"Trajectory of Functional Limitations among Chinese Older People: the Effects of Socioeconomic and Demographic Status"

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Introduction

China has the largest number of elderly people in the world, numbering 82 million (Liang et al., 2001). The proportion of elderly people aged 65 and over is projected to increase rapidly in the coming few decades to reach 30% in 2050 (United Nations, 2002), making China one of the most aged societies. The most common problem confronting elderly people is functional disability that leads to dependency and institutionalization (Fried et al., 1994) as well as great social and economic costs (Beydoun and Popkin, 2005; Stuck et al., 1999). However, so far, the number of studies on functional disability conducted in Chinese context is still limited, especially using longitudinal design. Studies based on the panel data of Chinese elderly people not only can fill in the knowledge gap, but also could text the validity of the findings attained in U.S., given that the living conditions, environmental facilities and social-historic changes in China are different from those in Western nations (Chen et al., 2010; Liang et al., 2001).

This study aims to explore the trajectory of functional limitation over time among Chinese older people based on multiple waves of panel data. More importantly, I am interested in examining how socioeconomic and demographic statuses contribute to disparities in functional limitations and how such disparities change over time. To my knowledge, this is the first study that investigates the mechanism of changing functional disability levels over time based on samples of Chinese elderly people. Although some of the previous studies relied on longitudinal design, most of them studied the transitions of disability between two points, which often do not provide an accurate reflection of the true picture of the way disability changes in middle and later life (Rogosa, 1988).

The current study contributes significantly to the existing knowledge on social gradients of functional limitations in developing countries. By adopting multiple-wave longitudinal data design, it elaborates the complex and dynamic transitions in disability status in China which previous studies fail to capture. Furthermore, facing the inconsistent findings on the relationship between SES and health in China, it offers some insights to the dynamics of health stratifications among Chinese older people.

Theoretical Perspectives and Research Hypotheses

I conduct the study under the framework of cumulative disadvantage perspective. This theoretical perspective is systematically proposed by Dannefer (1987, 2003) and exemplified later by O'Rand (1996, 2003). The basic proposition of cumulative disadvantage theory is that the disadvantage of one individual or group over another accumulates over time, which is often taken to mean that social inequality of particular characteristics grows over time (Direte and Eirich, 2006). Existing studies yield controversial conclusions as to whether the effects of social status on health outcomes strengthen or diminish over the life course (Chen et al., 2010; Dupre, 2007). Gender,

education and income gaps in health outcomes are found either diverge (Chen et al., 2010; Ferraro and Kelly-Moore, 2003; Lynch, 2003; Miech and Shanahan, 2000; Liang et al., 2008), converge (Mendes de Leon et al., 2005) or remain stable (Kelly-Moore and Ferraro, 2004; Liang et al., 2003).

To adequately test the cumulative disadvantage perspective, two methodology requirements need to be met. One is the utilization of longitudinal design that differentiates population-level processes with those occurring at the individual level (Dupre, 2007). The other is the control of attrition to reduce the selective bias in longitudinal data. For the current preliminary analysis, I control death and other attritions by entering dummy variables into the model. I will adopt more advanced and accurate technique in later analysis.

Guided by cumulative disadvantage theoretical perspective, I examine the following three hypotheses based on a 4-wave survey spanning 10 years:

Hypothesis 1: Gender and SES disparity in functional limitations exist with being a female, having less education and income and not having a lifelong work is associated with higher levels of functional limitations.

Hypothesis 2: Gender and SES disparity in functional limitations will increase over time among Chinese older people.

Hypothesis 3: Gender disparity in functional limitation status and functional limitation growth are attributed to the mediating effects of SES (specifically education and working history).

Data and Measurements

For the purpose of this study, I adopt longitudinal dataset of Chinese Health and Nutrition Survey (CHNS). So far, eight waves of panel data were collected in 1989, 1991, 1993, 1997, 2000, 2004, 2006. For each wave, a multistage, random cluster process was used to draw samples across country. Previous studies show that the characteristics of the CHNS households and individuals are comparable to those of nation samples (Chen et al., 2010).

Questions on functional limitations were first asked in 1993 survey. Starting from 1997, ordinal scales of measurements of ADL and IADL are adopted. The analysis of this study is based on 1997, 2000, 2004 and 2006 waves. In 1997, 3,875 households and 14,426 individuals participate in the survey. Among surveyed individuals at baseline, 2,383 respondents aged 55 and older were asked about difficulties of activities of daily living. Out of 2,383 older people, 1,040 respondents completed all four waves of interviews. Of those who did not finish the study, 424 individuals died by the end of 2006 and 149 were lost to follow due to their moving out of the household. Others are lost to follow up due to unknown reasons. Altogether, these respondents yield to 6,422 person-year records.

Measurements of ADLs are based on 5 items including activities of bathing, clothing, eating, toileting and grooming. For IADLs, five tasks are elicited namely shopping, cooking, using public transportation, managing money and using the telephone. All ADLs and IADLs are measured on 4-level scale. Except household income and age, all other independent variables are added into models as dummy variables or series of dummy variables.

Methods

To test the disability trajectory over time and variations of trajectory by gender and SES, I adopt multilevel growth curve model. Stepwise analysis strategy is applied for both ADL and IADL outcomes to clarify the possible mediating effects of SES. All the models control for living arrangement, region and whether living in urban area.

$$\textit{Level 1: } Y_{tij}=\pi_{0ij}+\pi_{1ij}(Age)_{tij}+\pi_{2ij}(Age^2)_{tij}+\varepsilon_{tij}$$
$$\textit{Level 2: } \pi_{0ij}=\beta_{00j}+\beta_{01j}Male+\beta_{02j}Education+\beta_{03j}Everwork+\varepsilon_{0ij}$$
$$\pi_{1ij}=\beta_{10j}+\beta_{11j}Male+\beta_{12j}Education+\beta_{13j}Everwork$$

Given the sample includes multiple respondents from the same household, I first specify a three-level hierarchical linear model. However, non-positive-definite hessian is generated which suggests me to focus on two-level model. Furthermore, the results of 3-level models and 2-level models are quite similar. With unbalanced 4-wave data, I am not able to estimate multiple random effects (models resulted in non-positive definite matrices) (Singer & Willett, 2003). Therefore, I estimate random effect for the intercept. To examine the quadratic rate of change with age, I add the term of squared age into the model.

Preliminary Findings

Descriptive analysis of all variables is shown in Table 1. On average, older people in the sample have higher levels of difficulty on IADL than ADL. Only about 35% of elderly people in the sample have some education experience in primary school. 70% of respondents report having a lifelong job.

Preliminary findings are displayed in Table 2 and Table 3. Results in Table 2 illustrate that females tend to report higher levels of ADL than males. And such gender discrepancy increases as people age. Education is associated with neither mean level of ADL nor the trajectory of ADL. Work history is only related to mean level of ADL and also partly explains away the gender gap of ADL status. However, unexpectedly, household income fails to play a role in explaining the patterns of SES gradients of ADL.

Looking at Table 3, similarly, females are less favored in terms of IADL either at the mean age or over time. People with higher education or having a lifelong job are less likely to report IADL. Also, people who have a lifelong job are less likely to report IADL decline. And they together partly explain away gender gap in mean level of IADL and trajectory of IADL. Household income contributes to the gradients of IADL at mean age and marginally to the discrepancy of IADL trajectory.

Table 1 Descriptive statistics of all variables in the analyses (N=6,422)

Total observations (N=6,422)			
ADL	1.100 (.365)	Living arrangement[d]	
IADL	1.430 (.719)	With spouse and others	.459
Age	70.736 (8.623)	Alone	.056
Male[a]	.469	With others and no spouse	.226
Urban[b]	.375	With spouse and no others	.259
Region[c]		Household income	12.188 (13.071)
Northeast	.070	Primary school or above[e]	.354
Inland	.360	Having a lifelong job[f]	.699
Coastal	.260	Death	.178

Mountainous South	.310	Attrition	.451

Notes: Comparison group for categorical variables [a] female [b] rural [c] Mountainous South [d] living with spouse and no others [e] less than primary school [f] not having a lifelong job. Reported household income divided by 1000 to avoid the small coefficient size.

Table 2 Growth curve model of SES and gender effects on ADL in China

	Model 1	Model 2	Model 3	Model 4
For intercept				
Male	-.039**	-.038**	-.025^{+}	-.026^{+}
Primary school or above		-.003	.004	.006
Having a lifelong job			-.062***	-.060***
Household income				-.003
For growth curve rate				
Intercept	.005	.005	.006^{+}	.005
Male	-.006**	-.006**	-.005*	-.005*
Primary school or above		-.001	-.001	.000
Having a lifelong job			-.003	-.003
Household income				-.001
AIC (smaller is better)	3997.1	4014.1	4012.1	4033.6

Notes: All models adjust for urban, living arrangement, region, death and any attrition.
$^{+}$ <.1 * <.05 ** <.01 *** <.001

Table 3 Growth curve model of SES and gender effects on IADL in China

	Model 1	Model 2	Model 3	Model 4
For intercept				
Male	-.199***	-.148***	-.123***	-.129***
Primary school or above		-.165***	-.154***	-.143***
Having a lifelong job			-.101***	-.014**
Household income				.092***
For growth curve rate				
Intercept	.023***	.023***	.031***	.029***
Male	-.013***	-.011**	-.008*	-.008*
Primary school or above		-.007	-.005	-.005
Having a lifelong job			-.014***	-.014***
Household income				-.001^{+}
AIC (smaller is better)	8975.0	8953.9	8941.4	8953.2

Notes: All models adjust for urban, living arrangement, region, death and any attrition.
$^{+}$ <.1 * <.05 ** <.01 *** <.001

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