This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record.
Please cite this article as an 'Accepted Article', doi:10.2188/jea.JE20190083

Received May 9, 2019; accepted September 24, 2019; released online October 12, 2019

Gender difference in the association between subjective socioeconomic mobility across life course and mortality at older ages: Results from the JAGES longitudinal study

Yuiko Nagamine MD, MSc[1,2,3], Takeo Fujiwara MD, PhD[2], Yukako Tani PhD[3], Hiroshi Murayama, PhD, MPH, RN, PHN`[4], Takahiro Tabuchi MD, PhD[5], Katsunori Kondo MD, PhD[1,6,7], Ichiro Kawachi MD, PhD[8]

[1] Center for Preventive Medical Science, Chiba University, Chiba, Japan

[2] Department of Global Health Promotion, Tokyo Medical and Dental University, Tokyo, Japan

[3] Department of Family Medicine, Tokyo Medical and Dental University, Tokyo, Japan

[4] Institute of Gerontology, The University of Tokyo, Tokyo, Japan

[5] Cancer Control Center, Osaka International Cancer Institute, Osaka, Japan

[6] Department of Gerontological Evaluation, Center for Gerontology and Social Science, Aichi, Japan

[7] Center for Well-being and Society, Nihon Fukushi University, Aichi, Japan

[8] Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Boston, Massachusetts

Corresponding author:

Takeo Fujiwara MD, PhD

Department of Global Health Promotion, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan

Tel: +81-3-5803-5187

fujiwara.hlth@tmd.ac.jp

Number of Figures : 0 Number of Tables : 3 Number of appendices : 4

ABSTRACT

Background: Socioeconomic mobility affects health throughout the life course. However, it is not known whether there are gender differences in the association between life-course subjective socioeconomic status (SSS) mobility and mortality at older ages.

Methods: Participants were 16,690 community-dwelling adults aged 65–100 years in the Japan Gerontological Evaluation Study (JAGES). Baseline information including demographic characteristics, depression and lifestyle factors were collected in 2010. Participants' vital status was confirmed in 2013 via linkage to death records. We categorized life-course socioeconomic mobility into the following categories: 'persistently high', 'downward mobility', 'upward mobility' and 'persistently low'. Cox proportional hazard modeling was used to estimate hazard ratios (HR) for all-cause mortality.

Results: Mortality HRs for the 'downward' group were 1.37 (95% confidence interval [CI] 1.08–1.74) among men and 1.27 (95% CI 0.94–1.71) among women in comparison with the 'persistently high' group. Compared to the 'persistently low' group, the HRs for the 'upward' group were 0.54 (95% CI 0.35–0.83) among women and 0.91 (95CI 0.73–1.24) among men. Associations were not changed after adjusting for objective socioeconomic status, but attenuated by depression.

Conclusions: 'Downward' mobility was associated with mortality among men, but not among women. Depression appeared to mediate the association. A protective effect of upward mobility was observed among women but not among men.

Keywords: Subjective socioeconomic status; trajectory; all-cause mortality; gender roles; Japan

Running title: Gender roles associated with SSS mobility and mortality

INTRODUCTION

Subjective socioeconomic status (SSS), defined as "a person's belief about his location in a status order" [1], has been shown to be correlated with health and illness independently from objective socioeconomic status (SES, including educational attainment, income and occupation) [2]. Singh-Manoux A et al. concluded that SSS can capture a perceived average of objective SES [3]. More recently, the biological pathways linking SSS to health have begun to be documented. People's perceptions of their social status predict health behaviors, such as smoking [4] and sedentarism [2], as well as some biomarkers, such as heart rate, sleep latency, cortisol habituation to stress, body fat distribution [5] and high waist circumference [6]. Additionally, SSS has been shown to be inversely related to metabolic syndrome [6], insulin resistance [7], coronary artery diseases, hypertension, diabetes and dyslipidemia [8]. As for older people, Instrumental Activities of Daily Living difficulties are also inversely related to SSS [2]. Presumably, through these pathways, low SSS is associated with excess risk of mortality [9]. The statistically significant associations between SSS and all outcomes above—except coronary artery disease, hypertension and diabetes—were observed even after adjusting for objective socioeconomic status.

Recent studies have begun to focus on the trajectories of SSS across the life course. For example, Burazeri et al. [10] found that downward mobility in SSS (i.e. high SSS in childhood/low SSS during mid-life) was associated with increased risk of acute coronary syndrome (ACS) for both men and women at around 60 years of age. In this study, financial loss appeared to mediate downward mobility and ACS. Depressive symptoms were not considered in the study, although depression might be a robust mediator of the association between SSS and ACS. Another study of Latino and Asian immigrants in the United States (US) found that downward subjective social mobility was associated with elevated risk of major depression [11,12]. However, to the best of our knowledge, no studies have examined the association between mobility in SSS and mortality among older people prospectively, independent from objective SES, and the mediating effect of depression in this association.

It is also not known whether there are gender differences in the association between mobility

in SSS and health outcomes. Previous studies on "objective" social class mobility have found gender differences. For example, Cambois et al. examined occupational class mobility and standardized mortality rates (SMR) stratified by sex in a French population aged 30–84 years old. In this study, occupational class was classified into six groups: 'upper classes', 'craft, trade, etc.', 'farmers', 'clerks', 'manual workers' and 'inactive'. Among both men and women, individuals who were downwardly mobile had statistically significant higher mortality compared to 'non-movers'. At the same time, men who moved upwards from 'inactive' to a higher occupational position also experienced higher mortality risk compared to non-movers. By contrast, among women, moving up from the 'inactive' group showed a protective effect on mortality risk [13]. A study in Poland reported that upward intergenerational educational mobility (comparing individuals to their fathers) was protectively associated with cardiovascular risk—as measured by the Framingham risk score (FRS)—only among men [14]. No study has investigated whether there are gender differences in the association between "subjective" social class mobility and mortality.

Gender roles closely mirror the cultural context. For example, in Japan's traditional patriarchal culture, women can be college-educated, but still end up as home-makers and therefore do not benefit from upward educational mobility to the same extent as men [15]. We derive two theoretical predictions for the gender difference we should expect to observe in the association between mobility in SSS and mortality. In a rigidly traditional society (men are expected to be bread-winners and women are expected to stay at home), (i) upward social mobility may not be beneficial to women; and (ii) in the same society, downward mobility could be more "toxic" for men because the male is the breadwinner and the household's fortunes are more closely linked to the male's SES trajectory. In this present study, these hypotheses were examined.

The Japan Gerontological Evaluation Study (JAGES) is a large-scale, population-based cohort study established in 2010 that collected data on both childhood and current SSS among healthy older (65 years or older) community residents in Japan. Vital status was ascertained in the cohort via linkage to death registry data. Previously, using prospective JAGES data from 2003, we reported that lower

objective SES (educational attainment and household income) was associated with higher mortality [16]. However, the impact of differential trajectories of SSS on mortality risk has not been investigated in older Japanese adults. In the present study, our objectives were to examine whether trajectories of SSS across the life course, that is, subjective social status mobility from childhood to old age, are associated with the risk of mortality and whether there is a gender-related difference in the association.

METHODS

Study participants

Data from an ongoing prospective longitudinal cohort study, the Japan Gerontological Evaluation Study (JAGES), was analyzed. The cohort was established with the aim of elucidating the determinants of healthy ageing among community-dwelling seniors. The baseline survey was administered between August 2010 and January 2012, when survey questionnaires were mailed to 131,468 community-dwelling individuals aged ≥ 65 years who were physically and cognitively independent. People from 24 municipalities throughout Japan were invited to participate. Participants were randomly selected from the official residence registries in 13 large municipalities; and in the remaining 11 smaller municipalities, census data of all eligible residents was sought. A total of 86,063 subjects returned the questionnaire (response rate: 65.5%).

Approximately one-fifth of the total sample (N=19,528) was randomly selected to receive a supplementary survey module inquiring about their childhood and current SSS. After excluding those who had missing SSS responses (N=2,832) as well as individuals who could not be linked to mortality register data (n=6), our analytical sample consisted of 16,690 subjects (7,944 men and 8,746 women). The JAGES protocol was approved by the Ethics Committee in Research of Human Subjects at Nihon Fukushi University (No. 10-05) and the Ethics Committee of Chiba University, Faculty of Medicine (No. 1777).

Ascertainment of death

Participants were matched to death records from the public long-term care insurance system, which is maintained by local municipal authorities throughout Japan. All deaths were reported and submitted by physicians to municipalities. In the analysis sample from 2013, 780 deaths were found, which was 4.7% of total participants at baseline. Of these deaths, 524 were men (6.6% of 7,944 male participants), and 256 were women (2.9% of 8,746 female participants).

Childhood and current SSS

Childhood SSS was asked using the following question: "How would you rate your social status when you were aged 15 years compared to others in society at that time?" [17]. Possible responses were arranged on a 5-point Likert scale: 'high', 'middle-high', 'middle', 'middle-low', or 'low'.

Current SSS was assessed by the question: "How would you rate your current social status in comparison with others in society?", with the same 5-point Likert scale of responses.

Since a previous study showed that even subtle downward/upward mobility can be associated with health outcomes [13], we subtracted the 5-point Likert scale response for childhood SSS from the same 5-point Likert scale response for adult SSS, and categorized the resulting numbers into 'downward SSS trajectory' if the calculated result was -4 to -1, 'no change' if 0 and 'upward SSS trajectory' if +1 to +4. Subsequently, 'no change' was dichotomized into two groups and the individual was defined as 'persistently high' if both childhood and current SSS were 'high', 'middle-high' or 'middle', and 'persistently low' if both SSS were 'middle-low' or 'low'.

Covariates

Self-reported adult height, current income, education and marital status were included as potential confounding factors. Additionally, depression and lifestyle factors were included as potential mediators of the association between SSS mobility and mortality. Adult height was used as a proxy of childhood adversity such as childhood nutrition and disease status [18,19]. Adult height was categorized into five groups in 5cm intervals specific to each gender: for men: <155, 155–159.9, 160–

164.9, 165–169.9, and ≥170cm; and for women: <145, 145–149.9, 150–154.9, 155–159.9, and ≥160cm [17]. Education was assessed as years of schooling (0–9, 10–12, or ≥13 years) and annual household income was equalized by dividing the gross income by the square root of the number of household members (< 2.00, 2.00–3.99, or ≥ 4·00 million yen). We decided not to include occupational class as a covariate after performing the sensitivity analysis. Marital status was categorized as married, widowed, divorced, unmarried or others. The 15-item short form of the Geriatric Depression Scale (GDS) (Japanese version) was used to assess depression and categorized as no depression (0–4), moderate depression (5–9), and depression (10+) [20,21]. Lifestyle factors included smoking status (current smoker/ex-smoker or non-smoker), alcohol intake (current drinker/ex-drinker or non-drinker), walking time per day (<30min, 30≤) and body mass index (BMI) (underweight (<18.5), normal (18.5–24.9), overweight (25.0-29.9) or obesity (30.0≤)) [22].

Statistical analysis

Data was analyzed by gender because self-rated health [23] and depressive symptoms [24,25] differed between men and women in our sample [26,27]. Cox proportional hazards models were used to estimate hazard ratios (HR) and 95% confidence intervals (CI) for all-cause mortality during the 3-year follow-up period. The following sequential multivariable-adjusted models were constructed: model 1 was adjusted for age, model 2 was additionally adjusted for adult height, adult objective SES (educational and income level) and marital status, model 3 was additionally adjusted for depression, and model 4 was additionally adjusted for lifestyle factors. Analysis was performed using Stata/SE version 13.1 (Stata Corp, College Station, TX 77845, USA).

RESULTS

The overall and gender-stratified characteristics of the study subjects are described in Table 1. Among all participants, 25.7% of men and 31.5% of women reported both a high childhood SSS and high current SSS, while 18.7% of men and 14.3% of women reported low current SSS and childhood SSS.

Twenty percent of men and 30.0% of women were categorized as 'downward mobility' while 35.6% of men and 24.2% of women were categorized as 'upward mobility' (Table 1).

Among men, after adjustment for age, the HR from the 'downward mobility' group was 1.37 (95% CI: 1.08–1.74) compared to those in the 'persistently high' group (Model 1, Table 2). Even after adjustment for adult height, adult objective SES and marital status, the HR of 'downward mobility' was significantly higher compared to 'persistently high' (HR 1.35; 95% CI 1.05–1.72, Model 2). Additional adjustment for depression attenuated the association between 'downward mobility' and mortality, which became non-significant (HR 1.22; 95% CI 0.95–1.56, Model 3). Additional adjustment for lifestyle factors showed a non-significant association (HR 1.22; 95% CI 0.95–1.56, Model 4). On the other hand, compared to the 'persistently low' group, no significant association was found between 'upward mobility' and mortality among men.

Interestingly, the trend was opposite in women (Table 3). Women from the downward mobility group showed no significant excess mortality risk compared to the 'persistently high' group either before (HR 1.27; 95% CI 0.94–1.71, Model 1) or after adjustment for age, adult height, objective SES and other covariates (HR 1.08; 95%CI 0.79–1.47, Model 4). Although the result was not statistically significant, the point estimate of the HR showed that adjustment for depression considerably attenuated the effect of downward mobility among women also. We additionally conducted a check for the interaction between gender by mobility in the SSS and mortality. The result confirmed that downward mobility was harmful only among men. However, compared to 'persistently low', the age-adjusted HR of the 'upward mobility' group was 0.54 (95% CI: 0.35–0.83, Model 5). After adjustment for adult height, adult objective SES and marital status, the HR for 'upward mobility' was slightly attenuated to 0.58 (95% CI: 0.38–0.90, Model 6). In the final model, after additional adjustment for depression and other covariates, the HR for 'upward mobility' was attenuated to statistical non-significance (HR 0.68; 95% CI: 0.44–1.07, Model 8).

DISCUSSION

In this analysis of life-course trajectories of SSS among Japanese older adults, we found four notable patterns: (a) 'downward mobility' increased the risk of mortality compared to the 'persistently high' group only among men; (b) 'upward mobility' decreased the risk of mortality only among women, with no effect seen among men; (c) depression appeared to mediate the association between mobility in SSS and mortality, and finally, (d) objective SES in later life did not fully explain the relationship between mobility in SSS and mortality.

Our finding of excess mortality among downwardly mobile groups is consistent with previous studies in other populations and other age groups [10-12]. However, it was observed only among men in the older Japanese population. Downward mobility increases the risk of poor health for men because of a subjective sense of deprivation in adult life relative to their childhood status. This might be less salient for women in Japanese society because their economic fortunes are more tightly linked to their spouse's status. As shown in Table 1, over 90% of women in the sample were married or previously married (now widowed). Also, as mentioned above, the gender difference here is probably real because the formal test of interaction was statistically significant only among men. In addition to that, depression is probably mediating the association between downward mobility and mortality. Depression had the strongest attenuation effect among covariates in Model 3 both among men and women.

Generally, upward SES mobility has a protective effect on health compared to persistently low SES [28]. In our study, 'upward' SSS mobility attenuated mortality risks among women, but not among men. This pattern is contrary to our original hypothesis that upward mobility would not affect women's risk, because even if women graduated from college, this would not be reflected by higher earnings/income. Many Japanese women of the generation in our sample became housewives irrespective of their years and quality of education [15]. For men, we did not find either a harmful or protective effect of 'upward' mobility in this study. We can cite two possibilities why upward mobility is sometimes harmful. Firstly, status incongruity refers to when upward mobility creates stress because the individual feels like an outsider in her new status/position. Striving for upward mobility

and success can also induce stress, also known as the John Henryism phenomenon [29]. Secondly, the "long arm" of low childhood SES may continue to exert an influence on health even if the individual manages to escape from lower status, i.e. poor childhood SES persists even if someone achieves high SES in later life [30]. For women in this study, there was a protective effect of 'upward' mobility. In theory, upward mobility for Japanese women could be even more stressful than in the west, because it was so non-normative and consequently women in positions of authority and power could become very isolated. However, in the age-group represented by our cohort, we may assume that the majority of 'upward' mobility more closely reflected their father's or spouse's social class rather than their own [31] so that it may not be indicative of exposure to status incongruity.

Our results are also notable for finding that mobility in SSS had a similar impact on mortality even after adjusting for objective SES. The contribution of SSS to mental and physical health—over and above the contribution of objective SES—has been previously discussed [5,32,33]. Singh-Manoux et al. investigated the determinants of SSS in a cohort of middle-aged British civil servants [3]. They concluded that classic objective SES such as occupational grade, income and education were highly correlated to SSS, but none of them fully explained the impact of SSS on health. Two possible explanations for the residual effect of SSS have been proposed [25]: (a) SSS may reflect an individual's SES more comprehensively than objective SES by capturing, for example, feelings of financial security, stocks of wealth, the respect of peers, satisfaction with standard of living, and so on; and (b) SSS may capture not only the objective social grade, but also people's sense of their relative position in society and its impact on health.

On the other hand, the possibility of reverse causation between SSS and health, especially mental health, has also been raised as an alternative explanation [25,34]. That is, depressed individuals are more likely to make pessimistic evaluations of their past and present circumstances. However, a strength of our study is that the outcome was objective (mortality), and not self-assessed (such as depression), thereby avoiding the threat of common method bias.

Limitations of this study should be mentioned. First, childhood SSS was assessed via

subjective recall. Previous research, however, supports the reliability of retrospective assessments of childhood SSS using siblings' recall of childhood SSS [35]. Second, our analysis was limited to all-cause mortality, and cause-specific mortality was not considered. Future studies should examine cause-specific mortality, such as coronary heart disease, stroke, or cancer, to clarify the effect of mobility in SSS among older Japanese adults, who are ranked as having the longest life expectancy in the world [36]. Third, our findings may have been biased by selective survival due to the fact that all the participants were aged 65-100 years at baseline, i.e. more vulnerable population may have already died before the start of follow-up. Lastly, the duration of follow-up (three years) was comparatively short.

In conclusion, our study found a possible harmful effect of downward SSS mobility on mortality among Japanese older men and protective effect of upward SSS mobility among women. The adverse downward effect was mediated by depression. Additionally, mobility in SSS in later life may have higher predictive value on mortality related to depression than objective SES. Mobility in SSS from childhood to older age may be important to be considered when assessing the mortality risk of older people.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Funding: This study used data from JAGES (the Japan Gerontological Evaluation Study), which was supported by the MEXT (Ministry of Education, Culture, Sports, Science and Technology, Japan) Supported Program for the Strategic Research Foundation at Private Universities (2009-2013), JSPS (Japan Society for the Promotion of Science) KAKENHI (grant numbers JP18390200, JP22330172, JP22390400, JP23243070, JP23590786, JP23790710, JP24390469, JP24530698, JP24683018, JP25253052, JP25870573, JP25870881, JP26285138, JP26882010,JP15H01972), Health Labour Sciences Research Grants (grant numbers H22-Choju-Shitei-008, H24-Junkanki [Seishu]- Ippan-007, H24-Chikyukibo-Ippan-009, H24-Choju-Wakate-009, H25-Kenki-Wakate-015,H25-Choju-Ippan-

003, H26-Irryo-Shitei-003 [Fukkou], H26-Choju-Ippan-006, H27-Ninchisyou-Ippan-001), the Research and Development 37 Grants for Longevity Science from AMED (Japan Agency for Medical Research and Development), the Personal Health Record (PHR) Utilization Project from AMED, the Research Funding for Longevity Sciences from the National Center for Geriatrics and Gerontology (grant numbers 24-17, 24-23, 29-42) , World Health Organization Centre for Health Development (WHO Kobe Centre) (WHO APW 2017/713981). The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the respective funding organizations.

Acknowledgements: This study used data from the Japan Gerontological Evaluation Study (JAGES), conducted by the Center for Well-being and Society, Nihon Fukushi University. We thank other JAGES group members for their assistance. We also thank Emma Barber for editing our paper.

REFERENCES

1. Davis JA. Status Symbols and the Measurement of Status Perception. *Sociometry* 1956; **19**(3): 154-65.
2. Hu P, Adler NE, Goldman N, Weinstein M, Seeman TE. Relationship between subjective social status and measures of health in older Taiwanese persons. *J Am Geriatr Soc* 2005; **53**(3): 483-8.
3. Singh-Manoux A, Adler NE, Marmot MG. Subjective social status: its determinants and its association with measures of ill-health in the Whitehall II study. *Soc Sci Med* 2003; **56**(6): 1321-33.
4. Sweeting H, Hunt K. Adolescent Socioeconomic and School-Based Social Status, Smoking, and Drinking. *J Adolesc Health* 2015; **57**(1): 37-45.
5. Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: preliminary data in healthy white women. *Health Psychol* 2000; **19**(6): 586-92.
6. Manuck SB, Phillips JE, Gianaros PJ, Flory JD, Muldoon MF. Subjective socioeconomic status and presence of the metabolic syndrome in midlife community volunteers. *Psychosom Med* 2010; **72**(1): 35-45.
7. Subramanyam MA, Diez-Roux AV, Hickson DA, et al. Subjective social status and psychosocial and metabolic risk factors for cardiovascular disease among African Americans in the Jackson Heart Study. *Soc Sci Med* 2012; **74**(8): 1146-54.
8. Tang KL, Rashid R, Godley J, Ghali WA. Association between subjective social status and cardiovascular disease and cardiovascular risk factors: a systematic review and meta-analysis. *BMJ open* 2016; **6**(3): e010137.
9. Kopp M, Skrabski A, Réthelyi J, Kawachi I, Adler NE. Self-rated health, subjective social status, and middle-aged mortality in a changing society. *Behav Med* 2004; **30**(2): 65-70.
10. Burazeri G, Goda A, Sulo G, Stefa J, Kark JD. Financial loss in pyramid savings schemes, downward social mobility and acute coronary syndrome in transitional Albania. *J Epidemiol Community Health* 2008; **62**(7): 620-6.

11. Nicklett EJ, Burgard SA. Downward social mobility and major depressive episodes among Latino and Asian-American immigrants to the United States. *Am J Epidemiol* 2009; **170**(6): 793-801.
12. Alcántara C, Chen CN, Alegría M. Do post-migration perceptions of social mobility matter for Latino immigrant health? *Soc Sci Med* 2014; **101**: 94-106.
13. Cambois E. Careers and mortality in France: evidence on how far occupational mobility predicts differentiated risks. *Soc Sci Med* 2004; **58**(12): 2545-58.
14. Jankowska EA, Szklarska A, Lipowicz A, Lopuszanska M, Koziel S, Bielicki T. Inter-generation social mobility modifies framingham risk score in Polish middle-aged men, but not in women. *J Biosoc Sci* 2008; **40**(3): 401-12.
15. OECD. OECD Employment Outlook 2002. Paris, France, 2002.
16. Hirai H, Kondo K, Kawachi I. Social Determinants of Active Aging: Differences in Mortality and the Loss of Healthy Life between Different Income Levels among Older Japanese in the AGES Cohort Study. *Curr Gerontol Geriatr Res* 2012; **2012**: 701583.
17. Fujiwara T, Kondo K, Shirai K, Suzuki K, Kawachi I. Associations of childhood socioeconomic status and adulthood height with functional limitations among Japanese older people: results from the JAGES 2010 Project. *J Gerontol A Biol Sci Med Sci* 2014; **69**(7): 852-9.
18. Silventoinen K. Determinants of variation in adult body height. *J Biosoc Sci* 2003; **35**(2): 263-85.
19. Peck MN, Lundberg O. Short stature as an effect of economic and social conditions in childhood. *Soc Sci Med* 1995; **41**(5): 733-8.
20. Burke WJ, Roccaforte WH, Wengel SP. The short form of the Geriatric Depression Scale: a comparison with the 30-item form. *J Geriatr Psychiatry Neurol* 1991; **4**(3): 173-8.
21. Wada T, Ishine M, Kita T, Fujisawa M, Matsubayashi K. Depression screening of elderly community-dwelling Japanese. *J Am Geriatr Soc* 2003; **51**(9): 1328-9.
22. Ortlepp JR, Metrikat J, Albrecht M, Maya-Pelzer P, Pongratz H, Hoffmann R. Relation of body mass index, physical fitness, and the cardiovascular risk profile in 3127 young normal weight men with an apparently optimal lifestyle. *Int J Obes Relat Metab Disord* 2003; **27**(8): 979-82.
23. Demakakos P, Nazroo J, Breeze E, Marmot M. Socioeconomic status and health: the role of subjective social status. *Soc Sci Med* 2008; **67**(2): 330-40.
24. Hamad R, Fernald LC, Karlan DS, Zinman J. Social and economic correlates of depressive symptoms and perceived stress in South African adults. *J Epidemiol Community Health* 2008; **62**(6): 538-44.
25. 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**(6): 855-61.
26. Kondo N, Kawachi I, Subramanian SV, Takeda Y, Yamagata Z. 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**(6): 982-7.
27. Saito M, Kondo N, Kondo K, Ojima T, Hirai H. Gender differences on the impacts of social exclusion on mortality among older Japanese: AGES cohort study. *Soc Sci Med* 2012; **75**(5): 940-5.
28. Poulton R, Caspi A, Milne BJ, et al. Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. *Lancet* 2002; **360**(9346): 1640-5.
29. James SA. John Henryism and the health of African-Americans. *Culture, medicine and psychiatry* 1994; **18**(2): 163-82.
30. Tani Y, Kondo N, Nagamine Y, et al. Childhood socioeconomic disadvantage is associated with lower mortality in older Japanese men: the JAGES cohort study. *Int J Epidemiol* 2016; **45**(4): 1226-35.
31. Baxter J. Is Husband's Class Enough? Class Location and Class Identity in the United States, Sweden, Norway, and Australia. *American Sociological Review* 1994; **59**(2): 220-35.
32. Operario D, Adler NE, Williams DR. Subjective Social Status: Reliability and Predictive Utility for Global Health. *Psychology and Health* 2004; **19**(2): 237-46.
33. Ostrove JM, Adler NE, Kuppermann M, Washington AE. Objective and subjective assessments of socioeconomic status and their relationship to self-rated health in an ethnically diverse sample of pregnant women. *Health Psychol* 2000; **19**(6): 613-8.
34. Nobles J, Weintraub MR, Adler NE. Subjective socioeconomic status and health: relationships reconsidered. *Soc Sci Med* 2013; **82**: 58-66.
35. Ward MM. Concordance of sibling's recall of measures of childhood socioeconomic position. *BMC Med Res Methodol* 2011; **11**: 147.
36. World Health Organization. World Health Statistics 2014. 2014 (accessed 18th Oct. 2015).

Table 1 Characteristics of participants

	Men (n=7,944)	Women (n=8,746)
	N (%)	N (%)
Age (years)		
65–69	2731 (34.4%)	2844 (32.5%)
70–74	2332 (29.4%)	2531 (28.9%)
75–79	1656 (20.8%)	1800 (20.6%)
80 ≤	1225 (15.4%)	1571 (18.0%)
Mobility of SSS*		
Persistently high	2042 (25.7%)	2756 (31.5%)
Downward mobility	1588 (20.0%)	2622 (30.0%)
Upward mobility	2829 (35.6%)	2114 (24.2%)
Persistently low	1485 (18.7%)	1254 (14.3%)
Height[a]		
Short	580 (7.3%)	1071 (12.2%)
Middle-short	1331 (16.8%)	2442 (27.9%)
Middle	2498 (31.4%)	2884 (33.0%)
Middle-tall	2066 (26.0%)	1461 (16.7%)
Tall	1092 (13.7%)	389 (4.4%)
Missing	377 (4.7%)	499 (5.7%)
Equivalised income (million yen)		
High (≥ 4.00)	851 (10.7%)	782 (8.9%)
Middle (2.00 - 3.99)	2846 (35.8%)	2569 (29.4%)
Low (< 2.00)	3201 (40.3%)	3506 (40.1%)
Missing	1046 (13.2%)	1889 (21.6%)

Education (years)		
High (≥ 13)	1654 (20.8%)	971 (11.1%)
Middle (10 - 12)	2528 (31.8%)	2930 (33.5%)
Low (- 9)	3465 (43.6%)	4538 (51.9%)
Other/Missing	297 (3.7%)	307 (3.5%)
Marital status		
Married	6748 (84.9%)	5056 (57.8%)
Widowed	611 (7.7%)	2846 (32.5%)
Divorced	181 (2.3%)	321 (3.7%)
Unmarried	102 (1.3%)	190 (2.2%)
Others/Missing	302 (3.8%)	333 (3.8%)
Smoking status		
Non-smoker	1873 (23.6%)	7066 (80.8%)
Smoker/ex-smoker	5516 (69.4%)	674 (7.7%)
Missing	555 (7.0%)	1006 (11.5%)
Alcohol intake		
Current drinker/Ex-drinker	4778 (60.1%)	1332 (15.2%)
Non-drinker	2698 (34.0%)	6923 (79.2%)
Missing	468 (5.9%)	491 (5.6%)
Walking time		
< 30 min/day	2354 (29.6%)	2869 (32.8%)
≥ 30 min/day	5156 (64.9%)	5279 (60.4%)
Missing	434 (5.5%)	598 (6.8%)
Body weight status (BMI, kg/m2)		
Underweight (< 18.5)	424 (5.3%)	699 (8.0%)
Normal (18.5–24.9)	5397 (67.9%)	5749 (65.7%)

Overweight (25.0–29.9)	1612 (20.3%)	1550 (17.7%)
Obesity (≥ 30.0)	128 (1.6%)	228 (2.6%)
Missing	383 (4.8%)	520 (5.9%)
Depressive symptoms		
No depression (GDS < 5)**	4970 (62.6%)	5130 (58.7%)
Moderate depression (5 ≤ GDS < 10)	1406 (17.7%)	1490 (17.0%)
Depression (10 ≤ GDS)	496 (6.2%)	539 (6.2%)
Missing	1072 (13.5%)	1587 (18.1%)

[a]Height (<155, 155–159.9, 160–164.9, 165–169.9, and ≥170cm for men and <145, 145–149.9, 150–154.9, 155–159.9, and ≥160cm for women).

*SSS = Subjective Socioeconomic Status

**GDS = Geriatric Depression Scale

Table 2. Hazard ratio of SSS* mobility, SES and other covariates among men (N=7,944)**

	Model 1	Model 2	Model 3	Model 4
Persistently high	ref	ref	ref	ref
Downward	**1.37 (1.08 - 1.74)**	**1.35 (1.05 - 1.72)**	1.22 (0.95 - 1.56)	1.22 (0.95 - 1.56)
Upward	0.87 (0.69 - 1.09)	0.85 (0.68 - 1.08)	0.83 (0.66 - 1.04)	0.84 (0.66 - 1.05)
Persistently low	0.95 (0.73 - 1.24)	0.91 (0.69 - 1.20)	0.83 (0.63 - 1.10)	0.78 (0.59 - 1.03)
	Model 5	Model 6	Model 7	Model 8
Persistently high	1.05 (0.80 - 1.37)	1.09 (0.83 - 1.44)	1.20 (0.91 - 1.58)	1.28 (0.97 - 1.69)
Downward	1.44 (1.10 - 1.88)	1.47 (1.13 - 1.93)	1.46 (1.12 - 1.91)	1.56 (1.19 - 2.04)
Upward	0.91 (0.71 - 1.18)	0.94 (0.72 - 1.22)	0.99 (0.76 - 1.29)	1.07 (0.82 - 1.39)
Persistently low	ref	ref	ref	ref

Models 1 and 5 were adjusted for age

Models 2 and 6 were additionally adjusted for height, equivalised income, education, marital status

Models 3 and 7 were additionally adjusted for GDS***

Models 4 and 8 were additionally adjusted for smoking status, drinking habits, BMI**** and walking times

* SSS = Subjective Socioeconomic Status

** SES = Socioeconomic Status

*** GDS = Geriatric Depression Scale

**** BMI = Body Mass Index

Table 3. Hazard ratios of SSS* mobility, SES** and other covariates among women (N=8,746)

	Model 1	Model 2	Model 3	Model 4
Persistently high	ref	ref	ref	ref
Downward	1.27 (0.94 - 1.71)	1.22 (0.90 - 1.65)	1.10 (0.81 - 1.50)	1.08 (0.79 - 1.47)
Upward	0.71 (0.49 - 1.04)	0.69 (0.48 - 1.02)	0.68 (0.47 - 1.00)	0.69 (0.47 - 1.01)
Persistently low	1.33 (0.91 - 1.94)	1.20 (0.81 - 1.76)	1.07 (0.72 - 1.58)	1.01 (0.68 - 1.50)
	Model 5	Model 6	Model 7	Model 8
Persistently high	0.75 (0.52 - 1.10)	0.83 (0.57 - 1.23)	0.94 (0.63 - 1.38)	0.99 (0.67 - 1.47)
Downward	0.95 (0.66 - 1.38)	1.02 (0.70 - 1.48)	1.03 (0.71 - 1.49)	1.06 (0.73 - 1.55)
Upward	**0.54 (0.35 - 0.83)**	**0.58 (0.38 - 0.90)**	**0.64 (0.41 - 0.99)**	0.68 (0.44 - 1.07)
Persistently low	ref	ref	ref	ref

Models 1 and 5 were adjusted for age

Models 2 and 6 were additionally adjusted for height, equivalised income, education, marital status

Models 3 and 7 were additionally adjusted for GDS***

Models 4 and 8 were additionally adjusted for smoking status, drinking habits, BMI**** and walking times

* SSS = Subjective Socioeconomic Status

** SES = Socioeconomic Status

*** GDS = Geriatric Depression Scale

**** BMI = Body Mass Index