Disparities of life-course socioeconomic position in subsequent cognitive functioning in older Taiwanese adults

Background & Significance

Late-life cognitive impairment has become of growing attention to health research and policy in recent decades as population ageing worldwide and cognitive decline in old age. Cognitive impairment does not meet the clinical criteria for dementia but it is suggested as a precursor in dementia development. Recent research in western populations has documented individual differences in the rate of cognitive impairment and decline. High socioeconomic position (SEP) is recognized as a "protective" factor in delaying cognitive impairment (Karp et al. 2004; Peters et al. 2009; Scazufca et al. 2008; Stern et al. 1994).

Health disparities by social position and other socioeconomic characteristics have become a principal focus of research and policy around the world. Insights also provided by the stress process model (Pearlin 1989; Pearlin et al. 2005) underscored that disadvantaged socioeconomic groups of individuals are more vulnerable to experiencing poor health than others. Research evidence has suggested that people in the lower SEP are likely to experience the health problems such as cognitive impairment at much younger ages in comparison to those people in the upper SEP who maintain relatively better health status into late life (Haan et al. in press; Hackman and Farah 2009; House et al. 1990, 1994; Moceri et al. 2000). An increasing attention has thus been paid to life-course aspects of SEP that might be associated with poor cognitive functioning in later life. Most of exiting research examining SEP differences in cognitive functioning status used Western populations (Evans et al 1997; Haan et al in press; Hall et al 2000; Hazzouri et al 2011; Scazufca et al 2008), and less is known about the causal link of life-course SEP to poor cognitive functioning status in a non-western society.

To our knowledge, there have been no studies to date that examined the association between disparities in SEP across the life course and subsequent poor cognitive functioning status among non-western populations. In the present study, we investigate whether disparities of life-course SEP affects gaps of cognitive functioning between older adults with the SEP disadvantaged and their non-disadvantage peers over a 15 year follow-up period (1993-2007) in a cohort of older Taiwanese adults.

Method

Sample

The data for this analysis are from the Taiwan Longitudinal Study on Aging (TLSA), a nationally representative sample. The baseline cohort was first interviewed in 1989 and

included 4,049 participants: 57% men and 43% women ages 60 to 96. Cognitive impairment measures were not added to the survey until 1993, however. Therefore, this analysis of cognitive impairment is focused on data collected in 1993, 1996, 1999, 2003 and 2007. The measures of life-course SEP are obtained from the 1989 survey. The analytic sample is further restricted to the adult respondents with complete self reported data on cognitive impairment. These selections yielded an analytic sample of 2,958 older adults in 1993, 2,386 in 1996, 2032 in 1999, 1,330 in 2003, and 899 in 2007.

Measures

Cognitive functioning is the outcome variable, measured in 1993, 1996, 1999, 2003 and 2007. Five items measuring cognitive impairment are used consistently across TLSA waves and these items are part of a short portable mental status questionnaire (SPMSQ; Pfeiffer 1975). The measure used for all analyses was based on a count of correct answers, possibly ranging from 0 to 5.

Life-course SEP is the major explanatory variable that includes measures from 3 life stages: childhood, adulthood, and midlife (Hazzouri et al. 2011). The childhood SEP consists of paternal education and paternal occupation. Participant's education and their major lifetime occupation are measures of adulthood SEP. The last occupation is the measures of mid-life SEP. Both paternal and participant education are categorized into low (less than elementary school) or high (completed elementary school or higher) as occupation is also categorized into low (manual, unemployed, or housekeeper) or high (non-manual). All SEP measures are assigned a score of 0 (high SEP) or 1 (low SEP) and then adds to a composite index. A possible range is 0-2 respectively for childhood and adulthood SEP. The higher score represents the greater SEP disadvantage. Three indicators represent SEP disadvantage separately for 3 life-stage SEP disadvantage.

In addition to measures of life-course SEP disadvantage, we also construct a measure of **cumulative SEP disadvantage** by summing scores from childhood to mid-life (Hazzouri et al. 2011), possibly ranging from 0 to 5. A higher score represents a greater SEP disadvantage. We spilt the total score of cumulative SEP advantage at the median and recoded cumulative SEP disadvantage or advantage.

Control variables include background factors (sex, age, ethnicity, marital status and income) and several health indicators such as smoking and alcohol habits, physical disability, history of cardiovascular disease, and psychological distress. Prior research has found lifestyle variables that are correlated with socioeconomic status and affect cognitive function (Singh-Manoux, Richards, and Marmot 2003). We thus include variables of social support and

leisure activities as control factors.

Analytical strategy

One of the primary objectives is to estimate the effects of life-course and cumulative SEP disadvantage by comparing groups of similar older adults. We estimate the impact of life-course SEP and cumulative disadvantage among matched samples of those who were and were not SES disadvantaged in the 15-year observation interval. Matching is based on a "propensity for SES disadvantage" score, and effect estimates are generated using the STATA *psmatch2* match program (Leuven and Sianesi 2003).

The matching procedure and estimation of SES disadvantage effects are as follows. We first generate a "propensity for SES disadvantage" score for each older adult by using a logit model for dichotomous outcomes and multinominal logit model for categorical outcomes (with 3 or more categories). Covariates in this model include observable factors that have known associations with the risk for SES disadvantage and may also affect cognitive function. The variables included in the propensity score estimation are measured before 1993, prior to measuring cognitive impairment. The predicted probability of SES disadvantage generated from the logit or multinomial models serves as the propensity score.

Second, those with SES disadvantage are matched to respondents who were not SES disadvantaged based on their propensity score. Using the radius matching method, each disadvantage (treatment) case matches non-disadvantage (control) case with a propensity score within a specified radius of the treatment's propensity score. We propose to choose a radius of .01, which allows control cases within 1% (or .01 predicted probability) to be used as matches for the treatment case.

Third, we estimate the propensity score equation and conduct the matching procedure and diagnostic for the overall sample, and separately for each subgroup based on key covariates. Once matched, effect estimates are the difference in the cognitive outcome between those with SES disadvantage and their matched comparisons, respectively in 1993, 1996, 1999, 2003, and 2007. This is known as the average effect of the *treatment on the treated*.

Preliminary Findings

Table 1 presents means of cognitive function status by life-course SEP measures and cumulative SEP disadvantage, separately for each wave. Individuals with lower SEP and cumulative SEP disadvantage consistently score lower on cognitive function status than those with higher SEP and cumulative SEP advantage over 15 years. For example, among our sample of older adults in 1993, the mean score is 4.71 for individuals with high childhood

SEP and 4.25 for individuals with low childhood SEP (difference=0.46). In addition to SEP measures from 3 life stages, the adulthood SEP measure seems more likely than the measures for childhood and mid-life SEP produces a larger gap in later-life cognitive function between low and high SEP groups.

Our preliminary results suggest that the SEP disadvantage in cognitive function as that observed over life course. These preliminary findings warrant further investigation and models incorporating other identified covariates to limit sample selection bias. Further investigations will continue matching *propensity for SES disadvantage* in order to estimate the differenced in the cognitive outcome between those with SES disadvantage and their matched comparisons.

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Table **1**. Means and standard deviation (SD) of cognitive function status by measures of life-course socioeconomic position (SEP) and cumulative SEP, TLSA 1989-2007

Cognitive measures	**Total**		**Childhood SEP**			**Adulthood SEP**			**Mid-Life SEP**	
Number of correct answers	N	Mean (SD)	Low Mean (SD)	Median Mean (SD)	High Mean (SD)	Low Mean (SD)	Median Mean (SD)	High Mean (SD)	Low Mean (SD)	High Mean (SD)
1993	2958	4.33 (1.09)	4.25 (1.13)	4.63 (0.82)	4.71 (0.78)	3.96 (1.23)	4.71 (0.77)	4.85 (0.49)	4.27 (1.12)	4.69 (0.77)
1996	2386	4.40 (1.02)	4.29 (1.09)	4.65 (0.79)	4.79 (0.64)	4.07 (1.18)	4.71 (0.71)	4.79 (0.58)	4.36 (1.05)	4.65 (0.76)
1999	2032	4.36 (1.03)	4.27 (1.08)	4.58 (0.84)	4.71 (0.77)	4.01 (1.20)	4.71 (0.67)	4.72 (0.68)	4.32 (1.06)	4.63 (0.76)
2003	1330	4.27 (1.01)	4.15 (1.07)	4.46 (0.91)	4.60 (0.79)	3.85 (1.15)	4.63 (0.70)	4.53 (0.79)	4.24 (1.03)	4.51 (0.78)
2007	899	4.07 (1.16)	3.93 (1.19)	4.39 (0.93)	4.27 (1.10)	3.56 (1.25)	4.45 (0.92)	4.36 (0.97)	4.04 (1.18)	4.30 (1.00)

Table **1**. Continued.

Cognitive measures	**Cumulative SEP**	
Number of correct answers	Disadvantage Mean (SD)	Advantage Mean (SD)
1993	3.95 (1.22)	4.69 (0.78)
1996	4.03 (1.21)	4.69 (0.74)
1999	3.99 (1.20)	4.65 (0.76)
2003	3.83 (1.16)	4.53 (0.83)
2007	3.56 (1.25)	4.37 (0.96)