents of low blood-sugar episodes (Spangler et al. 1993). As predictors of mortality in male patients who had myocardial infarctions, stress and depression are rated as best predictors (Denollet et al. 1995).

In spite of such rapid accumulation of researches on SHE and psychological stress, it is fair to say that the relationship between the SEH and depression or stress has not been regarded as particularly important by most researchers. A small number of studies that examined the relationship between SEH and objective health variables did include depression as one of the explanatory variables (Groot 2000, Honda et al. 2003). These studies, however, according to Schnittker (2005), may suffer from a serious missing variable problem, as depressed individuals are

known to be under-treated for depression, particularly among the elderly population. In fact, Schnittker who has CES-D which is a measure of depression for all his samples, has found out that as age progresses, the chronic diseases and functional limitations lose their importance in explaining SEH, while depression gains importance, and at age 75, depression becomes as important to strokes or cancer, if not more.

In this paper, using a panel data of health care costs of Japanese workers, which we augmented by questionnaire on life-style, we want to find out how stress affects SEH, and how stress affects their health care expenditures. While we do not have measures of depression like CES in our survey questionnaire, the workers in our sample are generally young and quite healthy, physically and psychologically. Practically speaking, therefore, for most of these workers, stress is far more important than depression in evaluating their own health. Our findings in this paper firmly lead us to believe that an increase in psychological stress of workers lowers the self-evaluated health, which in turn increases their health care costs. The net result of this causality is that if the stress increases by one level in the four possible rating scales, health care costs increases by almost 10%. If this is the case, it is important for the Japanese health care system as a whole to make sure that the minds of Japanese workers are as well taken care of as their bodies.

2 . Framework of Our Research

In the summer of 2005, we recruited volunteers for our research on the lifestyle and health care costs through a health insurance association of a certain firm, and succeeded in getting more than 3000 volunteers. The health insurance association then conducted a survey on their lifestyle, using a questionnaire we have prepared. We received the survey data in Octobers as well as the monthly health insurance claims data, and their health checkup data from the health insurance association. In each step, the ethical guidelines of the Ministry of Health, Labor and Welfare on individual health care researches have been observed.

- Outline of Survey Questionnaire

- Self-Evaluated Health and Stress

Q6, How do you rate your own health at present?

(1)very good (2)good (3)not bad (4)somewhat bad (5)bad

Q9, How strong is the stress you are feeling at this moment?

(1)strong (2)medium (3)weak (4)no stress at all

Q11a , If you are male and you have never been diagnosed as having prostate cancer, please

answer this question: what is the your probability of getting prostate cancer, compared with your contemporaries?

b , If you are female and you have never been diagnosed as having breast cancer,
please answer this question: what is the probability of getting breast cancer compared
with your contemporaries?

(1)very high (2)somewhat higher (3)about the same (4)somewhat lower (5)very low

Q14a, In the last few days, have you had any symptoms of ill health?

(1)yes (2)no

Q14b , If you have answered “yes” in Q13a, please answer this question: what are your
symptoms? Choose all the symptoms that you have.

(1)stiff shoulder (2)lower back pain (3)pains in joints of hands and feet (4)blurred
vision (5)itches (6)eczema and tinea (7)cold hands and feet (8)coughs and phlegm
(9)numbness in hands and feet (10)headaches (11)indigestion (12)memory lapse
(13)other symptoms

➤ Life-Style Diseases

Q16a , Have you ever been diagnosed as having one or more of the following life-style diseases
in the table below?

(1)yes (2)no

Q16b ,If you have answered (1) yes in Q16a, please answer this question: what are the diseases

you have ever been diagnosed to have? Please choose all that apply to you.

List of Groups of Lifestyle Diseases

<p>Diseases of heart, blood pressure and the vascular system</p>	<p>(1) angina (2)myocardial infarction (3)hypertension (4)arteriosclerosis</p>
<p>Disease of brain and nervous system</p>	<p>(5) stroke (cerebral hemorrhage , cerebral infarction) (6) cerebral arteriosclerosis (7) alcohol dependency</p>
<p>Disease of lung and bronchial tubes</p>	<p>(8) chronic bronchitis (9) emphysema</p>
<p>Disease of stomach and intestines</p>	<p>(10) gastric ulcer (11)duodenal ulcer</p>
<p>Diseases of liver and pancreas</p>	<p>(12) cirrhosis of the liver (13) diabetes</p>
<p>Cancers</p>	<p>(14)colon cancer (15)lung cancer (16)prostate cancer (17) stomach cancer (18) liver cancer (19) esophageal cancer (20)breast cancer (21) uterine cancer</p>
<p>Skeltal muscular diseases</p>	<p>(22) gout (23) osteoporosis</p>

Diseases of Teeth	(24) periodontal disease
Other Diseases	(25)hyperlipemia (26)obesity

Q17a , From the same list as in Q16b, please identify the groups of diseases your father has had in the past.

Q17b , From the same list as in Q16, please identify the groups of diseases your mother has had in the past.

(1) Diseases of heart, blood pressure and the vascular system (2) Disease of brain and nervous system (3) Disease of lung and bronchial tubes (4) Disease of stomach and intestines (5) Diseases of liver and pancreas (6) Cancers (7) Skeltal muscular diseases (8) Diseases of Teeth (9)Other Diseases (10) Do not know

Q19 , If you have had health checkups in the last twelve months, please answer this question:

have you been warned as a likely candidate for one or more life-style diseases as a result of the checkup?

(1) Yes (2)No

➤ Drinking

Q35a , How many days did you have wine or liquor during last week?

(1)One day (2)two days (3)three days (4)four days (5)five days (6)six days (7)seven days

(8)none

➤ Smoking

Q51 , Do you smoke?

(1)yes (2)no

Q56a , Are you an ex-smoker?

(1)yes (2)no

In addition to these groups of questions, our questionnaire includes such groups of questions as eating habits, on job characteristics, education and family backgrounds, and exercise habits.

- Insurance claims data

For each worker, for each month, all insurance claims submitted by health care providers are summed separately for hospitalization costs, outpatient costs, dental care costs, and pharmacist costs. Total monthly health care costs are obtained as the sum of these four costs. Disease codes listed in the insurance claims have been recorded for hospitalization, physician visits and dentist

visits as possible covariates.

- Data Base

For our analysis, we have used the total monthly health care costs, and the total numbers of days of inpatient and outpatient services, and disease codes from the insurance claims data, and data from lifestyle survey questionnaire for each individuals. We have analyzed the health care costs data starting April 2000 and ending March 2005, but the survey on lifestyle was conducted during the month of July and August of 2005, later than the dates of health care costs. In spite of this time difference, in our econometric analysis, we have treated as if the survey information was contemporaneous to the cost information. We have believed that most of the information provided by the survey is very stable over time, not liable to change in a short-term, but obviously, this assumption has to be confirmed in our follow-up studies.

3 . Estimation of Self-Evaluated Health Function

As we have seen above, in our questionnaire, we have asked individuals to rate their own health in five categories, and stress in four categories. As to physical symptoms, own lifestyle diseases and those of parents, individuals are asked to select all that apply out of the provided lists.

In Table 1, we have shown the distribution of each class of SEH. As to smokers or

ex-smokers, it is well-known that their SEH are affected by smoking behavior. Hence, we have limited our analysis to non-smokers, excluding smokers and ex-smokers. Among the non-smokers, only 2% of the respondents chose “bad” as their own state of health, which is the lowest of the five ranks and only 5% chose “very good” which is the top rank. For the rest, 17% of the respondents chose “somewhat bad” which is the second lowest, 37% chose “not bad” which is the middle of the five, and 40% chose “good” which is the second highest. Thus “not bad” and “good” together account for almost 80% of the replies.

As to the replies on stress, “no stress” accounts for 4%, “weak” stress for 22%, “medium” stress for 58%, and “strong” stress for 17%. Furthermore, among those who replied feeling “strong” stress, two out of three agree to the statement that “in the last three years, my stress has increased substantially” (Table 2).

What are the factors that determine good individuals feel about their health? This is the first question we wanted to ask to ourselves. We have assumed our five categories of self-evaluated health represent the values of health status, ranging from 1 to 5, and regressed it over individual characteristics as sex and age, as well as the dummy-variables for the symptoms and life-style diseases, and the values of self-evaluated stress. We have tried several specifications, some of which are shown in Table 3.

According to the result, sex and age do not affect self-evaluation of health too much. While the

female workers report slightly lower values, and age seem to lower the evaluation, both coefficients are not statistically significant. As to the dummies of life-style diseases, stomach cancer (-1.26), alcoholism(-0.81), emphysema(-0.54), hyper-tension (-0.22) and stroke (-0.15) are the ones that lower the self-evaluation of health substantially. Other dummies of life-style diseases do not lower the self-evaluation, but, for some reason, the dummy for gout (0.89) is associated with higher evaluation. Thus while life-style diseases tend to lower the self-evaluation of health, the individuals in question are generally quite healthy workers, and the incidence of such diseases is very low (Table 4), and hence, they explain only several percentage points of the total variation in SEH.

Consequently, far more variation in SEH of the individuals comes from the difference in reported physical symptoms. Examples of such physical symptoms include pains in the joints(-0.27), lower-back pains(-0.22), itchiness, cold hands and feet, headaches, indigestion, stiff-shoulders(-0.14) clearly pull down SEH by 0.2 or less, but the numbness in arms and legs(-0.54) and lethargy(-0.45) are more than twice influential in lowering the SEH.

Another source of variation in SEH are our (self-evaluated) stress index. One unit of increase in the index reduced SEH by 0.3. Among the physical symptoms, only lethargy and numbness are more influential. Moreover, the magnitude of this coefficient is fairly stable across wide specifications (Table 3). In the table, we are treating the four levels of stress as numerical values of 1,2,3 and 4, and the validity of this assumption should be examined. In order to test it, we have

constructed three dummies for stage2 (weak), 3 and 4(strong), and used them in our estimation (equation 2). The two results are very similar. Hence, in what follows, we will be using numerical values for our stress index.

4 . Analysis of Effects of Self-Evaluated Health on Health Care Costs

4.1 The Model

To put it simply, we want to estimate an equation of the following form;

$$(1) \quad \log y_{jt} = \theta \log y_{jt-k} + \beta H_j + \xi_{jt}$$

Where y_{jt} is the j th individual's health care expenditure in the t _th month, y_{jt-k} is the value of the expenditure k months earlier, H_j is the value of self-evaluated health, and ξ_{jt} is the error terms. In general, SEH should change over time, but, in our analysis, we assume it has remained constant during the one-year period¹ under our analysis. We also fix the value of k at 11 in our estimation.

There are two potential problems when we try to estimate this equation from our data;

$$(a) \quad E[\text{cov}(H_j, \xi_{jt})] \neq 0$$

$$(b) \quad E[\text{cov}(\log y_{jt-k}, \xi_{jt})] \neq 0$$

In the first place, our condition (a) stands for the possible endogeneity problem of SEH in the

¹ We analyzed the health care costs starting April 2004 and ending xxxx 2005.

health care cost equation. As we have seen, SEH reflects various individual characteristics, some of which may share the error term ξ_{jt} . For example, an individual who has been suffering from a severe pain in some part of his body will rate his own health rather low, and he may seek medical treatment for the pain. In this case, in the health expenditure equation, SEH shares the same error term with the equation, making it an endogenous variable.

Secondly, our condition (b) stands for the possible endogeneity problem of the health care expenditure incurred k months ago. This can happen when there is a serial correlation in the error term of (1): someone who has a lifestyle disease usually has high $\log y_{jt-k}$ and high $\log y_{jt}$. This may not be very important because, clearly, the parameter of our interest is β in (1), and, as long as our estimate of β is not affected, we do not have to worry too much if θ may not be precisely estimated. Nevertheless, we try to solve this potential problem to provide our best estimate of equation (1).

The standard technique to solve these two endogeneity problems is to find good instruments. In particular, suppose we can find a vector (Π_j, X_j) which are independent from ξ_{jt} but correlated with H_j , and another vector (Π_j, Z_{jt-k}) which are independent from ξ_{jt} but correlated with c . Here Π_j denotes the common factors of the j th individual, while X_j and Z_{jt-k} do not share any common factor. Given these instruments, we can estimate our first stage equations for H_j and $\log y_{jt-k}$;

$$(2) H_j = \alpha_h' \Pi_j + \gamma' X_j + \delta_j$$

$$(3) \log y_{jt-k} = \alpha_y' \Pi_j + \omega' Z_{jt-k} + \lambda_{jt-k}$$

Then we can obtain fitted values of H_j and $\log y_{jt-k}$ in the second stage to obtain consistent estimates of θ and β .

4.2 Instruments and Identification

In order to test the appropriateness of our selection of instruments in this three equation system, we have conducted two separate tests; one for the two equation system of (1) and (2), and the other for (1) and (3).

- Excluded Instruments(X_j):

In equation (2), we decided to use the same explanatory variables as in our SEH equation, but we removed the lifestyle diseases from the instruments, as they are likely to be being treated, except alcoholism. For physical symptoms, we had to eliminate a number of them from the original list to pass the over-identification test. As a result, our list of excluded instruments consists of stress index, number of over-time work hours, blurred vision, headaches, lethargy, numbness, cold hands and feet, and alcoholism.

- Excluded instrument (Z_{jt-k})

We have decided to use the log of the health care cost of the previous month (i.e., 12 months

ago), and the disease dummy variables that satisfy the exogeneity conditions. For disease dummy variables to satisfy the exogeneity condition here implies that once (about 11 months ago) they were correlated with higher health care cost, but now they are not. In our sample, myocardial infarction, pneumonia, and ulcer of stomach and duodenum have passed the test.

- Common Instruments(Π_j)

In addition to sex (female) and 10-year age class of the individual workers, we have used the habit of washing hands and gargling, frequency of teeth-brushing, salary classes, regular employment dummy, work classification dummies, hypertension, diabetes, colon cancer, stomach cancer, gout, and osteoporosis. In addition, we have used all lifestyle disease dummies of parents, highest education dummies, and spouse work dummies.

4.3 The Test Results of Over-Identification and Hetero-Schedasticity

First we present the estimated coefficients of our two stage least squares for each system in Table 5A and 5B. In Table 5A, where we show the result of (modified) two equation system of (1) and (2), the coefficient of SEH is minus 0.360, meaning that one stage improvement in SEH reduces the health care costs by 36 percent. The J statistics of the null hypothesis of over-identification ($df=7$) is 8.02 with p-value of 0.330, and we cannot reject the hypothesis that all excluded instruments are independent. In Table 5B, where we show the result of (modified) two equation system of (1) and

(3), the coefficient of health care cost of 11 months ago is 0.559. The J-statistics of the null hypothesis (df=3) is 2.26 with p-value of 0.527, and we cannot reject the hypothesis that all excluded instruments are independent.

In both of these estimations, as Pagan/Hall test indicated the existence of strong heterogeneity, we are reporting the results of robust estimates for standard errors. The J-statistics, however, have changed very little in either of the two systems.

4.4 Three Stage Least Square Estimation

In Table 6, we have shown the result of three-stage least square estimation of our three simultaneous equation system. The same instruments are used for this estimation. According to this table, in the health care cost equation, the coefficient of SEH is minus 0.398, the coefficient of the health care costs 11 months ago is 0.61. In the SEH equation, the stress index has a coefficient of minus 0.316. By and large, these coefficients are of the same order of magnitude as those obtained by 2SLS estimation..

5 . Concluding Remarks

In this paper, first, we have explored what factors determine the self-evaluation of health of Japanese workers. We have seen that sex and age do not affect the self-evaluation, but lifestyle diseases such as hypertension, stomach cancer, stroke and alcoholism lower it considerably.

However, in the group of healthy workers, physical symptoms such as shoulders, lower-back pains, lethargy, numbness of hands and feet are far more important factors to account for the variation of self-evaluated health.

Secondly, we have established that mental stress is the most important factor to explain the interpersonal variation of self-evaluated health. The coefficient of the stress index is around -0.3 in the SEH equation, which is much smaller than those of the life-style diseases, but the prevalence of higher values of stress is far greater than those of lifestyle diseases for the healthy workers.

Thirdly, we have shown that SEH affects the health care costs very substantially, even after we take care of the endogeneity of SEH in the health care costs equation. If an individual's SEH is rated one stage higher, his health care costs are expected to decrease almost by 30%. Thus those who reported their health as "good" (the highest rank) spend only 40% of health care costs of those who report their health as "not good" (the third rank), other things being equal.

Fourthly, a unit increase in our stress index is expected to increase health care cost by almost 10 %, which is not a negligible quantity. We do not yet know if this increase is a temporary increase, or a permanent one due to new cases of diseases or due to deterioration of existing cases. Repeated future surveys on our sample will be expected to clarify this question too.

Traditionally, the Japanese health care system has focused mostly on physiological changes in patients and provided quality treatments for them. In the process, psychological stress, or even

depression, has not been adequately taken care of. Large number of suicides in economic hard times of the last decade is a sign of such deficiency. Some large firms are reported to have psychiatrist's or psychologist's service available in their clinic for their employees, and our analysis here indicates that such attempts may be effective even in controlling the health care costs. Recent studies on elderly people indicate that their self evaluated health is greatly affected by depression. We should reexamine the resource allocation in our health care system to see if we are providing sufficient psychological treatments to these patients as well.

References

- Affleck, G., H. Tennen, S. Urrows and P. Higgins (1994) Person and Contextual Features of Daily Stress Reactivity: Individual Differences in Relations of Undesirable Daily Events with Mood Disturbance and Chronic Pain Intensity, *Journal of Personality and Social Psychology*, 66, pp.329-340.
- Brody, D.S. (1980) Psychological Distress and Hypertension Control, *Journal of Human Stress*, 6, pp.2-6.
- Clark, L.F., A. Aaron, M. Littleton, K. Pappas-Deluca, J. B. Avery and V. S. McKleroy (1999) Stress, Coping, Social Support, and Illness, in J.M. Raczynski and R.J. DiClemente (eds.), *Handbook of Health Promotion and Disease Prevention*, Kluwer Academic / Plenum

PubliSEHrs, pp.123-145.

Denollet, J., S.U. Sys and D.L. Brutsaert (1995) Personality and Mortality after Myocardial Infarction, *Psychosomatic Medicine*, 57, pp.582-591.

Ferraro, K.F. and M.M. Farmer (1999) Utility of Health Data from Social Surveys: Is There a Gold Standard for Measuring Morbidity? *American Sociological Review*, 64, pp.303-315.

Groot, W. (2000) Adaptation and Scale of Reference Bias in Self-Assessments of Quality of Life, *Journal of Health Economics*, 19(3), pp.403-420.

Haberman, P. (1969) The Reliability and Validity of the Data, in Kosa, Antonovsky and Zola (eds.), *Poverty and Health*, Harvard University Press. pp.343-383.

Hirdes, J.P. and W.F. Forbes (1993) Factors Associated with the Maintenance of Good Self-Related Health, *Journal of Aging and Health*, 5(1), pp.101-122.

Hoeymans et al. (1997), Ageing and the relationship between functional status and self-rated health in elderly men, *Social Science and Medicine*, 45(10), pp.1465-1603.

Honda, C. and Y. Ohkusa (2003), Subjective Health Evaluation: Advanced Model and International Comparison, *Japanese Journal of Social Security Policy*, 2(1), pp.24-31.

Idler, E.L. (1993), Age Differences in Self-Assessments of Health: Age Changes, Cohort Differences, or Survivorship? *Journal of Gerontology: Social Sciences*, 48, pp.S289-300.

Idler E.L., and Y. Benyamini (1997), Self-Rated Health and Mortality: A Review of Twenty-Seven

Community Studies, *Journal of Health and Social Behavior*, 38, pp.21-37.

Kaplan, G.A. and T. Camacho (1983), Perceived Health and Mortality: A Nine-Year Follow-Up of the Human Population Laboratory Cohort, *American Journal of Epidemiology*, 117, pp.292-304.

Liu, G. and Z. Zhang (2004), Sociodemographic Differentials of the Self-Related Health of the Oldest-Old Chinese, *Population Research and Policy Review*, 23, pp.117-133.

Maddox, G.L. and E.B. Douglass (1973), Self-Assessment of Health: A Longitudinal Study of Elderly Subjects, *Journal of Health and Social Behavior*, 14(1), pp.87-93.

Mechanic, D. and R.J. Angel (1987), Some Factors Associated with the Report and Evaluation of Back Pain, *Journal of Health and Social Behavior*, 28, pp.131-139.

Ogura, S. (2006), Sutoresu, Kenko no JikoHyoka to Iryohi no Kankei nit suite (in Japanese: On the Relationship between Stress, Self-Evaluated Health and Health Care Costs), *Japanese Journal of Health Economics and Policy Vol 18*, 2006.

Schnittker, J. (2005), When Mental Health BecomeSEHealth: Age and the Shifting Meaning of Self-Evaluations of General Health, *Milbank Quarterly*, 83(3), pp.397-423.

Simon, J.G, H. van de Mheen and J.B.W. van der Meer (2000), Socioeconomic Differences in Self-Assesed Health in a Chronically Ill Population: The Role of Different Health Aspects, *Journal of Behavioral Medicine*, 23(5), pp.399-420.

- Spangler, J.G., J.C. Konen, and K.P. McGann (1993), "Prevalence and Predictors of Problem Drinking among Primary Care Diabetic Patients" *Journal of Family Practice*, 37, 370-375.
- Stein, M. and A.H. Miller (1993) Stress, "The Immune System, and Health and Illness, in L. Goldberger and S. Breznitz" (eds.), *Handbook of Stress: Theoretical and Clinical Aspects* (2nd ed., pp.127-141), New York: Free Press.
- Suls, J., C.A. Marco and S. Tobin (1991), "The Role of Temporal Comparison, Social Comparison, and Direct Appraisal in the Elderly's Self-Evaluations of Health, " *Journal of Applied Social Psychology*, 21, pp.1125-1144.
- Wood, J.V., S.E. Taylor and R.R. Lichtman (1985), "Social Comparison in Adjustment to Breast Cancer", *Journal of Personality and Social Psychology*, 49, pp.1169-1183.