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## Perceived Social Position and Health in Older Adults in Taiwan

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### Abstract

We examined whether perceived social position predicted mental and physical health outcomes (depressive symptoms, cognitive impairment, mobility restrictions, and self-assessed health) in a prospective study based on a nationally representative sample of older persons in Taiwan. Cross-sectional and longitudinal models were used to demonstrate the relationship between perceived social position and health, as reported by participants in the Social Environment and Biomarkers of Aging Study in Taiwan (SEBAS). Lower perceived social position predicted declining health beyond what was accounted for by objective indicators of socioeconomic position. As predicted, the effect was substantially reduced for all health outcomes in the presence of controls for baseline health. After including these controls, perceived social position was significantly related only to depressive symptoms. The findings suggest that the strength of the association between perceived social position and health may have been overstated in cross-sectional studies.

### Keywords

Taiwan; perceived social position; older adults; mental health; physical health

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Social scientists from a broad range of disciplines have observed that a positive relationship exists between measures of socioeconomic status (SES) and health (Adler, Boyce, Chesney, & Cohen, 1994; Blaxter, 1987; Link & Phelan, 1995). More recently, investigators have focused on perceived social position as a predictor of health. Perceived social position is typically measured by asking respondents in surveys to assess their social status relative to others, often with reference to a visual analogue, such as a ladder with ten rungs (Adler, Epel, Castellazzo, & Ickovics, 2000). Multiple studies demonstrate that perceived social position continues to predict health once traditional measures of SES, like income and education, have been taken into account (Dunn, Veenstra, & Ross, 2006; Operario, Adler, & Williams, 2004; Singh-Manoux, Adler, & Marmot, 2003; Singh-Manoux, Marmot, & Adler, 2005). While the appraisal processes involved in perceived social position are unknown, it is likely that they constitute a “cognitive averaging” of traditional measures of socioeconomic position, including education, occupational status, and income, as well as psychosocial components such as perceptions of social rank and social networks (Singh-Manoux et al., 2005).

Perceived social position may be a particularly useful indicator of SES for older adults, because conventional measures of SES are often inappropriate at this stage of the lifespan. For example,

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income and occupation may be misleading measures when respondents are retired or receive financial help from their children (Chan, Ofstedal, & Hermalin, 2002; Goldman, Cornman & Chang, 2006). Similarly, education and occupational status may not adequately reflect the social position of older women who have had few educational and professional opportunities in their lifetimes. This is particularly relevant in Taiwan, where many women have had little education and have never worked outside the home (Cornman, Goldman, Gleib, Weinstein, & Chang, 2003). These limitations of conventional measures of SES for older persons may help to explain why the associations between measures of SES and health appear to weaken in late adulthood (House, Lantz & Herd, 2005; Marmot & Shipley, 1996).

Two explanations have been put forward to explain the relationship between perceived social position and health. The first is that perceived position may provide a better assessment of SES than traditional objective indicators, i.e., that perceived social position may reflect aspects of individuals' social and cultural circumstances that are not captured by conventional measures (Singh-Manoux et al., 2005). Assigning social status requires respondents to make cognitive evaluations of their own lives, which may lead to a more complete representation of their social circumstances. For example, ethnic identification and the sex and education level of children have been shown to influence individuals' perceptions of social position (Franzini & Fernandez-Esquer, 2006; Goldman, Cornman & Chang, 2006; Tropp & Wright, 1999).

The second argument is that perceived social position encompasses perceptions of disadvantage and subordination. Animal studies have demonstrated that lower social ranking can lead to chronic stress in some animals (Sapolsky, 2004), which in turn exacerbates illness through neuroimmune and neuroendocrine deficiencies (McEwen & Stellar, 1993). Lower perceived social position may encompass negative feelings about one's place in the social hierarchy, which can also contribute to chronic illness (Operario et al., 2004; Robles, Glaser, & Kiecolt-Glaser, 2005).

Studies illuminating a strong relationship between perceived social position and health have been primarily cross-sectional (Adler et al., 2000; Cheng, Chi, Boey, Ko, & Chou, 2002; Dunn et al., 2006; Hu, Adler, Goldman, Weinstein, & Seeman, 2005; Singh-Manoux et al., 2003), and the majority have examined younger and middle-aged populations (Adler et al., 2000; Singh-Manoux et al., 2003; Singh-Manoux et al., 2005). Using a drawing of a ladder with ten rungs, Adler et al. (2000) asked American women to rank themselves relative to the top rung, those who are best off in society, and the lowest rung, those who are worst off in society. They reported that the women's ladder ranking was a stronger predictor of health-related factors (psychological functioning, self-rated health, heart rate, sleep, body mass index, and cortisol habituation to repeated stress) than was objective SES. Similar results were found regarding the association between illness and ranking on a ten rung scale using data from the Whitehall II study based on a sample of civil servants working in London (Singh-Manoux et al., 2003). Perceived social position relative to all Canadians was a strong predictor of self-rated health in a telephone survey of Canadian adults (Dunn et al., 2006). In a study of older persons in Hong Kong, somatic complaints, physical disease, and functional and mental health status were related to self-rated economic condition, although these relationships were stronger for mental health compared to physical health (Cheng et al., 2002). Finally, low ladder ranking was associated with poorer health outcomes in a population-representative sample of elderly and near elderly men and women in Taiwan. The effects were stronger for those who had six or fewer years of education compared to those with more education (Hu et al., 2005).

The studies described above are often presented as evidence of a potential causal relationship between perceived social position and health, along with the caveat that the data are cross-sectional. However, cross-sectional designs make it difficult to assess the causal pathways underlying perceived social position and health because both sets of measures are assessed at

the same point in time. It is possible that poor physical and mental health status leads respondents to perceive their social position as lower than their healthier counterparts, or that causality runs in both directions (Singh-Manoux et al., 2005). Rich prospective data with controls for baseline health are needed to examine this relationship more thoroughly, but longitudinal investigations are scarce. One longitudinal study with controls for baseline health examined general physical and mental health and perceived social position using the Whitehall II data (Singh-Manoux et al., 2005). Perceived social position predicted health outcomes above and beyond employment grade, measures of childhood SES, education, income and wealth. A similar study of a cohort of Scottish men found that lower social position, either objective or subjective, was associated with risk for disease in the presence of controls for baseline health (Macleod, Davey Smith, Metcalfe, & Hart, 2005). Both studies were conducted on select samples: the Whitehall study consisted of white collar respondents age 35 to 55 and the Scottish Men Study was based on a middle-aged sample that excluded women. Longitudinal investigations of this relationship conducted on nationally representative samples are, to the best of our knowledge, nonexistent.

The present study builds on earlier work which demonstrates that perceived social position predicts health even when traditional indicators of SES are taken into account. We extend this work by examining the relationship longitudinally in a nationally representative sample of elderly and near elderly participants in Taiwan. We investigate a broad set of outcomes that are relevant to the well-being of an older population: depressive symptoms, cognitive impairment, mobility, as well as a single global question asking participants to rate their overall health. We anticipate that, in comparison with results from cross-sectional models, the association between perceived social position and health will be attenuated in longitudinal models, particularly in the presence of extensive controls for baseline health. Controls for baseline health make it less likely that the observed associations arise from reverse causal processes, i.e., that respondents' assessments of their relative social position are based in part on their mental and physical well-being. These controls also make it less likely that the associations arise from mechanisms linking perceived social position to health outcomes before the start of the follow-up period. Nevertheless, based on the findings of previous research (e.g. Singh-Manoux et al., 2005), we anticipate that respondents' perceived social position will significantly predict their mental and physical health at the end of the follow-up period taking into account their mental and physical health and SES at baseline.

## Method

### Participants

The sample includes participants in the longitudinal Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan. The first wave of data collection began in 1989 with a nationally representative sample of 4,049 persons aged 60 and older and an additional national sample of 2,642 near-elderly persons age 50 to 66 in 1996. Respondents have been re-interviewed at approximate three-year intervals since the initial interview date, including data collection in 1999 and 2003. In 2000, a national subsample of near-elderly (age 54 to 70) and elderly (age 71 to 91) was randomly selected from the 1999 wave of the survey to participate in the Social Environment and Biomarkers of Aging Study. Elderly respondents were over sampled relative to the near-elderly, and urban areas were over sampled relative to rural areas. Of the 1,713 respondents selected to participate in the 2000 data collection, 1,497 provided interviews (92% of survivors). Of the 1,497 respondents who were interviewed in 2000, 1,311 were interviewed in 2003, 34 were alive but did not participate in the follow-up, 164 were confirmed as having died, and 22 had unknown vital status. One hundred eighty-two respondents were missing data on one or more of the variables of interest. Most of the missing observations were due to the use of proxy respondents, who were not asked subjective questions

(e.g., perceived social position and depressive symptoms). The remaining 87 respondents were missing data on mobility restrictions or measures of SES. One thousand fifty-six participants had complete data on measures of socioeconomic position and health and were included in the present analysis.

## Measures

The current study relied primarily on data from the 2000 and 2003 interviews. The outcome variables were based on the 2003 interview and included depressive symptoms, cognitive impairment, mobility restrictions and self-assessed health. These same variables measured as of the 2000 interview date served as controls for baseline health status.

*Depressive Symptoms* were measured using items from the Center for Epidemiological Studies Depression Scale (CES-D). The CES-D has demonstrated reliability in older populations (Hertzog, Van Alstine, Usala, & Hultsch, 1990), and a short form of the CES-D was validated in Chinese populations (Boey, 1999). A 10-item version was used in the current study. Shorter versions of the CES-D have been shown to be highly correlated with the original 20-item version (Kohout, Berkman, Evans, & Cornoni-Huntley, 1993).

*Cognitive Impairment* was measured using the number of cognitive tasks that the respondent answered incorrectly (potential range = 0 to 24). Cognitive impairment was based on items from the modified Short Portable Mental Status Questionnaire (Pfeiffer, 1975), the modified Rey Auditory Verbal Learning Test (Lezak, 1983) and a modification of the Digits Backward Test (Wechsler, 1981). The index includes recalling personal details, the date and year, the current and most recent president, simple calculations, the recall of ten words and the reverse ordering of a list of numbers. The items were reverse coded so that higher scores reflect lower cognitive function.

*Mobility Restrictions* included the number of mobility activities for which the respondent had any difficulty (potential range = 0 to 9). These activities include standing for 15 minutes, standing continuously for 2 hours, squatting, reaching over one's head, grasping with fingers, lifting/carrying 11–12 kilograms, running 20–30 meters, walking 200–300 meters, and climbing 2–3 flights of stairs.

*Self-assessed Health* was rated by the respondent using the question “Regarding your current state of health, do you feel it is excellent, good, average, not so good, or poor?” The items were coded so that 1 = Excellent and 5 = Poor.

The explanatory variables included perceived social position, objective measures of SES and demographic variables as described below. We measured perceived social position using two reference groups, the society of Taiwan and the respondent's community. The reference group may influence the criteria used to appraise social status (Goodman et al., 2001), although a previous study found that responses to the two questions were highly correlated in the Taiwan sample (Goldman, Cornman & Chang, 2006).

*Perceived Social Position Relative to Other People in Taiwan* was assessed during the 2000 interview using the MacArthur Scale of Subjective Social Status, which has been used in several surveys of health (Adler et al., 2000; Goodman, Adler, Kawachi, Frazier, Huang & Colditz, 2001; Singh-Manoux et al., 2003). Participants were shown a picture of a ten rung ladder and asked (in Mandarin) to “Think of this ladder as representing where people stand in Taiwan. At the top of the ladder are the people who are the best off—those who have the most money, the most education, and the most respected jobs. At the bottom are the people who are the worst off—who have the least money, the least education, and the least respected jobs or no jobs.” Participants were then asked to consider their current situation and rank themselves

relative to all other people in Taiwan. Using the same picture of a ten rung ladder, interviewers also asked participants to consider their current situation and rank themselves relative to other people in the community.

*Objective SES* was measured by three variables: education, occupational prestige, and income. Education reflects the number of years of schooling of the respondent. The measure of occupational prestige was derived from reports of occupation in the 1989 interview (for the elderly sample) or the 1996 interview (for the near elderly) and was coded according to a socioeconomic index (SEI) score developed for Taiwan (Tsai & Chiu, 1991). The index ranges from 55.1 to 76.1, with low values indicating low-level service work and agricultural work and high levels pertaining to scientists, physicians and teachers, among others. The index of occupational prestige used in this analysis referred to the respondent's SEI score if male, and the spouse's score if female. Because this measure cannot be determined for females who were never married at the time of the survey, these women were omitted for the sample used in this study. The income variable reflects the combined income in 1999 of the respondent and the respondent's spouse recoded into quintiles. Combined income ranged from \$0 to \$624,000 in Taiwan dollars (in the year 2000, 1 USD was approximately equivalent to 31 TWD).

*Demographic variables* included age in 2000, measured with a linear and quadratic term, respondent's sex and urban vs. non-urban residence.

## Data Analyses

Each health outcome was examined in one cross-sectional and two longitudinal models. All models included age, sex, and a dummy variable indicating urban residence in order to control for over sampling in urban areas. We also included the three objective measures of SES described above in order to explore the degree to which perceived social position predicts health above and beyond these conventional indicators. In model (a), health outcomes observed in 2000 were regressed on perceived social position; because both of these variables were ascertained in 2000, this model is cross-sectional. Model (b) is similar to model (a) but the outcome is based on reports of health in 2003. In model (c), measures of baseline health (reported in 2000) were added to the variables in model (b). Because of the multistage sampling design, we used a robust estimator of variance and adjusted for clustering by primary sampling units ( $N = 24$ ) to produce correct standard errors. The data were analyzed using Stata 9.0 (StataCorp, 2005).

The statistical model varied by the nature of the outcome variable. Depression scores were modeled using linear regression. Self-assessed health, which is based on five ordinal categories, was analyzed using ordered probit regression. Because mobility restrictions and cognitive impairment are count variables, we used Poisson regression. Zero-inflated Poisson regression was used to analyze mobility restrictions, because a large number of participants had no mobility restrictions (38.5% in 2000 and 33.5% in 2003) (Goldman, Turra, Gleib, Lin, & Weinstein, 2006; Long & Freese, 2006). Because higher values for each of the health outcomes indicate poorer health we should expect to find negative coefficients associated with perceived social position ratings.

Separate models were estimated for perceived social position relative to other people in Taiwan and perceived social position relative to other people in the community. We present only the results for perceived social position relative to other people in Taiwan, because the results were virtually identical. On the basis of previous research suggesting that the relationship between perceived social position and health may vary by demographic characteristics (Cornman et al., 2003; Hu et al., 2005), we also explored models that included interaction terms between perceived social position and both sex and education. These models are not presented because we found no significant interaction effects.



## Results

The sociodemographic characteristics and health status of the study population are shown in Table 1. The participants ranged in age from 54 to 91 ( $M = 67.7$ ;  $SD = 8.1$ ). The sample was 57% male because of the selective migration of men from mainland China in 1949. The average perceived social position score was 3.8 ( $SD = 1.9$ ) and mean education level was 5.3 years ( $SD = 4.7$ ). Only 27% of the sample had more than 6 years of education. There was substantial change in all of the health outcomes over the three year follow-up period as a result of both improvements and deteriorations in respondents' mental and physical health. For two of the outcomes – the number of mobility restrictions and cognitive impairment – respondents were considerably more likely to have experienced increases as compared with decreases in these measures, reflecting net declines in health for the sample over the three-year period.

Table 2 presents the regression results for depressive symptoms and cognitive impairment and Table 3 presents the corresponding estimates for mobility restrictions and self-assessed health. Models (a) and (b) demonstrate that perceived social position significantly predicted depressive symptoms, mobility restrictions and self-assessed health in both the cross-sectional models (2000) and longitudinal models (2003), despite the inclusion of measures of education, income and occupational prestige. However, with controls for baseline health (model (c)), the associations between perceived social position and health were substantially attenuated (i.e., reduced by half or more) for all four outcomes. The coefficient remained significant only for depressive symptoms. For cognitive impairment the associations remained at virtually zero, and the coefficients became substantially weaker and insignificant for mobility restrictions and self-assessed health. In most cases, the coefficients corresponding to the objective measures of SES were also substantially smaller in model (c) as compared with the preceding models. The results for perceived social position relative to the community were very similar to those for the models already reported.

## Discussion

Our primary purpose was to extend previous work examining the association between perceived social position and health by including extensive baseline controls for health in longitudinal models using a nationally representative sample of older adults in Taiwan. Use of the Taiwan data also permits us to evaluate the strength of this relationship for a sample that is older and less educated than those in previous studies of perceived social position and health (Adler et al., 2000; Dunn et al., 2006; Macleod et al., 2005; Singh-Manoux et al., 2003; Singh-Manoux et al., 2005). The estimates from models (a) and (b) supported previous findings: perceived social position significantly predicted cross-sectional and longitudinal health outcomes in the presence of controls for age, sex and objective indicators of SES (Adler et al., 2000; Cheng et al., 2002; Dunn et al., 2006; Hu et al., 2005; Singh-Manoux et al., 2003; Singh-Manoux et al., 2005). However, the coefficients corresponding to perceived social position, relative to the community and to Taiwan, were greatly attenuated in the presence of controls for baseline health measures. Although we anticipated a substantial attenuation, the results imply that, with the exception of depressive symptoms, the relationship between perceived social position and health is largely explained by baseline health status. Respondents' assessments of their relative social position appear to be based in part on their mental and physical well-being. These findings suggest that previous research has overstated the importance of perceived social position in determining health and reinforce the importance of controlling for baseline health status in studies that strive to assess the causal impact of perceived social position on health.

The finding that there is a significant relationship between perceived social position and depressive symptoms at follow-up is consistent with the cross-sectional findings of Cheng et

al. (2002) in their study of elderly persons in Hong Kong. However, because respondents' reports of perceived socioeconomic position and depressive symptoms are subjective, it is possible that both sets of responses are influenced by a general sense of well-being (or ill-being) or similar variables omitted from the analysis. For example, because personality characteristics such as trait levels of negative affect or neuroticism are likely to be associated with both perceived position and depressive symptoms, failure to include them in the statistical models could lead to an exaggeration of the association of interest. Although we reduce this bias in the current study by including baseline depressive symptoms in the longitudinal models, we cannot eliminate the bias altogether. Nevertheless, our findings suggest that respondents' perceptions of their social position affect the development and/or the duration of depressive symptoms rather than the reverse process.

In addition to the potential biases discussed above that are likely to inflate the associations between perceived social position and at least some of the health variables, we recognize that the estimates may understate the potential associations for all of the outcomes because of the short follow-up period used in our analysis. In essence, our longitudinal models that include controls for baseline health assess the extent to which perceived social position is associated with changes in physical and mental health over a three-year period. It is possible that perceptions of social status negatively impact health over a longer interval. Data from the next wave of the Taiwan survey (2006–2007), which includes measures of personality and provides a six- to seven-year follow-up period, may help to address these concerns in future studies. In light of the focus on reducing social inequities in health in today's public health agenda, obtaining accurate estimates of the magnitude of these inequalities – and the extent to which they reflect the impact of social position on mental and physical health rather than the reverse process – should be of paramount concern to social scientists and epidemiologists.

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Table 1

Descriptive Statistics (n = 1,056)

Variable	2000		2003	
	Mean or %	SD	Mean or %	SD
Age (54 – 91)	67.7	8.1		
Female	42.9%			
Urban	56.7%			
Education (years) <sup>a</sup>	5.3	4.7		
Index of Occupational Prestige (55.1 – 76.1) <sup>a</sup>	62.1	4.9		
Income (quintiles) <sup>b</sup>	3.3	1.4		
Perceived Social Position Relative to Taiwan (1 – 10)	3.8	1.9		
Perceived Social Position Relative to the Community (1 – 10) <sup>c</sup>	4.3	2.1		
CES-D (0 – 30)	5.4	5.7	5.5	5.8
> 3 point decrease in CES-D			24.3%	
≤3 point change in CES-D			53.2%	
> 3 point increase in CES-D			22.4%	
Cognitive Impairment (0 – 24)	7.2	3.2	8.7	3.9
> 2 point decrease in cognitive impairment			8.2%	
≤2 point change in cognitive impairment			58.4%	
> 2 point increase in cognitive impairment			33.3%	
Mobility Restrictions (0 – 9)	2.0	2.3	2.5	2.6
decrease in mobility restrictions			24.2%	
no change in mobility restrictions			36.3%	
increase in mobility restrictions			39.5%	
Self-assessed Health (1 = Excellent and 5 = Poor)	2.9	1.0	2.9	1.1
improved self-assessed health			28.5%	
no change in self-assessed health			38.2%	
poorer self-assessed health			33.3%	

<sup>a</sup>Education and index of occupational prestige were assessed in 1989 for the elderly sample and 1996 for the near elderly sample.

<sup>b</sup>Income was assessed in 1999

<sup>c</sup>n = 1,053

**Table 2**  
 Estimated Coefficients (and P-values) for Regression Models of Health Outcomes on Perceived Social Position (n = 1,056)

Variables	CES-D			Cognitive Impairment		
	2000 (a)	2003 (b)	2003 (c)	2000 (a)	2003 (b)	2003 (c)
Perceived Social Position						
Relative to Taiwan	-0.426**	-0.445**	-0.243*	-0.011	-0.003	0.002
Education	-0.119*	-0.131**	-0.060	-0.034**	-0.028**	-0.017**
Index of Occupational Prestige	0.096	0.026	0.001	0.000	-0.006*	-0.006*
Income	-0.695**	-0.562**	-0.264*	-0.015*	-0.014	-0.004
CES-D 2000			0.269**			0.001
Cognitive Impairment 2000			0.041			0.039**
Mobility 2000			0.276**			0.013*
Self-assessed Health 2000			0.675**			0.002

<sup>a</sup> Depression scores were modeled using linear regression and cognitive impairment was modeled using Poisson regression. All models also include age (linear and quadratic terms), sex and urban residence.

<sup>b</sup> \*  $p < .05$ ;

\*\*  $p < .01$

**Table 3**  
 Estimated Coefficients for Regression Models of Health Outcomes on Perceived Social Position (n = 1,056)

Variables	Mobility Restrictions			Self-assessed Health		
	2000 (a)	2003 (b)	2003 (c)	2000 (a)	2003 (b)	2003 (c)
Perceived Social Position						
Relative to Taiwan	-0.057**	-0.050**	-0.015	-0.090**	-0.063*	-0.027
Education	-0.030*	-0.014*	-0.005	-0.022*	0.000	0.013
Index of Occupational Prestige	0.006	0.003	0.001	-0.004	-0.014	-0.016
Income	-0.060**	-0.045*	-0.016	-0.092**	-0.112**	-0.069
CES-D 2000			0.005			0.014*
Cognitive Impairment 2000			-0.003			-0.005
Mobility 2000			0.126**			0.114**
Self-assessed Health 2000			0.102**			0.299**

<sup>a</sup> Mobility scores were modeled using zero-inflated Poisson regression and self-assessed health was modeled using ordered probit regression. All models also include age (linear and quadratic terms), sex and urban residence.

<sup>b</sup>, \*  $p < .05$ ;

\*\*  $p < .01$