

Self-rated Health and Its Indicators: A Case of the 2001 Korean National Health and Nutrition Examination Survey

Byung Chul Ahn,¹⁾ Hyojee Joung^{2)†}

*School of Economics and Finance,¹⁾ Yeungnam University, Gyeongsan, Korea
Graduate School of Public Health & Institute of Health and Environment,²⁾ Seoul National University, Seoul, Korea*

ABSTRACT

There were numerous evidences that subjective health evaluation was a powerful indicator for morbidity and mortality in many countries. Since self-rated health (SRH) was a reasonable health measure, identifying predictors for SRH would be beneficial for assessment of overall health, monitoring health status, and development of health promotion programs. Health risks, health behavior, socioeconomic characteristics and social capital were potential indicators for SRH. We examined association between SRH and indicators such as health risk factors, subjective living condition, income, education level and dietary variety score. Total 4,262 subjects, aged between 20 and 69 years old, were selected from KNHANES 2001; those who completed health examination, nutrition survey, and provided their socioeconomic information. Results of logistic regression showed that it was likely to have better SRH for those who were younger, male and have higher education, higher income, better living condition, no metabolic syndrome and higher dietary variety. (*J Community Nutrition* 8(1): 38~43, 2006)

KEY WORDS : self-rated health · health risk factor · socioeconomic indicator · logistic regression.

Introduction

Health outcomes are associated with a variety of intermediate indicators; health eating, health risks such as obesity, health behavior, and community characteristics. Socioeconomic factors such as household income and education level are considered as strong predictors for health outcomes as well.

Since evaluation of objective health status at a national level is too costly, an alternative way of health assessment is to use self-rated health (SRH) as a proxy for health status in large scale surveys. SRH method has its own benefits of being fast, easy and cheap to obtain. SRH is indeed associated with objective health status. Functional disability and SRH were recognized as important health indicators in older persons. SRH was strongly associated with morbidities, de-

pressive symptoms, hospitalization and functional disability (Lee, Shinkai 2003) and also associated with physical health status and sensitive to chronic disease (Shadbolt 1997). Perceived health status and physical fitness were inversely related (Miilunpalo et al. 1997).

Furthermore, SRH was associated with mortality for some groups (Idler, Angel 1990; Miilunpalo et al. 1997). SRH was found to be strong predictors of mortality in Swedish elderly people aged 77 years and more (Manderbacka et al. 2003), and in people with older onset diabetes (Dasbach et al. 1994). In older Australians, better SRH had an incremental association with survival for women, but men with poor SRH had worse survival (McCallum et al. 1994).

However, the association of SRH and mortality could be different to different social groups. SRH exhibited differential socio-demographic relationships in the US; lower SES and being black are associated with lower reported health status and higher mortality; women reported lower health status but exhibited lower mortality (Franks et al. 2003).

Given strong association between SRH and health status such as morbidity and mortality, SRH could be used for as-

† Corresponding author: Hyojee Joung, Graduate School of Public Health & Institute of Health and Environment, Seoul National University, 28 Yungun-dong, Chongro-gu, Seoul 110-799, Korea
Tel: (02) 740-8865, Fax: (02) 762-9105
E-mail: hjjoung@snu.ac.kr

assessment of and in monitoring health status (Miilunpalo et al. 1997). Therefore, it would be helpful to identify determinants of SRH for assessment of overall health, health monitor, and health promotion.

Even though there were many reports on the various aspects of self-rated health for many countries and communities, reports for the case of Korea were limited. In this paper, we attempted to identify predictors of self-rated health for the Korean population.

Materials and Methods

1. Data

The Korean National Health and Nutrition Examination Survey (KNHANES), a comprehensive and representative survey of the country's population, is conducted every three years. The KNHANES in 2001 included 37,769 individuals from 12,183 households across the country, selected through stratified random sampling. General information was collected by a face-to-face interview. Trained dietitians interviewed 9,968 subjects from 3,398 households for dietary intakes using one single 24-hour recall. For the purpose of our study, we analyzed data from 4,262 subjects those who aged between 20 and 69 years old, successfully completed health examination and nutrition survey, and provided their socioeconomic information.

2. Household income and living cost

Respondents were asked to report monthly household income and living cost of all household members. For all cases, income and expenditure was per capita.

3. Self-rated health

Subjects were asked to evaluate his or her health status in a 5 digit scale; very good, good, fair, bad and very bad. In logistic regression, SRH was grouped into three categories; good (very good included), fair and bad (very bad included).

4. Health risks and metabolic syndrome

Health risks considered were 1) waist circumference > 102cm for male and > 88cm for female, 2) triglycerides ≥ 150 mg/dl, 3) HDL cholesterol < 40mg/dl for male and < 50 mg/dl for female, 4) systolic blood pressure ≥ 130 mmHg or diastolic blood pressure > 85mmHg, 5) fasting glucose ≥ 110 mg/dl. Patients diagnosed by physicians were treated to have relevant risk factors accordingly. Subjects

were identified to have metabolic syndrome when three or more risk factors were present (NCEP 2004).

5. Subjective living condition

Subjects were asked to evaluate his or her living condition in 5 categories: very good, good, fair, bad and very bad. Living condition was regrouped into three; 'higher' (including 'very good' and 'good'), 'average' and 'lower' (including 'bad' and 'very bad'). In logistic regression analysis, it was grouped into two: 'higher' and 'average' (including 'lower').

6. Diet variety score

Variety score was calculated as the number of consumed food items a day from the 24 hour recall data.

7. Statistical analysis

To obtain representative estimation, we adjusted sampling weight accordingly and incorporated stratified sampling design for statistical inferences. Standard errors were calculated based on sampling design method provided by appropriate SAS survey procedures. Cross tabulation, weighted mean and logistic regression were carried using SAS 9.1 (SAS Institute Inc., Cary, NC, USA). Whenever applied, reference cate-

Table 1. General characteristics of study population

		Mean(%)	SE	
Age		42.9	0.31	
Income group	$\leq 1.5^{1)}$	46.0	1.76	
	> 1.5	54.0	1.76	
Education	≤ 12 year	70.6	1.40	
	> 12 year	29.4	1.40	
Gender	Male	40.7	0.66	
	Female	59.3	0.66	
Metabolic	No	82.4	0.84	
	Yes	17.6	0.84	
		Subjective living condition (%)		
		Higher	Average	Lower
Income***	$\leq 1.5^{1)}$	1.26	50.83	47.91
	> 1.5	10.85	72.24	16.91
Insurance***	Firm	8.11	67.09	24.80
	Local	4.74	57.61	37.65
		Self-rated health (%)		
		Good	Fair	Bad
Gender***	Male	53.14	33.57	13.29
	Female	47.51	34.98	17.51
Education***	≤ 12 year	42.65	36.95	20.41
	> 12 year	67.02	28.26	4.73

1) Unit: million Korean Won. ***: statistically significant at $p < 0.001$

gories were higher education (> 12years), 'bad' or 'lower' living condition, female, presence of metabolic syndrome and 'bad' SRH.

Results

General characteristics of the study population were summarized in Table 1. Mean age was 42.9 ± 0.31 (SE, year). When grouped by household income, 54% belonged to higher income group (> 1.5million Won) and remaining 46% to lower income group. About 30% had higher education (> 12years). Among the population, 49.4% were holders of local health insurance (medical care included) and 50.6% were through employment (government employee included).

The prevalence of metabolic syndrome was estimated as 17.6%. As for subjective evaluation on living condition, the percentage of subjects answered good, middle and lower living condition were 6.4%, 62.4% and 31.2%, respectively. The shares of good health (including very good health), fair health and bad health (including very bad) were 49.8%, 34.4% and 15.8%, respectively.

Summary measures of a few indicators across subjective living conditions were given in Table 2. The better living conditions one had, the higher per capita income, more diverse food intake and higher education level. Average income for 'higher' and 'average' living condition groups were 2.4 times and 1.5 times higher compared to 'lower' living condition group, respectively. Living cost for those groups were also 1.9 and 1.3 times higher than 'lower' living condition group, respectively.

Fig. 1 showed gender difference in SRH. Males tended to evaluate themselves healthier than female did ($p < 0.001$). The share of (very) good health was higher among the male than female subjects and the share of ill health were higher among female than male counterparts.

Fig. 2 compared SRH and number of risk factors described under metabolic syndrome. It appeared that people judged their own health pessimistically. The percentage of those who had less than or equal to one risk factor was 59.4%, whereas the percentage of very good SRH was only 4.9%. Subjects with less than or equal to two risk factors was 82.4% whereas SRH with 'very good' and 'good' health was only 49.8%.

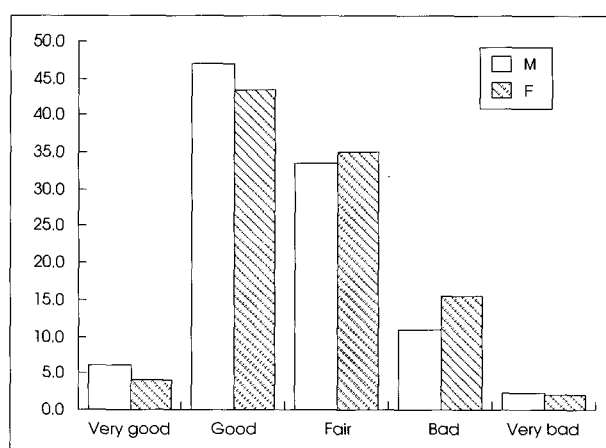


Fig. 1. Distribution of self-rated health status by gender (%).

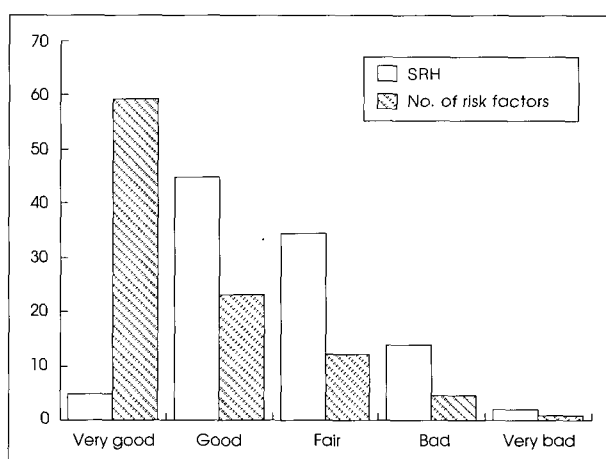


Fig. 2. Self-rated health status and the number of health risk factors (%). 1) Number of health risk runs from 1 to 5. The cases of zero risk factor were included in the first group.

Table 2. Mean value of income and others across living condition

	Subjective living conditions			
	Higher	Average	Lower	All
Income ^{1)***}	95.8(5.0)	62.7(1.40)	40.7(1.21)	58.0(1.31)
Living cost ^{1)***}	56.8(3.27)	40.0(0.86)	30.2(0.9)	38.1(0.82)
Dietary variety ^{***}	28.7(0.86)	27.3(0.3)	23.6(0.41)	26.2(0.27)
Education ≤ 12 year ^{2)***}	48.1(4.62)	65.7(1.58)	85.4(1.51)	70.6(1.4)
Education > 12 year ^{2)***}	51.9(4.62)	34.3(1.58)	14.6(1.51)	29.4(1.4)

1) Unit: 10,000 Korean Won (US\$1=1,000 Won). 2) Unit: %. () denotes standard error of the estimates. ***: significant at $p < 0.001$ (Chi-squares for education, ANOVA for all others)

Fig. 3 showed the prevalence of metabolic syndrome among SRH categories. Prevalence was higher for 'bad' SRH. Subjective living condition and subjective health status were compared in Fig. 4. The better the subjective living condition was, the better SRH was. The percentage of subjects answered 'good' health was the largest among the 'higher' living condition group and it became smaller as living condition worsened ($p < 0.001$).

The logistic regression results were given in Table 3. Dependent variables were dietary variety (binary variable: variety > 26 vs. variety ≤ 26) and SRH. In regression for dietary variety, independent variables were age, education, income, living condition, and gender. Older, higher educa-

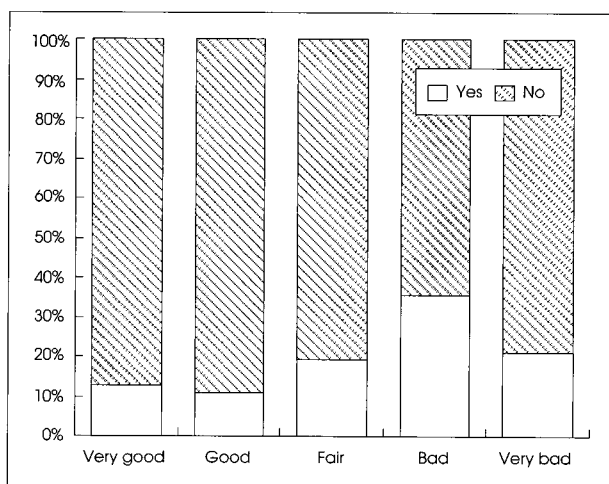


Fig. 3. Share of metabolic syndrome among each self-rated health.

tion and better living condition favored more dietary variety. In logistic regression analysis for SRH, metabolic syndrome (binary variable) and dietary variety (continuous variable) were added. All odd ratios were significantly different from 1. Higher education, higher income and better living condition showed odds in favor of better health. Furthermore, absence of metabolic syndrome and variety of food intake showed odds in favor of better health.

Discussion

Health outcomes are products of various factors: what people eat, what people do, where people live and what people value. Thus, health outcomes are highly associated with many intermediate indicators; biological markers such as

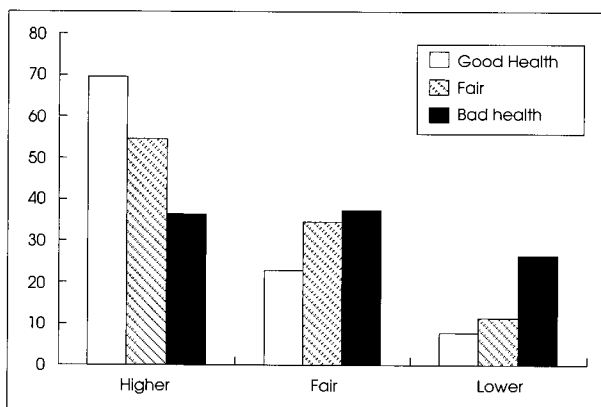


Fig. 4. Self-rated health status and subjective evaluation of living condition.

Table 3. Estimates of logistic regression of dietary variety and SRH

Dietary variety ¹⁾	Reference	Estimates	SE	OR ²⁾	95% ²⁾	
Age ^{***}		-0.02	0.00	0.98	0.97	0.98
Education ^{**}	> 12year	-0.17	0.05	0.71	0.58	0.88
Income ^{4)***}		0.07	0.01	1.07	1.04	1.10
Living ^{5)***}	Average	0.19	0.05	1.47	1.21	1.79
Gender ^{***}	Female	0.17	0.04	1.40	1.20	1.64
Self-rated health						
Age ^{***}		-0.04	0.00	0.96	0.95	0.97
Gender ^{**}	Female	0.13	0.04	1.31	1.14	1.50
Education ^{**}	> 12year	-0.17	0.05	0.71	0.59	0.86
Income ^{4)**}		0.04	0.01	1.04	1.01	1.07
Living ^{5)***}	Average	0.30	0.05	1.81	1.51	2.16
Metabolic ^{***}	Yes	0.24	0.05	1.63	1.35	1.97
Diet variety ^{3)***}		0.02	0.00	1.02	1.01	1.03

1) Binary variable: variety > 26 vs. variety ≤ 26 . 2) Odds ratio and its 95% confidence interval, 3) Continuous variable, 4) unit: 100,000 Korean Won, 5) Binary variable: higher living condition and average living condition (lower living included). ***: significant at $p < 0.001$. **: significant at $p < 0.01$, *: significant at $p < 0.05$

obesity and blood pressure, behavioral factors such as smoking, alcohol consumption, sedentary life style, occupational characteristics, and so on.

Self-rated health status could be a useful measurement for the assessment of health status in the large scale survey. In the present study, we analyzed the association of self-rated health and objective health status based on the risk factors of metabolic syndrome in addition to determinants of self-rated health.

There were various reports on determinants of or predictors for SRH. First, age and gender were predictors for SRH. The older and female tended to have poor SRH in China (Lui, Zhang 2004), Ireland (Kelleher et al. 2003), and Japan and Korea (Lee, Shinkai 2003). Second, health risk factors were associated with SRH. More obese people and smokers were found in lower classes, and an association between social class and worsening of SRH was observed: The lower the social class, the higher the proportion with deterioration of SRH (Borg, Kristensen 2000). Third, socioeconomic indicators were linked to SRH. Measures of actual absolute socio-economic status (SES; household income, personal income and education) were strongly related to SRH (Dunn et al. 2006). Elderly with lower social status tended to evaluate health negatively (Liu, Zhang 2004). Other factors were marital status, household size and eligibility for general medical service (Kelleher et al. 2003). The effects of SES on SRH were also evidenced in Russia (Nicholson et al. 2005) and Estonia (Leinsalu 2002) as well. Fourth, occupational characteristics were also significant factors that affected health status. SRH was inversely associated with employment status (manual to non-manual) in urban Japanese men and women (Nishi et al. 2004). Number of factors related to work environment such as repetitive work, high psychological demands, low social support, high job insecurity, and high ergonomic exposures were identified as worsening factors of health status (Borg et al. 2000; Borg, Kristensen 2000). Fifth, in addition to measures of actual absolute socio-economic status, perceived SES was a strong predictor of SRH. Subjective SES was significantly related to education, household income, occupation and SRH for most groups (Ostrove et al. 2000). Emotional distress (Leinsalu 2002) and both psychosocial and neo-material aspects of SES (Dunn et al. 2006) could be important for self-rated health. The results were consistent with our results since our 'subjective living condition' was a reflection of perceived and psychosocial

aspect of SES. Sixth, neighborhood social and physical characteristics influence on individual health outcomes as well. Association between neighborhood socioeconomic context and health was observed in London and Helsinki (Stafford et al. 2004). Increase in income inequality appeared to cause worsening poor SRH in the US (Lopez 2004). Hence, connecting individual health to their macro socioeconomic context may be necessary (Subramanian et al. 2001).

The results of the present study supported the previous reports. This study showed that SRH was significantly associated with age, education, income, living condition, gender, presence of metabolic syndrome and dietary variety. Those who had a higher education, higher income, better living condition and fewer health risks and variety of food intake showed better health among Korean adults.

We could observe close association between subjective evaluation of living condition and both of income and expenditure. Those who answered better living conditions tended to earn more and consume more. It was also true that better living conditions were positively linked with higher education (Table 2). Hence, better living condition could be an indicator of more economic resources, better knowledge and better health. Frank et al. (2003) reported that greater education and greater income were associated with better health.

Therefore it could be possible for one with better living condition to equip with healthier environment than the one with worse living conditions. The higher the subjects' living condition was, the more resources of various types would be available: better foods, healthier dietary practice, better education and healthier environment and so on.

Given that various measures of SRH could be good indicators for objective health status, further research regarding predictive validity of SRH would be desired. In addition, considering current health status was a reflection of social exposures accumulated over the life course, life course approach would enhance deeper understanding of the underlying interactions between health and its predictors (Nicholson et al. 2005).

Summary and Conclusion

Present study showed that determinants of self-rated health would be socioeconomic factors (education, income, living condition), biological factors (age, gender), health status

(risk factors of metabolic syndrome) and behavioral factors (dietary behaviors). Among Korean adults, those who were younger, male, and had higher education, higher income, better living condition, no metabolic syndrome and higher dietary variety were likely to have better SRH. In addition, SRH could be used as a proxy for overall health status and potential candidate for monitoring national health status.

References

- Borg V, Kristensen TS, Burr H (2000): Work environment and changes in self-rated health: a five year follow-up study. *Stress Medicine* 16(1): 37-47
- Borg V, Kristensen TS (2000): Social class and self-rated health: can the gradient be explained by differences in life style or work environment? *Social Science & Medicine* 51 (7): 1019-1030
- Dasbach EJ, Klein R, Klein BEK, Moss SE (1994): Self-rated health and mortality in people with diabetes. *American Journal of Public Health* 84(11): 1775-1779
- Dunn JR, Veenstra G, Ross N (2006): Psychosocial and neo-material dimensions of SES and health revisited: Predictors of self-rated health in a Canadian national survey. *Social Science & Medicine* 62 (6): 1465-1473
- Franks P, Gold MR, Fiscella K (2003): Sociodemographics, self-rated health, and mortality in the US. *Social Science & Medicine* 56(12): 2505-2514
- Idler EL, Angel RJ (1990): Self-rated Health and Mortality in the NHANES-I Epidemiologic Follow-Up Study. *American Journal of Public Health* 80 (4): 446
- Kelleher CC, Friel S, Nic Gabhainn S, Tay JB (2003): Socio-demographic predictors of self-rated health in the Republic of Ireland: findings from the National Survey on Lifestyle, Attitudes and Nutrition, SLAN. *Social Science & Medicine* 57(3): 477-486
- Lee Y, Shinkai S (2003): A comparison of correlates of self-rated health and functional disability of older persons in the Far East: Japan and Korea. *Archives of Gerontology and Geriatrics* 37 (1): 63-76
- Leinsalu M (2002): Social variation in self-rated health in Estonia: a cross-sectional study. *Social Science & Medicine* 55(5): 847-861
- Liu G, Zhang Z (2004): Sociodemographic Differentials of the self-rated health of the Oldest-old Chinese. *Population Research and Policy Review* 23 (2): 117-133
- Lopez R (2004): Income inequality and self-rated health in US metropolitan areas: A multi-level analysis. *Social Science & Medicine* 59(12): 2409-2419
- Manderbacka K, Kareholt I, Martikainen P, Lundberg O (2003): The effect of point of reference on the association between self-rated health and mortality. *Social Science & Medicine* 56 (7): 1447-1452
- McCallum J, Shadbolt B, Dong W (1994): Self-rated Health and Survival: A 7-year follow-up of Australian elderly. *American Journal of Public Health* 84 (7): 1100-1105
- Miilunpalo S, Vuori I, Oja P, Pasanen M, Urponen H (1997): Self-rated health status as a health measure: The predictive value of self-reported health status on the use of physician services and on mortality in the working-age population. *Journal of Clinical Epidemiology* 50 (5): 517-528
- National Cholesterol Education Program (2004): Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Executive Summary. Available at: <http://www.nhlbi.nih.gov/guidelines/cholesterol/atp3xsum.pdf>
- Nicholson A, Bobak M, Murphy M, Rose R, Marmot M (2005): Socio-economic influences on self-rated health in Russian men and women—a life course approach. *Social Science & Medicine* 61 (11): 2345-2354
- Nishi N, Makino K, Fukuda H, Tataru K (2004): Effects of socio-economic indicators on coronary risk factors, self-rated health and psychological well-being among urban Japanese civil servants. *Social Science & Medicine* 58 (6): 1159-1170
- Ostrove JM, Adler NE, Kuppermann M, Washington AE (2000): Objective and Subjective Assessments of Socioeconomic Status and Their Relationship to self-rated health in an Ethnically Diverse Sample of Pregnant Women. *Health Psychology* 19 (6): 613-618
- Shadbolt B (1997): Some correlates of self-rated health for Australian women. *American Journal of Public Health* 87(6): 951-956
- Stafford M, Martikainen P, Lahelma E, Marmot M (2004): Neighborhoods and self rated health: a comparison of public sector employees in London and Helsinki. *J Epidemiol Community Health* 58: 772-778
- Subramanian SV, Kawachi I, Kennedy BP (2001): Does the state you live in make a difference? Multilevel analysis of self-rated health in the US. *Social Science & Medicine* 53 (1): 9-19