Socioeconomic Status and Subjective Social Status are Associated with Physical and Pulmonary Function in Older Taiwanese Adults

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ABSTRACT

It is well documented that socioeconomic inequalities have a substantial impact on health outcomes, including functional disability. Although a handful of studies have reported on the functional consequences of socioeconomic status (SES), few have examined both self-reported and performance-based measures of functioning. This study uses the Social Environment and Biomarkers of Aging Study to investigate the relationships among objective SES and subjective social status with self-reported and performance-based measures of physical and pulmonary function in Taiwanese older adults. I find that objective and subjective measures of SES are associated with self-reported and performance-based lower limb function, as well as pulmonary function. This underscores the importance of both subjective social status and objective measures of SES in determining perceptions of and observed ability to complete mobility tasks and lung function performance.

Key words: socioeconomic status, social status, functional limitations, mobility, pulmonary function

INTRODUCTION

It is well documented that socioeconomic inequalities have a substantial impact on health outcomes. Educational attainment and income, two of the most commonly used indicators of socioeconomic status (SES) have been associated with functional disability, morbidity, and mortality (Antonovsky, 1967; Avendano et al., 2006; Guralnik, Fried, Salive, 1996; Illsley & Baker, 1991). Given the differences in functional limitations by SES among older adults (Guralnik et al., 1993; Melzer et al., 2001), studying the relationships between other indicators of SES, including subjective measures of social status, and performance-based physical function and pulmonary function, which has been linked to physical function, represents an important area for further investigations of health disparities linked to socioeconomic differences. Additionally, understanding how social inequalities contribute to physical function is important given that functional status is an important aspect of living independently in the community and has been associated with a wide range of health outcomes (Kane & Kane, 1981; Wilson & Cleary, 1995), including chronic health conditions (Guralnik et al., 1989) and mortality at older ages (Ford et al., 1990). Physical function has oftentimes been considered an indicator of general health, healthy aging, and a determinant of quality of life among older populations (Jylhä et al., 2001; Osberg et al., 1987).

DESCRIPTION OF THE PROBLEM

Objective performance-based measures of mobility loss provide a more valid assessment of functional ability than self-report measures, especially for older adults who may have an inaccurate perception of their mobility capabilities (Simonsick et al., 2008). Models of the disability process illustrate such important distinctions in the functional domains incorporated

into the theoretical pathway from disease to disability (Institute of Medicine, 1991; Nagi, 1976; Verbrugge & Jette, 1994). These models view the disablement process as a sequence of steps in which disease leads to impairments (dysfunctions or structural abnormalities in body systems), which lead to functional limitations (limited ability to perform basic cognitive and physical tasks), and in turn result in disability (further restriction or inability to perform social roles or desired activity within a given environment).

Measures used to investigate disparities in physical function have typically relied on self-reported ability to perform a given task. Self-reports of functioning (e.g., ability to perform activities of daily living) underscore a severe disability, which is typically the final outcome of a progressive disablement process (Ferrucci et al., 1996). In contrast, performance-based measures of lower extremity function are often a precursor to a more severe form of disability and can be considered a "vital sign" sign of physical function (Studentski et al., 2003), thereby enabling researchers and clinicians to monitor and quantify functional limitations prior to disability (Vasunilashorn et al., 2009). While a handful of studies have examined the reported consequences of SES measures in different populations (Bassuk, Berkman, Amick, 2002; Fried & Guralnik, 1997; Guralnik et al., 1993; Hu et al., 2005; Knesebeck et al., 2003; Snowdon et al., 1989; Stuck et al., 1999), most studies have examined either self-reported (Berkman et al., 1993; Huisman, Kunst, Mackenbach, 2003; Kington & Smith, 1997; Melzer et al., 2001; Smith & Kington, 1997) or performance-based measures of functioning (Berkmann & Gurland, 1998; Coppin et al., 2006). Hence, little is known about how subjective and objective measures of SES relate to self-reported and performance-based measures of physical and pulmonary function, which has been associated with mortality and physical function (Cook et al., 1991, 1995; Schunemann et al., 2000).

PURPOSE

The primary goal of this study is to estimate the association between SES and physical and pulmonary function in late life. The Social Environment and Biomarkers of Aging Study (SEBAS) is an appropriate dataset for this analysis because it collects various measures of SES and physical function in a modest sample (about 1000) of older Taiwanese adults. One subjective and two objective measures of SES are used: the MacArthur Subjective Social Status scale, household income, and years of education obtained (respectively). Both self-reported (activities of daily living and other mobility tasks) and performance-based measures of physical function (grip strength, 3m walk, and chair stands) are examined, in addition to a performance test of lung function (peak expiratory flow).

METHODS

Sample

The data are from the Social Environment and Biomarkers of Aging Study (SEBAS). SEBAS includes a random subsample of participants from the Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan, a nationally representative survey of older Taiwanese adults (including institutionalized individuals) that began in 1989. Participants age 71 and older in 2000 are oversampled relative to the near-elderly (age 54-70), and urban areas are over-sampled compared to rural areas. All protocols have been approved by the Institutional Review Boards at Princeton University, Georgetown University, and the Bureau of Health Promotion, Department of Health, Taiwan.

Among the participants aged 54 and older selected for SEBAS, 1497 (92% of the survivors) were interviewed in 2000, and 1,023 had a physical examination (68% of individuals interviewed). Participants who did participate in the physical examination are more likely to be younger than age 70 compared to those who did not participate. Participants did not, however, differ significantly from non-participants on measures of SES, sex distribution, or average score of self-reported health. These findings indicate that, after controlling for age, estimates using the measures obtained from the physical exam are unlikely to be highly biased (Goldman et al., 2003).

A second round of SEBAS, fielded in 2006, includes interviews and a medical exam for participants who had a physical exam in SEBAS 2000. Among survivors, the participation rate for this second exam was 76%. The analysis in this paper is based on physical and pulmonary function measures collected in 2006. Additional information about SEBAs has been previously published (Chang et al., 2007; Glei et al., 2011).

Measures

SES Variables

Subjective Social Status.— During the interview, the MacArthur Scale of Subjective Social Status is shown to the participants; this illustration of a ladder with 10 rungs is described as follows: "Think of this ladder as representing where people stand in our society. At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, and worse jobs or no job." Participants are asked to mark the rung that best represents where they believe they stand on the ladder (Adler et al., 2000). A dichotomous

variable for high and low levels of social position is based on the sample median, so that scores of 1-4 are considered low compared to high ladder scores of 5-10.

Objective Socioeconomic Status.— Education is measured by the number of years of education obtained by the respondent. Income is quantified as the respondents' and spouses' combined income. Education and income are dichotomized into high and low groups based on the medians of the distribution because about 50% of participants had 0-6 years of education. Low levels of household income included individuals with <270,000 New Taiwanese [NT] $; 1 US $ ≈ 34 NT $).

Physical Function variables

Self-reported measures

Participants are asked to self-report any difficulty independently completing six activities of daily living (ADLs) and nine additional indicators of physical function. The ADLs include: bathing; dressing and undressing; eating; getting out of bed, standing up, or sitting in a chair; moving around the house; and using the toilet. The nine indicators of physical function include: standing continuously for 15 minutes; standing continuous for 2 hours; squatting; raising both hands over head; grasping or turning objects with fingers; lifting or carrying item(s) weighing 11-12 kgs; running 20-30 meters; walking 200-300 meters; and walking up two or three flights of stairs. For each of the six ADLs and nine mobility tasks, participants are asked if they had no difficulty, some difficulty, great difficulty, or are unable to do the activity. I create two dichotomous variables indicating (1) inability to perform at least one of six ADLs and (2) inability to perform at least one of nine mobility tasks. Among individuals able to perform all six ADLs, an ADL limitation score is created. Additionally, among participants who report being able to perform all nine mobility tasks, a mobility limitation score is created. The ADL

limitation and mobility limitation scores are calculated by summing the values (0=no difficulty, 1=some difficulty, 2=great difficulty) across the six activities for the ADL limitations score (possible range 0-12; 12 indicating the highest degree of limitations) and the nine mobility tasks for the mobility limitation score (possible range 0-18; 18 indicating the highest degree of limitations).

Performance-based measures

In the 2006 round, interviewers carried out the following tests of physical function: timed walk, timed chair stands, and grip strength. Respondents are asked to walk 3m at their usual walking speed. Due to space limitations, 10 respondents walked less than 3m. For these individuals, who walked between 2 and 2.5 m, the time is scaled up proportionally. Participants are able to use assistive devices, if required. As reported in the literature, the fastest 3m walking speed from the two trials is used (Cornman et al., 2010; Guralnik et al., 2000; Rivera et al., 2008). The Pearson correlation between the two walks is .99.

For the chair stand test, participants are asked to keep their arms folded across their chest while standing up and down from a hard seated, armless chair. The back of the chair was placed against the wall and the participants are asked to complete five chair stands as quickly as possible. Participants are timed from the starting seated position to the standing position at the end of the fifth stand. Since chair heights differed from home to home, chair stand test findings are adjusted to account for this variation in chair height (for details, see Cornman et al., 2010). Participants are classified as unable to complete the chair stand test if they could not complete the five stands, were wheelchair bound, and if the participant or the interviewer felt it was unsafe to attempt. Among those able to complete the chair stand test, chair stand speed (stand/sec) is

calculated as the number of chair stands (5) divided by completion time (adjusted for chair height).

Grip strength is measured using a North Coast™ hydraulic hand dynamometer (NC70142). Measurements are taken three times for each hand while the participant is in a seated position with the elbow flexed at 90°. Participants are encouraged to exhibit the strongest possible force, and the highest value among the six trials is used in our analysis. Participants are classified as unable to complete the handgrip strength test if they attempted but were unable to complete the task, had weakness due to stroke or frailty, if the participant or interviewer felt it was unsafe to attempt, or if the task was stopped due to participant discomfort.

Peak expiratory flow (PEF; L/min) rate, an indicator of pulmonary function, is examined using a TruZone peak flow meter. The fastest speed for PEF rate is determined from three trials. Participants are classified as unable to complete the test of pulmonary function if they were excluded based on exclusion criteria, had a stroke or illness, if the interviewer felt it was unsafe, or if they attempted but could not complete the PEF trials.

Analysis

The sample size for our analyses varies slightly across the different outcomes due to missing data (values for PEF represent the highest percent of missing information [1.4%]). I conduct data analysis in two stages. First I use logistic regression models to determine the association between the SES measures and inability to complete any of the six ADLs, any of the nine indicators of physical function, and each of the tests of physical and pulmonary function. Among individuals able to complete a given task, I next use linear regression models to examine performance on the measure or test by the SES measure classifications.

Two sets of models are conducted. The first set of models includes only subjective or objective SES variables one at a time and additionally adjusts for sociodemographic variables (age, sex, marital status [currently married or not married], and rural or urban residency]), body mass index (BMI; kg/m2) and a summary count of medical conditions. The summary count of medical conditions (possible range 0-12) considered whether the respondent currently has hypertension, heart disease, cancer, respiratory problems, arthritis, an ulcer, liver problems, cataracts, kidney problems, gout, spinal problems, and if he or she has ever had diabetes mellitus. The second set of models assesses the effects of subjective and objective measures of SES simultaneously and adjusts for the same covariates as Model 1.

RESULTS

The average age of the participants is 65.8 years, with more males (53.8%) due to the selective migration of Mainlander men to Taiwan around 1949 (Table 1). Most study participants are married (75.8%) and have less than seven years of education (61.7%). Respondents have an average BMI of 24.8 kg/m^2 and 1.5 medical conditions. They report an average subjective ladder score of 4.3 points and about half have a low income (<270,000 NT$). About 1% report being unable to complete at least one ADL, 24.5% report the inability to complete at least one of the nine other measures of physical function, nearly 2% cannot complete the handgrip strength test, about 3% are unable to complete the 3m walk, 7% cannot complete the five chair stands, and 2% are unable to complete a single PEF trial.

The estimated odds ratios (OR) for the first set of logistic regression models predicting self-reported or performance-based inability to complete a given physical or pulmonary function task is reported in Table 2A. These results reveal that self-reported inability to complete at least

one of nine mobility tasks is significantly associated with all three SES measures entered in separate models. Model 1 illustrates that individuals with a low ladder score have a 1.44 times greater odds of reporting the inability to complete at least one mobility task compared to those with a high ladder score. Lower educated people have a 1.80 times greater odds of self-reported inability to complete a mobility task compared to individuals with higher education (Model 1). Compared to individuals with high income, participants with low income have a higher odds of being unable to complete a minimum of one mobility task (OR 1.65, 95% confidence interval [CI] 1.13, 2.42; Model 1), after adjusting for sociodemographic variables, BMI, and number of medical conditions. After including of all three SES measures in one model (Model 2), the association between SES and reported inability to complete any mobility task is no longer significant. Aside from the self-reported mobility ability measure, the subjective social status and objective SES measures are not predictive of the inability to complete any other physical or pulmonary function outcomes.

Among participants able to perform the six ADLs, the nine mobility tasks, or the interviewer-assessed tasks, I next use linear regression models to examine functional abilities (self-reported or observed) by SES measures (Table 2B). I find a relationship between each of the three SES measures and 3m walking speed and chair stand speed. A lower ladder score is associated with a 0.05 m/sec slower walking speed (95% CI -0.08, -0.02) and 0.02 stand/sec slower chair stand speed (95% CI -0.05, 0.00) after adjusting for sociodemographic characteristics, BMI, and total number of medical conditions (Model 1). Individuals with less than six years of education have a slower walking speed and chair stand speed compared to individuals with 7 or more years of education (0.07 m/sec and 0.03 stand/sec slower, respectively; Model 1). Similarly, low income is associated with slow performance on the 3m

walk test and the chair stand test. Compared to individuals with a high income, low income individuals have a slower walking and chair stand speed: 0.05 m/sec and 0.03 stand/sec slower, respectively (Model 1). When I include all SES measures in one model and additionally adjust for sociodemographic variables, BMI, and medical conditions, only the ladder score and educational attainment remained significant predictors of slower walking speed (Model 2). None of the SES measures are predictive of chair stand speed when all three measures are included in one model (Model 2). No SES measures are associated with grip strength.

The subjective social status and objective SES measures are associated with performance on the test of pulmonary function. Participants with a low subjective ladder score have a 9.26 L/min slower PEF compared to those with a high ladder score (Model 1). Additionally, low education and low income are each independently associated with low PEF (β = -36.69 and -18.96 L/min; respectively, Model 1), compared to their respective high education and high income counterparts. Inclusion of subjective social status and the objectives SES measures in a single model (Model 2) indicates that only the subjective ladder score and education level are predictive of pulmonary function, while income is no longer predictive of PEF.

DISCUSSION

The primary purpose of this study is to extend prior work on the association between SES and physical function by examining both self-reported and performance-based measures of physical and pulmonary functioning. Two main observations emerge. First, a simple subjective ranking of an individual's social hierarchy and objective measures of SES (educational attainment and income) are predictive of both self-reported and performance-based measures of lower limb mobility function and lung function. Second, our subjective social measure seems to

capture an additional aspect of social status that is not incorporated in traditional SES measures of household income and educational attainment.

Our finding of poorer physical function among individuals with lower perceived social position replicates previous work that links perceived social position to health. In a study sample of Taiwanese older adults, lower perceived social status predicted declines in health, including depressive symptoms, self-assessed health, self-reported mobility restrictions, and reported difficulty with instrumental activities of daily living (Collins & Goldman, 2008; Hu et al., 2005). Similar reports of an inverse relationship between perceived social position and health have been reported in younger study samples and in populations with higher educational attainment (Adler et al., 2000; Dunn et al., 2006; Macleod et al., 2005; Singh-Manoux et al., 2003; Singh-Manoux et al., 2005). Additionally, the link between reported and performance-based mobility limitations and objective SES measures observed in the current study has similarly been observed in prior studies of different populations. For example, lower education levels are a risk factor for mobility loss in men enrolled in the Established Populations for Epidemiologic Studies of the Elderly (Guralnik et al., 1993), a study of older adults residing in select regions in the US.

The negative correlation between lung function and objective SES is consistent with prior reports (for a review, see Hegewald & Crapo, 2007). Although most studies are conducted in developed countries (e.g., the US [Burchfiel et al., 1996; Jackson et al., 2004], UK [Hole et al., 1996; Wheeler & Ben-Shlomo, 2005], Canada [Demissie et al., 1996], France [Krzyanowski & Kauffmann, 1988], Norway [Welle et al., 2004], and Denmark [Prescott, Lange, & Vestbo, 1999], some smaller studies include developing countries such as South Africa (Mokoetle, de Beer, & Becklake, 1994), India (Raju et al., 2005), Jamaica (Melville et al., 1984), and Bangladesh (Choudhury, Alam, & Begum, 1997). The current study extends prior findings by

demonstrating associations between low subjective social status and poor lung function, which is a predictor of an increased risk of cardiovascular disease and all-cause mortality (Hole et al., 1996; Schunemann et al., 2000; Strachan, 1992). To my knowledge, the current study is one of the first to report on the relationship between perceived social status and pulmonary function.

Although the association between subjective social status and mobility, as well as lung function, is modestly attenuated after controlling for the effect of income and education, education and the subjective ladder score remain significant predictors of walking speed and peak flow while income is not. Two conclusions can be made. First, and unsurprisingly, education captures all of the effect that income has on its relationship with walking speed and pulmonary function performance. Interestingly, the second observation indicates that the subjective social status score captures a different aspect of social ranking that is not incorporated in the objective SES measures of educational attainment and income. It is possible that these perceived social rankings include information about current and past situations, in addition to future potential circumstances, which may in turn be associated with physical health (Jackman, 1979).

I did not observe a relationship between SES and handgrip strength. Grip strength, a surrogate measure of overall muscle strength, is predictive of bone mineral density and vertebral fracture in women (Dixon et al., 2005), incident disability (Giampaoli et al., 1999), all-cause mortality (Ling et al., 2010), and is often present with pathological conditions commonly observed in late life (e.g., osteoarthritis, osteoporosis, and rheumatoid arthritis; Brosseau et al., 2000; Burkholder, 2000; Chaisson et al., 1999; Estes et al., 2000). Cross-national differences in grip strength have been reported and may partly explain the lack of a relationship to SES observed in our current analysis. One study finds that grip strength levels are lower in southern

European countries compared to northern and continental European countries (Andersen-Ranberg et al., 2009). Additionally, higher levels of gender-specific grip strength are found among US and Danish men and women compared to their Japanese counterparts (Oksuzyan et al., 2010). Although such comparisons may be influenced by differences in testing equipment, testing position and protocol, such cross-country differences in handgrip strength and in the relationship between grip strength and SES may be partly attributed to differences in socioeconomic development (Carlson, 1998) and income inequality (Huisman, Kunst, & Mackenbach, 2003).

The lack of an association between SES and reported difficulty with ADLs in the current study is similarly reported in a study of older Chinese adults (Beydoun & Popkin, 2005). In contrast, a study of older adults in Europe found that lower SES is associated with greater reported difficulty with daily activities (Huisman, Kunst, & Mackenbach, 2003). Differences in cultural perceptions of health (Jürges, 2007) may partly explain observed differences in the absence of an association between SES measures and difficulties with ADLs in our population of Taiwanese adults (and other Chinese older adults enrolled in the China Health and Nutrition Survey; Beydoun & Popkin, 2005).

There are a number of strengths of the current research. This unique dataset of a population-based sample of older Taiwanese adults examines a broad range of demographic characteristics, self-reported functional limitations, performance-based measures of physical and pulmonary function, and subjective and objective SES information. The use of performance-based measures of functioning enabled me to more thoroughly consider the possibility that an individuals' general sense of well-being is related to both subjective social status ranking and reported health status. These findings contribute to the literature on SES and physical and

pulmonary function, particularly since few studies of subjective social status and performance-based measures of function include Asian populations.

I also note some study limitations. First, the power to detect SES differentials with respect to inability to perform at least one ADL and to complete the grip strength test is limited by the prevalence of participants who are unable to complete these tests (1.2% and 1.7%, respectively). Second, the longitudinal associations between SES and performance-based measures of physical and pulmonary function cannot be determined given data limitations. As such, I am unable to determine whether low subjective social status is a consequence of poor physical function or if a low ranking in perceived social status results in functional limitations.

CONCLUSION

In summary, this study finds that subjective and objective SES measures are associated with self-reported and performance-based mobility and pulmonary function. This underscores the importance of both subjective social status and objective measures of SES in determining perceptions of and observed ability to complete mobility tasks and lung function performance in an older ethnic Chinese population. Future investigations that examine longitudinal change in SES (e.g., change in income or in subjective social position) and change in performance-based physical and pulmonary function is needed to determine the temporal relationship between subjective and objective SES and observed health outcomes.

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Table 1.Sociodemographic characteristics and health status of the study sample

	N	Mean (SD) of %
Age	955	65.8 (9.9)
Male (%)	955	53.8
Married (%)	955	75.8
Body mass index (BMI)	955	24.8 (3.5)
Number of medical conditions	955	1.5 (1.5)
Education (yrs)	955	7.04 (4.8)
0-6		61.7
7+		38.3
Subjective ladder score	955	4.3 (1.8)
1-4		45.3
5-10		54.7
Annual income, NT$	955	520303 (820,655)
Low income (<260,000) (%)		50.3
Self-reported physical function		
Unable to perform at least one ADL	955	1.2
ADL limitation score*	944	0.1 (0.7)
Unable to perform at least one physical function measure	949	24.5
Physical function limitation score**	717	1.1 (2.0)
Performance-based physical function		
Unable to complete a grip strength test (%)	948	1.7
Grip strength (kg)***	932	27.9 (10.4)
Unable to walk 3m (%)	949	2.7
3m walk speed (m/sec)***	923	0.9 (0.3)
Unable to complete chair stands (%)	947	6.9
Chair stand speed (stand/sec)***	882	0.5 (0.2)
Unable to complete a single PEF trial (%)	944	2.0
PEF (L/min)***	925	338.8 (139.2)

ADL = activities of daily living; PEF = peak expiratory flow
Mean/SD or % values based on unweighted analysis
*Among individuals reporting the ability to perform all 6 ADLs
** Among individuals reporting the ability to perform all 9 measures of physical function
***Among individuals able to complete the test
1 US $ ≈ 34 New Taiwanese $

Table 2A. Logistic regression models predicting the inability to perform an ADL or physical performance measures and inability to complete tests of physical and pulmonary function by Ladder score (Reverse coded - continuous), low education (<7 years), and low income (<260,000); B. Linear regression models predicting the extent of difficulty with ADLs, self-reported physical performance measures, and performance on tests of physical and pulmonary function by Ladder score (Reverse coded - continuous), low education (<7 years), and low income (<260,000)

A.	Self-reported inability		Performance-based inability			
	ADLs	Mobility	Grip strength	3m walk	Chair stands	Peak Flow
	N = 955	N = 949	N = 948	N = 949	N = 947	N= 944
Models	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Model 1						
Low ladder score	1.29 (0.38, 4.38)	**1.44 (1.02, 2.04)**	1.92 (0.68, 5.61)	2.27 (0.97, 5.28)	1.58 (0.91, 2.73)	3.30 (1.16, 9.43)
Low education level	1.61 (0.31, 8.39)	**1.80 (1.18, 2.74)**	1.83 (0.38, 8.92)	1.27 (0.44, 3.73)	1.35 (0.67, 2.72)	1.97 (0.98, 1.09)
Low income	0.86 (0.21, 3.52)	**1.65 (1.13, 2.42)**	3.05 (0.62, 14.91)	2.23 (0.77, 6.46)	1.15 (0.61, 2.15)	2.38 (0.71, 7.96)
Model 2						
Low ladder score	1.22 (0.34, 4.37)	1.26 (0.88, 1.80)	1.71 (0.58, 5.06)	2.15 (0.89, 5.16)	1.53 (0.87, 2.69)	2.93 (1.00, 1.59)
Low education level	1.64 (0.29, 9.40)	1.53 (0.98, 2.38)	1.18 (0.22, 6.24)	0.80 (0.25, 2.53)	1.18 (0.56, 2.48)	1.20 (0.30, 4.84)
Low income	0.74 (0.17, 3.16)	1.43 (0.96, 2.14)	2.63 (0.51, 13.53)	2.02 (0.67, 6.12)	1.01 (0.53, 2.48)	1.85 (0.54, 6.42)

B.	Self-reported limitations		Performance-based limiations			
	ADLs	Mobility	Grip strength	3m walking speed	Chair stand speed	Peak Flow
	N = 944	N = 717	N = 932	N = 923	N= 882	N=925
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Model 1						
Low ladder score	0.08 (-0.01, 0.16)	0.37 (0.11, 0.64)	-0.09 (-0.95, 0.77)	**-0.05 (-0.08, -0.02)**	**-0.02 (-0.05, 0.00)**	**-9.26 (-13.02, -5.50)**
Low education level	-0.01 (-0.11, 0.09)	0.15 (-0.14, 0.44)	-0.81 (-1.76, 0.14)	**-0.07 (-0.10, -0.03)**	**-0.03 (-0.06, -0.01)**	**-36.69 (-51.84, -21.55)**
Low income	0.10 (-0.01, 0.20)	0.23 (-0.07, 0.53)	-0.80 (-1.75, 0.15)	**-0.05 (-0.08, -0.01)**	**-0.03 (-0.06, 0.00)**	**-18.96 (-34.25, -3.68)**
Model 2						
Low ladder score	0.07 (-0.02, 0.17)	0.34 (0.06, 0.62)	0.18 (-0.71, 1.08)	**-0.03 (-0.07, 0.00)**	-0.01 (-0.04, 0.01)	**-10.71 (-24.89, 3.47)**
Low education level	-0.06 (-0.16, 0.05)	0.02 (-0.28, 0.33)	-0.69 (-1.70, 0.32)	**-0.05 (-0.09, -0.02)**	-0.02 (-0.05, 0.01)	**-31.31 (-47.40, -15.21)**
Low income	0.10 (-0.01, 0.20)	0.14 (-0.17 0.45)	-0.66 (-1.65, 1.08)	-0.03 (-0.07, 0.01)	-0.02 (-0.05, 0.00)	-8.67 (-24.45, 7.12)

ADLs = activities of daily living
Model 1 includes a single measure of SES in addition to age, sex, marital status, rural/urban residence, BMI, and total number of medical conditions
Model 2 includes ladder score, education, income, and Model 1 covariates