



TITLE:

Subjective social status and trajectories of self-rated health status: a comparative analysis of Japan and the United States

AUTHOR(S):

Takahashi, Yoshimitsu; Fujiwara, Takeo;
Nakayama, Takeo; Kawachi, Ichiro

CITATION:

Takahashi, Yoshimitsu ...[et al]. Subjective social status and trajectories of self-rated health status: a comparative analysis of Japan and the United States. *Journal of Public Health* 2018, 40(4): 713-720

ISSUE DATE:

2018-12

URL:

<http://hdl.handle.net/2433/267209>

RIGHT:

This is a pre-copyedited, author-produced version of an article accepted for publication in *Journal of Public Health* following peer review. The version of record [Yoshimitsu Takahashi, Takeo Fujiwara, Takeo Nakayama, Ichiro Kawachi, Subjective social status and trajectories of self-rated health status: a comparative analysis of Japan and the United States, *Journal of Public Health*, Volume 40, Issue 4, December 2018, Pages 713-720] is available online at: <https://doi.org/10.1093/pubmed/fox158>; This is not the published version. Please cite only the published version. この論文は出版社版ではありません。引用の際には出版社版をご確認ご利用ください。

Subjective social status and trajectories of self-rated health status: A comparative analysis of Japan and the United States.

Yoshimitsu Takahashi, DrPH, Associate Professor [1] [2], y-takahashi@umin.ac.jp

Takeo Fujiwara, MD, MPH, PhD, Professor [3], fujiiwara.hlth@tmd.ac.jp

Takeo Nakayama, MD, PhD, Professor [1], nakayama.takeo.4a@kyoto-u.ac.jp

Ichiro Kawachi, MD, PhD, Professor [2], ikawachi@hsph.harvard.edu

[1] Department of Health Informatics, Kyoto University School of Public Health, Kyoto, JAPAN.

[2] Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Boston, MA, USA.

[3] Department of Global Health Promotion, Tokyo Medical and Dental University, Tokyo, JAPAN.

Corresponding author

Yoshimitsu Takahashi, DrPH.

Associate Professor,

Department of Health Informatics, Kyoto University School of Public Health.

Yoshida-Konoe, Sakyo, Kyoto, 606-8501, JAPAN.

Tel: +81-75-753-9477; FAX: +81-75-753-9478

e-mail: y-takahashi@umin.ac.jp

ABSTRACT

[Background]

Japanese society is more egalitarian than the United States as is reflected by the lower degree of prevalence of social inequalities in health. We examined whether subjective socioeconomic status is associated with different trajectories of self-rated health, and whether this relationship differs between the United States and Japan.

[Methods]

We analyzed the responses of 3,968 Americans from the survey Midlife in the United States, 2004–2006, and the responses of 989 Japanese from the survey Midlife in Japan, 2008. We conducted a multilevel analysis with three self-ratings of health (10 years ago, current, and 10 years in the future) nested within individuals and nested within ten levels of subjective social status. Age, sex, educational level, and subjective financial situation were adjusted.

[Results]

After making statistical adjustments for confounding variables, respondents in Japan continued to report lower average levels of health. However, the rate of expected decline in self-rated health over the next decade was strongly socially patterned in the United States, whereas it was not in Japan.

[Conclusion]

The Japanese showed no disparity in the anticipated trajectory of self-rated health over time, whereas the Americans showed a strong social class gradient in future trajectories of self-rated health.

Keywords

Social Class; Health Status; Japan; United States

MAIN TEXT

INTRODUCTION

Self-rated health status and social class

Self-rated health (SRH) status is a robust predictor of future morbidity, mortality, and other health outcomes [1–8]. Self-rated health has also been effectively used in studies to document social inequalities in health [9–10]. Studies consistently indicate that self-rated health varies according to social class or socioeconomic status (SES), indexed by constructs such as educational attainment or income [11–16]. However, self-rated health status is influenced by individual and societal factors that may differ between countries or according to the cultural context [7, 17]. For example, Amartya Sen indicated that while India’s Kerala region enjoys the highest level of longevity in the country, they also report lower levels of self-rated health compared to the rest of the nation [18, 19]. Japan currently enjoys one of the highest levels of average life expectancy in the world, as well as comparatively low levels of health inequality than other developed nations [20, 21]. However, the Japanese have been previously noted for their comparatively low levels of self-rated health [22]. Conversely, Americans have one of the lowest levels of life expectancy of the countries in the Organization for Economic Co-operation and Development (OECD); yet, their levels of self-rated health are one of the few health indicators on which they rank above other nations [23]. In the present study, we sought to provide a cross-national comparison between the trajectories of self-rated health in Japan and the United States, two countries having the highest and one of the lowest average life expectancies in the OECD.

Trajectories of health

Health, particularly functional health, declines with age [24]; thus, a sense of trend or change in symptoms over time was the subjective trajectory of health [4]. Self-rated health is also recognized as a consistent predictor of functional health decline [6]. Health and quality of life are expected to decline over time, but the rate of decline over the course of life varies among individuals and social groups [17, 25]. We sought to characterize differential trajectories of self-rated health according to the levels of subjective social status (SSS).

Subjective social status and health

Socioeconomic status (SES) has been measured both objectively (using such indicators as educational attainment and income) as well as using subjective perceptions, e.g., asking respondents to rate themselves on an imaginary hierarchical “ladder” in which the topmost rungs represent individuals with the highest levels of wealth, status, and prestige. Increasing evidence suggests that SSS predicts health status above and beyond objective SES, i.e., even after controlling for income and education, SSS remains associated with various health outcomes [16, 26–30].

SSS and health trajectories

Focusing on self-rated health trajectories, existing literature on the relationship between SSS and trajectories is limited. The self-rated health over age by lifetime SES declined, and lifetime SES was associated with poor late-life health in the Mexican longitudinal study [31]. A Swedish longitudinal survey showed that self-rated health trajectories slowly declined over time, and the rate of change was influenced by age and sex, with older people and women showing a slower rate [32]. Although several studies examined the relationship between SES and health trajectories, little is known about the relationship between the disparity of SSS and self-rated health status in some countries. We hypothesize that there is a disparity of self-rated health trajectories and difference in the steepness of self-rated health trajectories among SSS in each country. Therefore, we aimed to characterize the relationship between subjective social status (SSS) and trajectories of self-rated health status in Japan and the United States.

METHODS

Study participants and settings

We analyzed two large-scale cross-sectional studies in the United States and Japan. The survey used for the United States, the second wave of the Midlife in the United States (MIDUS II) survey, was conducted in 2004–2006 as a longitudinal follow-up of the first national survey of Midlife in the United States (MIDUS I), conducted in 1995–1996. MIDUS I was based on a nationally representative random-digit-dial sample of noninstitutionalized, English-speaking adults, aged 25 to 74, the number of respondents for which was 7,108. The number of respondents for

MIDUS II was 4,963, and 4,032 people completed a self-administered questionnaire survey (response rate for complete MIDUS II data adjusting for mortality was 60.8%). The survey used for Japan, the Midlife in Japan (MIDJA) survey, was modeled after the MIDUS I and II studies and was conducted in April–September 2008. The sample in MIDJA was selected from the Basic Resident Register Book for the Tokyo metropolitan area (23 wards), via two-stage stratified random sampling. Within each ward, five groups were created based on age (30–39, 40–49, 50–59, 60–69, and 70–79 years) and stratified by sex. Thus, 10 strata, based on sex and age were created. For each strata a total of 100 samples were allotted and proportionally distributed among each ward based on the number of registered residents. The number of respondents for MIDJA was 1,027 (response rate was 56.2%). The response rate of MIDJA was somewhat low. According to the description of the MIDJA study, males aged 40–49 years do not respond and this is one of the major reasons for uncollected data [33]. However, each strata had > 100 people according to the sampling method, and the selection bias might be limited. We conducted cross-sectional and secondary data analysis using MIDUS II and MIDJA data [16, 31].

Measurements

MIDUS I and II included information on respondent characteristics, physical and mental health, well-being, and lifestyles. Most survey items in MIDJA were translated into Japanese from the items of MIDUS I and II. Thus, all the measures from MIDUS II and MIDJA that we used in this study were directly comparable.

Self-rated health status. The study's main outcome was self-rated health, assessed by each respondent across three different time-points: the present, past, and future. Respondents rated their current health through the question “how would you rate your health these days?” from 0 (the worst possible health) to 10 (the best possible health). Respondents also rated their health statuses 10 years in the past, as well as looking ahead 10 years into the future (i.e., future prediction). Idler et al. mentioned that self-rated health was a dynamic evaluation that judges not only current level of health but also trajectory [1]. Ferraro et al. empirically showed that future health expectations were more important than past health expectations for predicting the mortality risk: People with more negative future health expectations were less likely to survive [34].

Subjective social status (SSS). Our measure of SSS was the MacArthur Scale of Subjective Social Status

community ladder [26, 35]. The question incorporates a picture of an imaginary ladder with ten rungs and asks the respondent the following question: “Think of this ladder as representing where people stand in their communities. Where would you place yourself on this ladder?” Possible responses ranged from 1 (representing the top of the ladder, where people have the highest standing in their community) to 10 (the bottom rung, representing people who have the lowest standing in their community) (see Appendix 2 Supplemental Figure 1).

Covariates. Age, sex, educational level, and subjective financial situation were included as covariates. We classified educational attainment into 3 levels (high school or lower, graduated high school but did not graduate college, and university or higher). Respondents rated their subjective financial situation via the question “how would you rate your financial situation these days?” from 0 (the worst possible financial situation) to 10 (the best possible financial situation). The responses were collapsed into 5 categories (see Table 1).

Statistical analysis

After excluding participants missing responses on SSS and self-rated health status, we analyzed 989 Japanese (96.3%) and 3,968 Americans (98.2%). We compared the current health status of Americans and Japanese using the t-test and analysis of covariance (ANCOVA) in which age and sex were adjusted. In the statistical analysis of individual trajectories of self-rated health, we considered each the current health status of each respondent as the reference point (the intercept with value set to zero) and estimated the trajectory of change over 10 years as the slope coefficient (i.e., the line connecting past, present, and future evaluations of health). We constructed a multilevel model with the three self-ratings of health (10 years ago, current, and 10 years in the future) nested within individuals (level 2) and nested within ten levels of SSS (level 3). To adjust for confounding by individual-level characteristics, we constructed a sequence of three models: Model 1 (not adjusted), Model 2 (age and sex adjusted), and Model 3 (age, sex, educational level, and subjective financial situation adjusted). In these models, each intercept (current health status) and each slope (expected decline over 10 years) were calculated according to SSS. Regression coefficients (B) and 95% confidence intervals (CIs) were also calculated. Cases with missing values were deleted in the three models. All analyses were performed using the R version 3.1.0. We used the `lmer()` function from the `lme4` library of the R version to conduct a multilevel analysis. All *p* values were 2-sided, with *p* <

0.05 considered to be statistically significant.

Ethics approval

We assessed that approval by an ethics review board was not required because this study was a secondary analysis using data publicly available online [33].

RESULTS

Characteristics/descriptive analysis

The demographic characteristics of the survey participants in Japan and the United States are presented in Table 1. The distributions of subjective social status (SSS) are shown in Supplementary Figure 1. Americans were more likely to assign themselves to higher SSS than were Japanese.

<Table 1. Characteristics of participants analyzed>

The average level of current self-rated health status was higher in the United States than in Japan (7.37 versus 6.23). The crude difference was 1.14 ($p < 0.001$). In ANCOVA, the adjusted difference was 1.25 ($p < 0.001$). The crude trajectories of self-rated health status according to SSS (ladder) are shown in Figure 1. In both the United States and Japan, the slopes of self-rated health tend to decline over time (and age), as expected.

< Figure 1. Trajectories of self-rated health status by subjective social status >

Multilevel analysis

The results of multilevel analysis are shown in Table 2. The unadjusted intercept (current self-rated health status) and slope (expected health decline over 10 years) were 7.22 [95% CI, 6.97–7.47] and -0.81 [-0.90 – -0.72] in the United States as compared to 6.09 [5.87–6.30] and -1.00 [-1.07 – -0.93] in Japan (Model 1). After statistical adjustment for confounding variables (Model 3), the intercepts and slopes were 7.28 [6.96–7.61] and -0.80 [-0.89 –

−0.71] as compared to 5.58 [5.10–6.05] and −1.00 [−1.07–−0.93], respectively. The range (and variance) across social status groups was greater in the United States than in Japan, i.e., 1.22 (0.14) compared to 0.50 (0.04). The range of the slopes across the 10 SSS levels was also greater in the United States than in Japan, i.e., 0.53 (0.03) compared to 0.02 (< 0.001). The differences in intercepts and slopes according to SSS are illustrated in Figure 2.1 and 2.2.

Figure 2.1 indicates that the lower the SSS, the worse the health status in both countries. Even after adjusting for SES (Model 3), the maximum difference among SSS in the US was 1.22, whereas that in Japan was 0.50. Figure 2.2 indicates that there was no variation in the trajectories of self-rated health across SSS groups in Japan: i.e., every social group in Japan expects their health to decline at roughly the same rate. By contrast, there is a steep gradient in the expected trajectory of health decline across SSS groups in the United States, i.e., low-SSS Americans expect their health to decline much more steeply compared to high-status Americans.

The association between individual-level characteristics and self-rated health are also shown in Table 2. For example, both the Japanese and Americans expect their health to decline with age. Females reported better health than males in Japan (0.17, $p = 0.058$) as well as in the United States (0.10, $p = 0.009$). Higher educational levels were significantly related to better rated health status in the United States (university or higher compared to high school or lower: 0.20, $p < 0.001$), but this was not the case in Japan (0.01, $p = 0.48$). Higher subjective financial situations were significantly related to better rated health status in both United States (the highest compared to the lowest: 1.21, $p < 0.001$) and Japan (1.61, $p < 0.001$).

<Table 2. Results of multilevel analysis>

<Figure 2.1. Differences of intercepts (current health status) by subjective social status >

<Figure 2.2. Differences of slopes (expected decline over 10 years) by subjective social status >

DISCUSSION

Main findings of the study

Our cross-national comparison confirmed what has been shown previously, viz., the Japanese report a lower average level of self-rated health compared to the Americans, despite enjoying greater longevity. The average level of current self-rated health was higher in the United States than in Japan (7.37 versus 6.23, $p < 0.001$). After statistical adjustment for confounding variables, respondents in Japan continued to report lower average levels of health. However, the rate of expected decline in self-rated health over the next decade was strongly socially patterned in the United States, whereas it was not the same in Japan. Self-rated health status was higher among Americans than the Japanese. However, the Japanese showed no disparity in the anticipated trajectory of self-rated health over time, whereas Americans showed a strong social class gradient in the future trajectories of self-rated health.

What is already known on this topic

According to OECD [22], 30% of people in Japan report their health to be good, roughly comparable to the percentage of Koreans at 37%; both of these are lower than the OECD average of 68%, and substantially lower than the average American (90% of whom report their health as being good). This is despite the fact that the longevity of the Japanese is much higher (82.7 years) than that of the Americans (78.7 years). This highlights the discrepancy between the high self-rated health status and other objective indicators of health. Although self-rated health status is a robust predictor of future morbidity and mortality within groups, it is also sensitive to cultural contexts; hence, direct national comparisons need to be approached with caution [36]. It is known that variations in the perceptions of health and self-assessments of health status are partly related to different health expectations, and several studies used anchoring vignettes for the cross-cultural comparability of SRH [37-39].

What this study adds

We adopted a novel approach, comparing the life-course trajectories of self-rated health across subjective social status (SSS) groups in two countries. Our results revealed some notable cross-national differences. In terms of SSS,

the Japanese were more likely to rank themselves at a lower status than Americans. The Japanese were generally likely to give a midpoint or close-to-the-middle response rather than expressing definite agreement or disagreement [40]. Hanibuchi et al. mentioned that the wording of the response categories from “Very good” to “Very bad” with the qualifier “very” may have biased the response toward the midpoint for Japanese respondents [21]. We confirmed that differences of current self-rated health between the two countries were consistency with the OECD report. To examine the disparity of self-rated health trajectories among SSS, the reference of self-rated health should be clear. It is inappropriate to use this result for direct national comparisons.

Moreover, the results of our multilevel analysis suggested two novel findings. One was that although there were social class disparities in current self-rated health status in both countries, the disparity in the United States was much steeper than in Japan. The other novel finding was that the rate of expected decline in self-rated health over the next decade indicated clear social class disparities in the United States but not in Japan. Sacker et al. reported that there were large discrepancies between the disadvantaged and “average” individuals’ health trajectories but only small differences between the trajectories of those in average and advantaged circumstances in the Western countries [24]. This may assist in explaining the observed differences between the United States and Japan. The slopes of each class were almost parallel in Japan. By contrast, the slopes were spread out across SSS groups in the United States. The lower the SSS, the faster the respondent expects their health to decline in the future. It is possible that these differences in self-rated health trajectories and social class may be attributable to national differences in welfare policies [24]. Japan has a system of universal health coverage [41], which provides assurance of access to future health care.

Limitations of this study

We acknowledge several limitations to this study. First, there is no information about household income in the surveys. We used instead respondents’ subjective ratings of their financial situation. Second, the sampling framework was different between the two countries; MIDUS in the United States was based on a nationally representative random-digit-dial sample from the 48 states, while MIDJA in Japan was based on residents in the Tokyo metropolitan area [16]. Therefore, the social status of participants in MIDJA may be higher than the rest of

the Japanese population. Third, the period of surveys was different; MIDUS II was conducted between 2004 and 2006, while MIDJA was conducted between April and September in 2008. Changes in economic conditions may have affected the relationship between social status and health. However, as MIDJA was almost complete before the bankruptcy of Lehman Brothers Holdings Inc. on September 15, 2008, the impact is expected to have been limited. Finally, because this was a cross-sectional observational study, it was difficult to examine the causality and mechanisms. A much larger longitudinal project will be required in the future.

Conclusion

Self-rated health status was higher among Americans than Japanese, despite the fact that the Japanese live longer than the average American. Social class gradients in current self-rated health status were apparent in both countries, although the steepness of the gradient was more marked in the United States than in Japan. Whereas the expected trajectories of health showed no social class gradient in Japan, Americans on the lowest rungs of SSS expected their health to decline much faster in the future than the Japanese. Future longitudinal studies are required to confirm these phenomena observed in our cross-sectional study.

COMPETING INTERESTS

None

ACKNOWLEDGMENTS

This research was supported by a grant from the National Institute on Aging (5R37AG027343) to conduct a study of Midlife in Japan (MIDJA) for comparative analysis with MIDUS (Midlife in the United States, P01-AG020166). Takahashi was supported by the Young Scholars Overseas Visit Program of the John Mung Advanced Program in 2014 at Kyoto University. The funding sources had no involvement in study design, in the collection, analysis and interpretation of data, in the writing of articles, or in the decision to submit it for publication.

REFERENCES

1. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav.* 1997;38:21-37.
2. Burström B, Fredlund P. Self rated health: Is it as good a predictor of subsequent mortality among adults in lower as well as in higher social classes? *J Epidemiol Community Health.* 2001;55:836-40.
3. Sudha S, Suchindran C, Mutran EJ, et al. Marital status, family ties, and self-rated health among elders in South India. *J Cross Cult Gerontol.* 2006;21:103-20.
4. Winter L, Lawton MP, Langston CA, et al. Symptoms, affects, and self-rated health: evidence for a subjective trajectory of health. *J Aging Health.* 2007;19:453-69.
5. Furuya Y, Kondo N, Yamagata Z, et al. Health literacy, socioeconomic status and self-rated health in Japan. *Health Promot Int.* 2013. [Epub ahead of print]
6. Latham K, Peek CW. Self-rated health and morbidity onset among late midlife U.S. adults. *J Gerontol B Psychol Sci Soc Sci.* 2013;68:107-16.
7. French DJ, Browning C, Kendig H, et al. A simple measure with complex determinants: investigation of the correlates of self-rated health in older men and women from three continents. *BMC Public Health.* 2012 13;12:649.
8. Schnittker J, Bacak V. The increasing predictive validity of self-rated health. *PLoS One.* 2014;9:e84933.
9. Macintyre S, Der G, Norrie J. Are there socioeconomic differences in responses to a commonly used self report measure of chronic illness? *Int J Epidemiol.* 2005;34:1284-90.
10. Quesnel-Vallée A. Self-rated health: caught in the crossfire of the quest for 'true' health? *Int J Epidemiol.* 2007;36:1161-4.
11. Adler NE, Ostrove JM. Socioeconomic status and health: what we know and what we don't. *Ann N Y Acad Sci.* 1999;896:3-15.
12. Kopp M, Skrabski A, Réthelyi J, et al. Self-rated health, subjective social status, and middle-aged mortality in a changing society. *Behav Med.* 2004;30:65-70.
13. Adler NE, Rehkopf DH. U.S. disparities in health: descriptions, causes, and mechanisms. *Annu Rev Public*

Health. 2008;29:235-52.

14. Kondo N, Kawachi I, Subramanian SV, et al. Do social comparisons explain the association between income inequality and health?: Relative deprivation and perceived health among male and female Japanese individuals. *Soc Sci Med.* 2008;67:982-7.
15. Chapman BP, Fiscella K, Kawachi I, Duberstein PR. Personality, socioeconomic status, and all-cause mortality in the United States. *Am J Epidemiol.* 2010;171:83-92.
16. Kan C, Kawakami N, Karasawa M, et al. Psychological resources as mediators of the association between social class and health: comparative findings from Japan and the USA. *Int J Behav Med.* 2014;21:53-65.
17. Steptoe A, Deaton A, Stone AA. Subjective wellbeing, health, and ageing. *Lancet.* 2015;385:640-8.
18. Sen A. Health: perception versus observation. *BMJ.* 2002;324:860-1.
19. Subramanian SV, Subramanyam MA, Selvaraj S, et al. Are self-reports of health and morbidities in developing countries misleading? Evidence from India. *Soc Sci Med.* 2009;68:260-5.
20. Kondo N, Sembajwe G, Kawachi I, et al. Income inequality, mortality, and self rated health: meta-analysis of multilevel studies. *BMJ.* 2009;339:b4471.
21. Hanibuchi T, Nakaya T, Murata C. Socio-economic status and self-rated health in East Asia: a comparison of China, Japan, South Korea and Taiwan. *Eur J Public Health.* 2012;22:47-52.
22. OECD. Health at a Glance. 2013. www.oecd.org/els/health-systems/Health-at-a-Glance-2013.pdf (accessed 15 June 2015).
23. Institute of Medicine of the National Academies. State of the USA Health Indicators. Letter Report. 2008. www.iom.edu/Reports/2008/State-of-the-USA-Health-Indicators-Letter-Report.aspx (accessed 15 June 2015).
24. Sacker A, Worts D, McDonough P. Social influences on trajectories of self-rated health: evidence from Britain, Germany, Denmark and the USA. *J Epidemiol Community Health.* 2011;65:130-6.
25. Ross NA, Garner R, Bernier J, et al. Trajectories of health-related quality of life by socio-economic status in a nationally representative Canadian cohort. *J Epidemiol Community Health.* 2012;66:593-8.
26. Adler NE, Epel ES, Castellazzo G, et al. Relationship of subjective and objective social status with psychological and physiological functioning: preliminary data in healthy white women. *Health Psychol.*

2000;19:586-92.

27. Adler N, Singh-Manoux A, Schwartz J, et al. Social status and health: a comparison of British civil servants in Whitehall-II with European- and African-Americans in CARDIA. *Soc Sci Med.* 2008;66:1034-45.
28. Singh-Manoux A, Marmot MG, Adler NE. Does subjective social status predict health and change in health status better than objective status? *Psychosom Med.* 2005;67:855-61.
29. Sakurai K, Kawakami N, Yamaoka K, et al. The impact of subjective and objective social status on psychological distress among men and women in Japan. *Soc Sci Med.* 2010;70:1832-9.
30. Park JH, Lee KS. Self-rated health and its determinants in Japan and South Korea. *Public Health.* 2013;127:834-43.
31. Torres JM, Rizzo S, Wong R. Lifetime socioeconomic status and late-life health trajectories: Longitudinal results from the Mexican health and aging study. *J Gerontol B Psychol Sci Soc Sci.* 2016 May 2. pii: gbw048.
32. Leineweber C, Eib C, Peristera P, et al. The influence of and change in procedural justice on self-rated health trajectories: Swedish Longitudinal Occupational Survey of Health results. *Scand J Work Environ Health.* 2016 Jul 1;42(4):320-8.
33. Inter-university Consortium for Political and Social Research. Midlife Development in the United States (MIDUS) Series. www.icpsr.umich.edu/icpsrweb/ICPSR/series/203/ (accessed 15 June 2015).
34. Ferraro KF, Wilkinson LR. Alternative measures of self-rated health for predicting mortality among older people: Is past or future orientation more important? *Gerontologist.* 2015 Oct;55(5):836-44.
35. Adler N, Stewart J. The MacArthur scale of subjective social status. 2007.
www.macses.ucsf.edu/research/psychosocial/subjective.php (accessed 15 June 2015).
36. Jylhä M, Guralnik JM, Ferrucci L, et al. Is self-rated health comparable across cultures and genders? *J Gerontol B Psychol Sci Soc Sci.* 1998;53:S144-52.
37. King G, Wand J. Comparing incomparable survey responses: evaluating and selecting anchoring vignettes. *Polit Anal.* 2007;15:46-66.
38. Salomon JA, Tandon A, Murray CJ. Comparability of self rated health: cross sectional multi-country survey using anchoring vignettes. *BMJ.* 2004 Jan 31;328(7434):258.

39. Xu H, Xie Y. Assessing the effectiveness of anchoring vignettes in bias reduction for socioeconomic disparities in self-rated health among Chinese adults. *Sociol Methodol.* 2016;46(1):84-120.
40. Shishido K, Iwai N, Yasuda T. Designing response categories of agreement scales for cross-national surveys in East Asia: the approach of the Japanese General Social Survey. *Int J Jap Sociol.* 2009;18:97-111.
41. Ikeda N, Saito E, Kondo N, et al. What has made the population of Japan healthy? *Lancet.* 2011;378:1094-105.

FIGURE LEGENDS

Fig. 1

Trajectories of self-rated health status by subjective social status

None

Fig. 2

Fig. 2.1. Differences of intercepts (current health status) by subjective social status

Fig. 2.2. Differences of slopes (expected decline over 10 years) by subjective social status

The self-rated health status of the social status with the highest health status was treated as reference.

<Table 1. Characteristics of participants analyzed>

	Japan		The United States	
	n%	mean SD	n%	mean SD
n	989	100%	3,968	100%
Sex (males), n%	487	49.2%	1,783	44.9%
Age, mean SD	54.0	14.0	56.2	12.3
Education, n%				
≤ High school	417	42.6%	1,305	32.9%
<High school and < University	248	25.3%	1,137	28.7%
≤University	315	32.1%	1,521	38.4%
Missing	0	NA	5	NA
Subjective financial situation (0–10), n %				
0–1 (lowest)	71	7.2%	107	2.7%
2–3	156	15.9%	295	7.6%
4–6	438	44.5%	1,221	31.3%
7–8	263	26.7%	1,683	43.2%
9–10 (highest)	56	5.7%	591	15.2%
Missing	5	NA	71	NA
Self-rated health status, mean SD				
10 years ago	7.17	2.14	8.18	1.70
Current	6.23	1.96	7.37	1.59
10 years in the future	5.18	2.13	6.71	2.04

SD, standard deviation.

<Table 2. The result from multilevel analysis>

	Japan						The United States					
	Model 1 (n = 989)		Model 2 (n = 989)		Model 3 (n = 975)		Model 1 (n = 3,968)		Model 2 (n = 3,968)		Model 3 (n = 3,893)	
Fixed effects	β	95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI
Intercept	6.09	5.87, 6.30	6.28	5.88, 6.68	5.58	5.10, 6.05	7.22	6.97, 7.47	7.97	7.65, 8.29	7.28	6.96, 7.61
Level 1 (Measurement level)												
Slope	-1.00	-1.07, -0.93	-1.00	-1.07, -0.93	-1.00	-1.07, -0.93	-0.81	-0.90, -0.72	-0.81	-0.89, -0.72	-0.80	-0.89, -0.71
Level 2 (Individual level)												
Age (continuous variable)			-0.01	-0.01, -0.00	-0.01	-0.01, 0.00			-0.01	-0.02, -0.01	-0.02	-0.02, -0.01
Sex [reference: males]												
Females			0.28	0.11, 0.45	0.17	-0.01, 0.34			0.08	0.01, 0.15	0.10	0.03, 0.17
Education [reference: ≤ High school]												
< High school and < University					0.13	-0.09, 0.34					0.12	0.04, 0.21
≤ University					0.01	-0.20, 0.22					0.20	0.12, 0.28
Subjective financial situation [reference: 0–1 (the lowest)]												
2–3					0.14	-0.23, 0.51					0.22	-0.02, 0.45
4–6					0.80	0.47, 1.14					0.48	0.26, 0.69
7–8					1.32	0.96, 1.67					0.84	0.63, 1.05
9–10 (the highest)					1.61	1.14, 2.07					1.21	0.98, 1.43
Random effects	Var.	S.D.	Var.	S.D.	Var.	S.D.	Var.	S.D.	Var.	S.D.	Var.	S.D.
Level 2 (Individual level)												
Intercept	2.11	1.45	2.08	1.44	1.90	1.38	1.56	1.25	1.50	1.23	1.36	1.17
Slope	1.10	1.05	1.09	1.05	1.09	1.05	1.03	1.01	1.03	1.01	1.02	1.01
Level 3 (Social status level)												
Intercept	0.13	0.36	0.15	0.39	0.04	0.20	0.21	0.46	0.26	0.51	0.14	0.37
Slope	0.00	0.02	0.00	0.02	0.00	0.01	0.02	0.16	0.03	0.16	0.03	0.16
Residual	1.38	1.17	1.38	1.17	1.38	1.18	0.85	0.92	0.85	0.92	0.84	0.92

β , regression coefficient; CI, confidence interval; S.E., standard error; Var., variance; S.D., standard deviation.

Model 1, not adjusted; Model 2, age, and sex were adjusted; Model 3, age, sex, educational level, and subjective financial situation were adjusted.

Figure 1

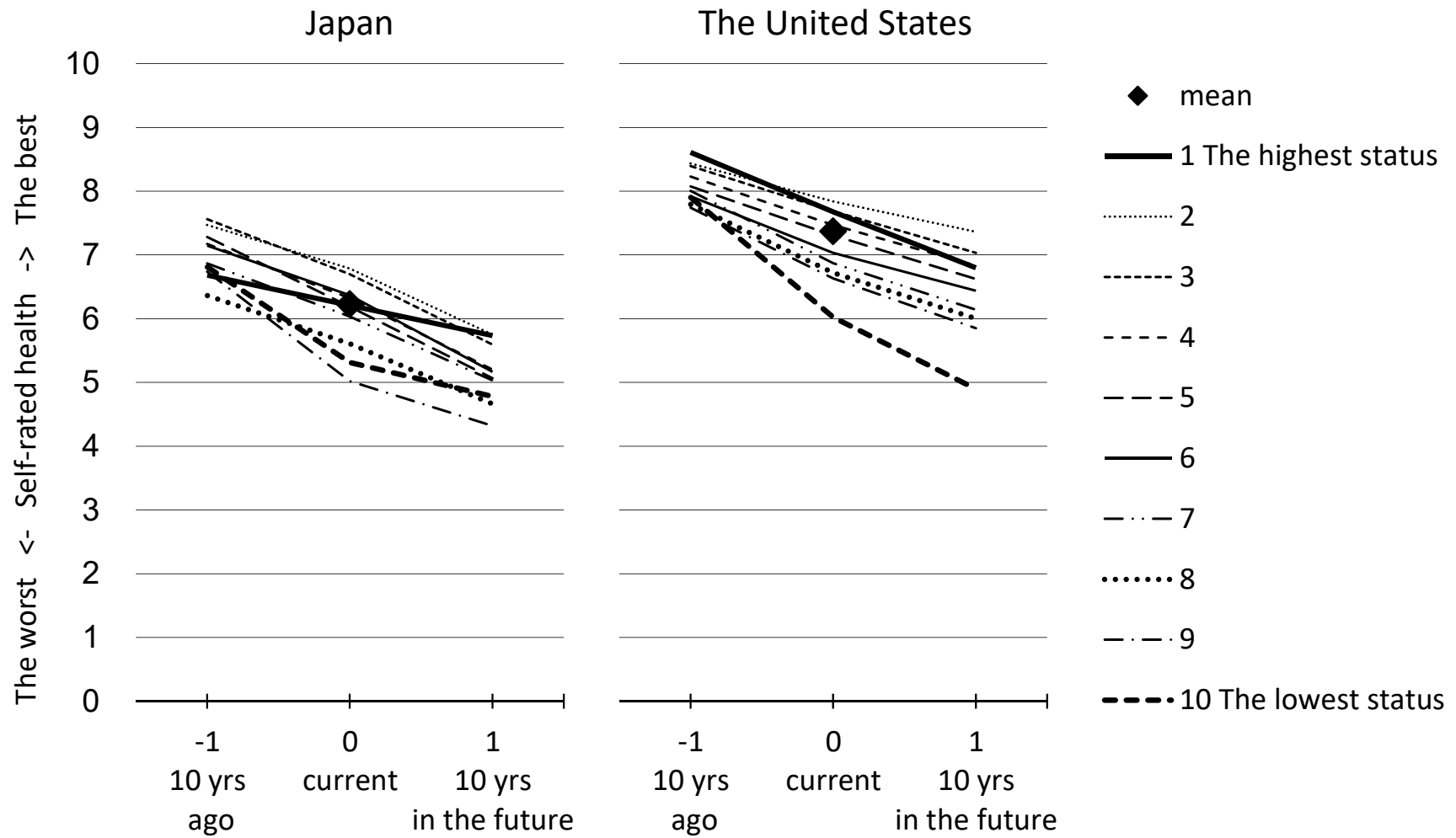


Figure 2.1

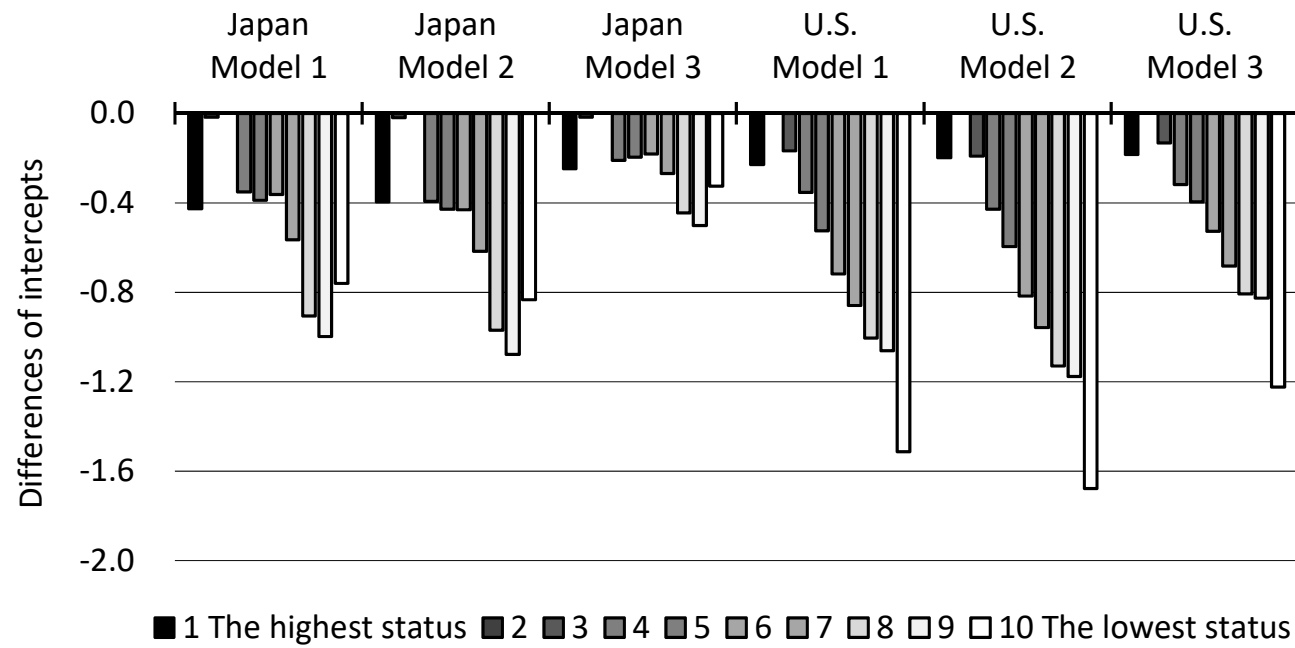
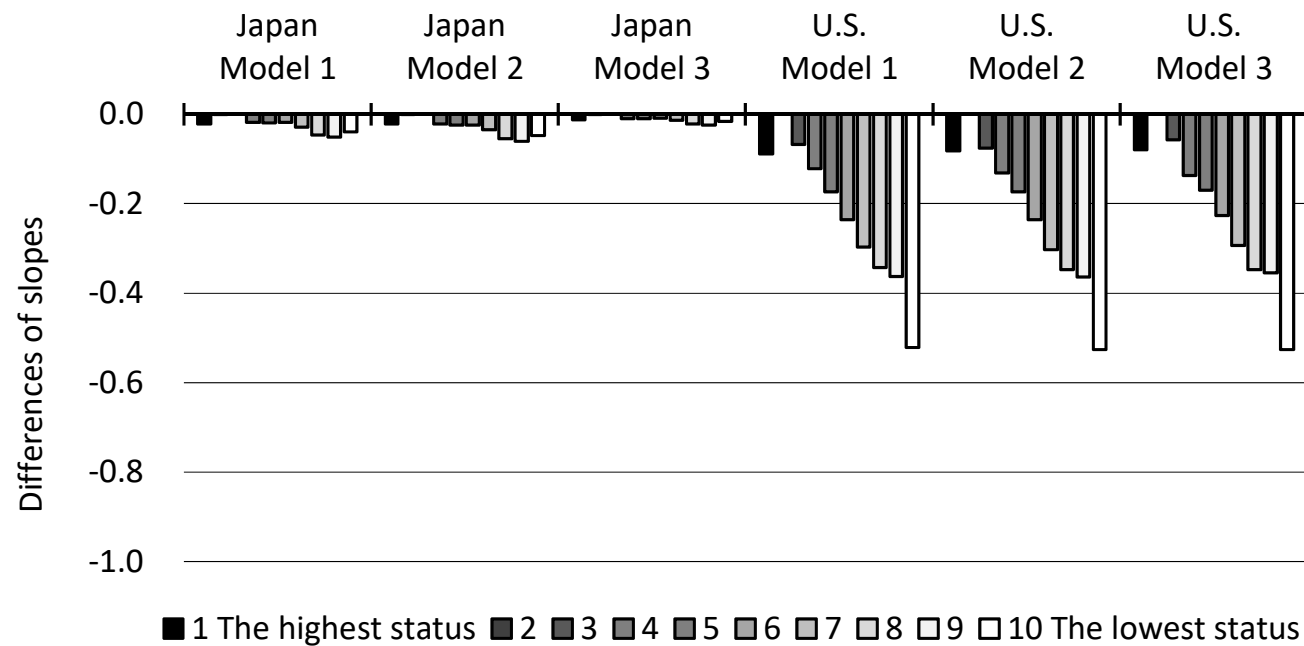


Figure 2.2



Appendix 1

Supplemental document: explanation of the models

Subscripts

n: number of participants

Time points: $i \in \{1, 2, 3\}$

Individuals: $j \in \{1, 2, \dots, n\}$

Subjective social status categories: $k \in \{1, 2, \dots, 10\}$

Variables

Y_{ijk} : self-rated health (continuous, from 1 to 10) at the i_{th} time point for the j_{th} individual with the k_{th} subjective social status category.

X_{1ijk} time variable (years, $\in \{-10, 0, 10\}$) at the i_{th} time point for the j_{th} individual with the k_{th} subjective social status category.

X_{2jk} : age for the j_{th} individual with the k_{th} subjective social status category.

X_{3jk} : sex for the j_{th} individual with the k_{th} subjective social status category.

X_{4jk} : education for the j_{th} individual with the k_{th} subjective social status category.

X_{5jk} : subjective financial situation for the j_{th} individual with the k_{th} subjective social status category.

Model 1

$$E[Y_{ijk}|X_{1ijk}] = \beta_{0jk} + \beta_{1jk}X_{1ijk}$$

where

$$\beta_{0jk} = \beta_{0k} + b_{0jk}; b_{0jk} \sim N(0, \sigma^2_{b0jk})$$

$$\beta_{0k} = \beta_0 + b_{0k}; b_{0k} \sim N(0, \sigma^2_{b0k})$$

$$\beta_{1jk} = \beta_{1k} + b_{1jk}; b_{1jk} \sim N(0, \sigma^2_{b1jk})$$

$$\beta_{1k} = \beta_1 + b_{1k}; b_{1k} \sim N(0, \sigma^2_{b0k})$$

Model 2

$$E[Y_{ijk}|X_{1ijk}, X_{2jk}, X_{3jk}] = \beta_{0jk} + \beta_{1jk}X_{1ijk} + \beta_2X_{2jk} + \beta_3X_{3jk}$$

Model 3

$$E[Y_{ijk}|X_{1ijk}, X_{2jk}, X_{3jk}, X_{4jk}, X_{5jk}] = \beta_{0jk} + \beta_{1jk}X_{1ijk} + \beta_2X_{2jk} + \beta_3X_{3jk} + \beta_4X_{4jk} + \beta_5X_{5jk}$$

Supplementary Figure 1

