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Early parental loss, socioeconomic stressors, and health in later life: Evidence for gender disparity

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EARLY PARENTAL LOSS, SOCIOECONOMIC STRESSORS, AND HEALTH IN LATER LIFE: EVIDENCE FOR GENDER DISPARITY

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Dedicated to my loving family and friends

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ABSTRACT

Fu, Rong. Ph.D., Purdue University, August 2016. Early Parental Loss, Socioeconomic Stressors, and Health in Later Life: Evidence for Gender Disparity. Major Professor: James Anderson.

Drawing from the stress process model and the cumulative disadvantage theory, this dissertation examined how childhood and later life stressors affected cognitive and subjective health in older adults. Using three main articles, this dissertation investigated (1) the effect of early parental loss on cognitive well-being in Chinese oldest old; (2) the effect of intergenerational socioeconomic mobility on cognitive and subjective health in advanced age; and (3) the effect of different dimensions of socioeconomic status and perceived financial strain on subjective health in later life. Data were derived from the 2002 and 2005 waves of the Chinese Longitudinal Healthy Longevity Survey. Ordinary least squares models and logistic regression models were used to estimate the stress-health association. Key findings of this dissertation include (1) losing a mother in early life predicted worse cognitive function in oldest old men; (2) experiencing downward intergenerational socioeconomic mobility was detrimental to cognitive and subjective health in advanced age, especially in oldest old women; and (3) perceived financial strain was associated with an elevated risk of reporting poor health for both urban and rural inhabitants. Findings of this dissertation suggest that traumatic events in early life

and socioeconomic stressors in later life both exact a toll on Chinese older adults' health, independent of their demographic characteristics and physical health conditions. This dissertation has policy implications for gender-specific healthcare.

CHAPTER 1. INTRODUCTION

1.1 Background

"Into each life some rain must fall, some days must be dark and dreary".

— Henry Wadsworth Longfellow

All individuals face challenges throughout their lives, which typically involve some degree of stress. From a sociological perspective, the unequal share of social and economic resources, as a consequence of social stratification, could lead to stressful experiences particularly for those who have lower levels of income, power, and other valued recourses. It is also quite common that stressful life events such as childhood trauma could remove important resources from individuals temporarily or even permanently, which further lead to health problems in later life (Pearlin, Schieman, Fazio, & Meersman, 2005; Thoits, 2010).

Medical sociologists and gerontologists have termed the inequitably distributed health outcomes across social groups as health disparities. According to the work of Braveman (2006), health disparities refer to the type of difference in health status where disadvantaged social groups in a social hierarchy system such as the poor and minorities typically have worse health than their advantaged counterparts. Both the

access to and the distribution of social and economic resources could shape health disparities at different life stages. This dissertation draws attention to the long-term effect of stressful life events on health disparities in older adults in China.

People with a higher socioeconomic status (SES) generally have a greater capacity to acquire resources that promote health and avoid risk of diseases (Haas, 2008; Link & Phelan, 1995). On the other hand, having a lower SES could be a risk factor for poorer health (House, Wells, Landerman, McMichael, & Kaplan, 1979; Khang & Kim, 2005). An individual's SES might not be stable over the life course. Whereas a person's childhood SES is largely ascribed, one's adulthood SES could be achieved to a great extent. This dissertation hypothesized that experiencing changes in SES in a negative way could be a stressor that affects one's health and well-being in later life. Apart from objective measures of SES, subjective SES based on social comparisons could possibly shape one's health outcomes as well. In this project, different dimensions of SES will be taken into account in estimating health outcomes.

1.1.1 Research Aims and Questions

The overall aim of this dissertation is to examine how childhood and later life stressors affect health in older age. Three dimensions of stressors were taken into account: early parental loss, intergenerational socioeconomic mobility, and perceived financial strain. Three measures of health were used in this project: cognitive function, cognitive impairment, and subjective health. Using data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS), this dissertation has three specific aims:

Aim 1. To determine the effect of early parental loss on cognitive well-being in Chinese oldest old and the gender differences in this effect.

According to the stress process model, adversities in early life contribute to an accumulation of stressors and a deprivation of social resources, which further produce health disparities in later life (Pearlin et al., 2005; Thoits, 2010). In the case of early parental loss, many important social and economic resources may be removed from a child's life, especially if the deceased parent was the primary income earner in the family (Gimenez, Chou, Liu, & Liu, 2013). Using the 2002 wave of CLHLS, this research examines the following questions: (1) Does losing a parent in early life lead to worse cognitive function in late life? (2) Does early parental loss increase the risk of cognitive impairment in later life? and (3) Do respondents' gender and the gender of the lost parent modify the association between early parental loss and cognitive function? In particular, is maternal loss or paternal loss more strongly associated with cognitive function in oldest old men and women?

Aim 2. To estimate the effect of intergenerational socioeconomic mobility on cognitive health and subjective health in Chinese oldest old and the gender differences in these effects.

Based on the work of Hallqvist et al. (2004), intergenerational SES mobility in this study is defined as the change in SES from childhood to adulthood. The accumulation model suggests that the detrimental effect of low SES accrues throughout the life course (Cohen et al., 2010). Based on this model, it is possible that having lower SES from childhood to adulthood could lead to worse health outcomes, as compared to

individuals with higher SES during any periods across the life course. The change model indicates that a change from lower to higher levels of SES would lead to better health in later life (Johnson-Lawrence, Kaplan, & Galea, 2013). In line with this perspective, it can be postulated that experiencing upward mobility in SES could benefit one's health and well-being, especially compared to having lower SES from childhood to adulthood or experiencing downward SES mobility. Using the 2005 wave of CLHLS, this research examines two research questions: (1) How does SES mobility from childhood to adulthood affect cognitive and subjective health in Chinese oldest old? and (2) Does the association between intergenerational SES mobility and health differ by gender?

Aim 3. To examine the effect of subjective SES, objective SES and perceived financial strain on health among rural and urban residents in China.

This research aims at investigating the socioeconomic health disparities in older adults, who are more likely than their younger counterparts to face the challenge of managing financial resources in ways to meet their needs (Mendes, Rapp, & Kasl, 1994). This challenge may become a source of stress proliferation for older adults, which further affects their health and well-being. This form of stress proliferation, commonly termed as financial strain, has the potential to affect health through direct and indirect pathways. Using the 2002 and 2005 waves of CLHLS, this research addresses three research questions: (1) How does childhood SES, adulthood SES and subjective SES affect subjective health in late life? (2) Does perceived financial strain modify the socioeconomic health disparities in older adults? and (3) Do these relationships vary category of residence (e.g., rural, urban)?

1.1.2 Stress and Health

The theoretical premise of the stress-health framework is that stressors and personal resources interact in predicting health outcomes (Holmes & Rahe, 1967). Stressors refer to a variety of events in everyday life or situations that causes stress to individuals (Schulz, Gallagher-Thompson, Haley, & Czaja, 2000; Schulz & Salthouse, 1999). Personal recourses include but are not limited to feelings of self-control, sense of mastery, and coping skills (Heilemann, Frutos, Lee, & Kury, 2004; Noh & Kaspar, 2003; Turner & Lloyd, 1999).

Although not all stressful events are negative, numerous studies have documented that higher levels of stress predicted poorer physical and mental health (Hammen, 2005; Willson, Shuey, & Elder, 2007) as well as dementia and cognitive decline (Norton, Østbye, Smith, Munger, & Tschanz, 2009). Extant literature has investigated two major forms of stressors: stressful life events and chronic life strains. Whereas stressful life events (e.g., assault, divorce) are generally acute changes that require substantial readjustments within a relatively short period of time, chronic life strains (e.g., poverty, chronic unemployment) are persistent demands that require readjustments over a prolonged time period (Thoits, 1995). As stressors accumulate, individuals may have ineffective or maladaptive coping abilities and subsequently elevated risk of developing chronic diseases, mental illnesses, or injuries (Lazarus & Folkman, 1984; Pearlin, 1989).

A growing body of literature has drawn attention to how events and strains in one stage of life can influence individuals' health and well-being both in a contiguous life

stage and over a longer period of time (Aneshensel & Gore, 1991; Coyne & Downey, 1991). Chronic life strains have been found to negatively affect physical and mental health at different life stages (House et al., 1979; Pearlin & Johnson, 1977; Pearlin, Menaghan, Lieberman, & Mullan, 1981). Some studies have demonstrated the negative effect of childhood traumatic events (e.g., parental loss, abuse) on mental health in adulthood (Kessler & Magee, 1993; McLeod, 1991). This is one example of how chronic life strain could affect health for a longer period of time.

There is also evidence on how stressful life events could affect one's well-being for a shorter period of time. For instance, Carr and colleges (2001) indicated that sudden spousal loss was associated with elevated levels of intrusive thoughts (a loss-related dimension of psychological adjustment to traumatic events) at the 6-month follow-up only, but not at the 18-month and 48-month follow-ups. Other studies further indicated that negative life events produced elevated emotional problems only when the events generated persistent strains (Aneshensel, 1992; Pearlin et al., 1981; Umberson, Wortman, & Kessler, 1992). Elder (1974) even found that although negative events and strains could be detrimental to one's well-being in the short term, they might prove to be beneficial in the longer term (Elder, 1974).

These findings indicate that different kinds of life events could be stressful for individuals in different ways. Even the same stressor could lead to divergent outcomes on different individuals. This dissertation would examine how different stressors affect the same health outcome over time and how the same stressor might affect different social groups (e.g., women, rural residents) in disparate ways.

1.1.3 Theoretical Framework

The stress process model posits that individuals' stressors are embedded in their structural positions and statuses (Pearlin, 1999a; Wheaton, 2010). The stress process is generally composed of three parts: the stressor, the mediator/moderator, and the stress outcome (Pearlin, 1989). Stressors are likely to interact with each other through a process termed as stress proliferation, in which an initial stressor gives rise to an accumulation of stressors that may yield negative consequences for health and well-being (Pearlin, 1999a; Pearlin et al., 2005). According to this theory, the stressors rooted in social structure may affect health through mediators or moderations such as personal and social resources.

The stress literature has mostly indicated that disadvantaged individuals were particularly vulnerable to stressors. There is substantial evidence that experiencing one or more stressful life events during a 6- to 12-month period predicted morbidity, mortality, and psychological distress (Cohen & Williamson, 1991; Creed, 1985; Kessler, Price, & Wortman, 1985). Empirical studies also suggested that those who were unmarried, in advanced age, or from lower SES background exhibited higher levels of depression or psychological distress, as compared to their higher-status counterparts (Kessler & Cleary, 1980; Kessler & Essex, 1982; McLeod & Kessler, 1990; Pearlin & Johnson, 1977; Thoits, 1982). Gender differences exist in the vulnerability to different types of stressors as well. For instance, women were found to be more vulnerable to life events related to their social networks, while men were indicated to be vulnerable to financial and job-related stressors (Kessler & McLeod, 1984; Turner & Avison, 1989).

Scholars also gave attention to the social origins of stress. Pearlin (1989) and Riessman (1990) both posited individuals' experiences of stressful life events and chronic strains in the social statues and roles constructed by their gender, race, and social class. Ross and Mirowsky (1989) argued that stress in life were derived from structural powerlessness, isolation, and lack of control. In addition, researchers have emphasized the importance of conceptualizing the stress process with reference to meaning construction and uncovering the structural origins of stressors and resources (McLeod, 2012; McLeod & Lively, 2007).

1.1.4 Traditional Chinese Society and the Study Cohort

In a traditional Chinese family, the father has mainly served as the "bread earner" and the mother has taken the primary role of child rearing. Chinese women have historically lived in a patriarchal society where they were structurally denied formal education or high-skilled occupation. Therefore, women mostly had lower SES than men over the life course in the traditional Chinese society. In particular, women living in the early 1990s generally had fewer opportunities for formal education and decent jobs than their male counterparts. The social and economic transitions occurred in the past few decades have gendered consequences and lead to different life experiences for men and women (Fan, 2003) Women who migrated from a rural area to an urban area were mostly disadvantaged in the urban labor market due to their inferior social status and limited formal education (Fan, 2003).

The first two articles of this dissertation drew attention to the oldest old adults mostly born between 1900 and 1925, who had experienced a variety of hardships due to wars and famine. China was considered an economically and politically strong nation in the late 17th and the 18th centuries. Yet, the Chinese empire declined gradually during the Qing Dynasty, and was overthrown by revolutionaries in 1911. After four decades of wars and conflict, the People's Republic of China (PRC) was finally established in 1949. For a time, the Chinese Communist Party mimicked Soviet socialist policies in terms of economics, education, and social welfare (Banister, Bloom, & Rosenberg, 2012).

The third article looked at the same oldest old population as well as some relatively younger older adults. Both the younger older adults and the oldest old people have experienced some important social changes throughout life. In 1958, the Chinese government officially promulgated the *hukou* system – the system of household registration required by law to control the movement of people between urban and rural areas. Compared to urban residents, rural residents generally had relatively lower income, fewer years of formal education, less access to public transportation, and poorer health conditions (Cohen-Mansfield & Frank, 2008; Reschovsky & Staiti, 2005). This study population also experienced the Cultural Revolution from 1966 to 1976, where the Chinese government reformed its economic policies and started to support the development of a free market. Since 1978, the urbanization process in China expanded dramatically, with 53% of the national area urbanized in 2012 (National Bureau of Statistics of China, 2014).

1.2 Data and Methods

This dissertation draws on data from the 2002 and 2005 waves of the CLHLS, which is the first national longitudinal survey with the largest sample of the oldest old ever conducted in China. The survey area covered 85% of the Chinese population. Information was obtained concerning respondents' demographic characteristics, access to adequate healthcare services when in need, activities of daily living (ADL), instrumental activities of daily living (IADL), self-reported health, cognitive function, etc. Systematic assessments of the CLHLS regarding reliability, validity and the randomness of attrition showed that the data quality of this survey was quite good (Gu, 2008).

In this dissertation, three dependent variables were examined: cognitive impairment (dichotomous variable), cognitive function (continuous variable), and self-rated health (dichotomous variable). For the two dichotomous dependent variables, logistic regression models were used to estimate the odds ratios of being cognitive impaired and reporting poor self-rated health respectively. For the continuous dependent variable, ordinary least squares models were performed to estimate the coefficients of cognitive function. The key independent variables used to predict the three dependent variables include: early parental loss, intergenerational socioeconomic mobility, childhood/adulthood SES, subjective SES, and perceived financial strain.

1.3 Description of Chapters

This dissertation is divided into five chapters. Chapter 1 is a brief introduction of the purpose and background of this dissertation. Chapters 2, 3, and 4 are the three main

articles of this project, based on three empirical studies regarding the stress-health association. Chapter 2 investigated the effect of early parental loss on cognitive well-being in Chinese oldest old and whether this association was modified by the gender of the lost parent and the gender of the offspring. In this study, respondents who did not lose a parent early in life were used as the reference group and compared to those who lost a father only or a mother only or both parents early in life. Chapter 3 examined the effect of intergenerational socioeconomic mobility on subject health and cognitive well-being in Chinese oldest old and the gender differences. In this article, changes in education, occupation and category of residence from childhood to adulthood were used as the predictors of health outcomes. Chapter 4 estimated the direct effect of different dimensions of SES and the indirect effect of perceived financial strain on subjective health. This research used childhood SES, adulthood SES, subjective SES and perceived financial strain as the predictors of health outcomes. Since the three articles were based on the same survey and very similar study samples, the description of the sample and the measurement of some dependent and control variables would be partially repeated in each chapter. Chapter 5 is the concluding chapter, which provides a summary of the findings and a discussion on the strengths, limitations, and future directions of this dissertation project.

CHAPTER 2. EARLY PARENTAL LOSS AND COGNITIVE WELL-BEING IN THE OLDEST OLD: REEVALUATING THE CUMULATIVE DISADVANTAGE THEORY IN THE CONTEXT OF GENDER INEQUALITY

2.1 Introduction

Losing a parent in early life, as a traumatic family event, could pose a long-term risk for one's health and well-being. Nurturing by a caring parent in early life is central to successful physical and mental development of children (Luecken & Roubinov, 2012). Previous research indicated that early parental loss increased one's risk of developing physical and psychological illness (Otowa, York, Gardner, Kendler, & Hettema, 2014; Slavich, Monroe, & Gotlib, 2011) and affected one's capacity to cope with stressful life events (Cerniglia, Cimino, Ballarotto, & Monniello, 2014). Further, the association between the loss of a parent and offspring psychopathology may differ by the gender of the offspring (Tieman, van der Ende, & Verhulst, 2005; Lizardi, Thompson, Keyes, & Hasin, 2009). There is evidence that losing a mother was more strongly associated with offspring psychiatric disorder, as compared with losing a father (Kunugi, Sugawara, Aoki, Nanko, Hirose, & Kazamatsuri, 1995). It was further documented that people who had experienced the loss of the same-sex parent (e.g., a girl who lost a mother) in childhood reported higher levels of depression (Takeuchi et al., 2003).

According to the stress process model, adversities in early life contribute to an accumulation of stressors and a deprivation of social resources, which further produce health disparities in later life (Pearlin et al., 2005; Thoits, 2010). In the case of early parental loss, many important social and economic resources may be removed from a child's life, especially if the deceased parent was the primary income earner in the family (Gimenez et al., 2013). Since fathers and mothers generally play different roles in the family (Craig, 2006; Parke, 2004), children who lose a father may have very different experiences compared to those who lose a mother. Gimenez and colleagues (2013) found that children's educational attainment was affected by the death of a mother more than the death of a father. It should also be noted that boys and girls may have different responses to the loss of a father or a mother or both parents (Gimenez et al., 2013). Despite the evidence so far that links childhood adversities to immediate and long-term health outcomes, there is a lack of understanding on how early parental loss affects cognitive health in very advanced age. Identifying early life risk factors of cognitive function in the oldest old population has the potential to reduce the risk of developing dementia and delay the onset of dementia (Zhang, Gu, & Hayward, 2008).

In general, the prevalence of cognitive problems (e.g., cognitive decline, memory loss) increases dramatically with age (Kemper, Greiner, Marquis, Prenovost, & Mizner, 2001; Lamar, Resnick, & Zonderman, 2003). The magnitude and speed of age-related cognitive decline vary from person to person (Luszcz, Bryan, & Kent, 1997; Sachs-Ericsson & Blazer, 2005). Biological studies based on twin samples suggest that the variability in cognitive performance is only partially explained by genetic heritability

even for people aged 75 years or older (McClearn et al., 1997; McGue & Christensen, 2001). This indicates that there is plasticity in one's cognitive abilities even at an advanced age. To date, scholars have linked cognitive variability to demographic predictors (e.g., Chan, Choi, & Salmon, 2001; Karlamangla et al., 2009), socioeconomic predictors (e.g., Chan et al., 2001; Sachs-Ericsson & Blazer, 2005), and health-related lifestyle such as leisure activities (e.g., Rundek & Bennett, 2006; van Praag, Shubert, Zhao, & Gage, 2005; Wang et al., 2006). Whereas a gradual decline of cognitive function is common in late life (Kemper et al., 2001; Lamar et al., 2003), a faster cognitive decline may indicate mild to severe cognitive impairment, which is associated with elevated mortality risk (Bäckman, Laukka, Wahlin, Small, & Fratiglioni, 2002; Nguyen, Black, Ray, Espino, & Markides, 2003).

Cognitive impairment can be considered as a condition where cognitive function declines greater than expected given one's age and educational level (Gauthier et al., 2006). Extant literature has identified a set of risk factors for cognitive impairment, such as socioeconomic positions (Sachs-Ericsson & Blazer, 2005; Zeki Al Hazzouri et al., 2011), social networks (Seidler, Bernhardt, Nienhaus, & Frölich, 2003), living arrangements (Brenowitz, Kukull, Beresford, Monsell, & Williams, 2014), and leisure activities (Hughes, Flatt, Fu, Chang, & Ganguli, 2013). What is less developed, however, is an understanding of the childhood origins of cognitive problems in advanced age. Among the very few studies that addressed the early origins of cognitive impairment in later life, lower childhood socioeconomic predictors were linked to worse cognitive function (Luo & Waite, 2005) and higher risk of cognitive impairment (Zhang et al., 2008). Still, little

attention has been given to the long-term effect of traumatic family events such as early parental loss on cognitive well-being.

So far, mixed findings have been reported as to whether cognitive function is modified by gender in later life. One strand of literature suggests that no gender differences exist in cognitive performance and the incidence of dementia in older adults (Chan et al., 2001; Ruitenberg, Ott, van Swieten, Hofman, & Breteler, 2001). However, a considerable body of recent Chinese literature indicates that older women have worse cognitive function than older men (Gu & Qiu, 2003; Ho, Woo, Sham, Chan, & Yu, 2001; Zeng, Liu, & George, 2003). The disadvantage in cognitive function among the recent generations of oldest old Chinese women is attributable to the traditional patriarchal society, where women were generally denied formal education in early life and higher-income occupations in adulthood. Since education and occupation are both related to cognitive development and maintenance (Stern & Carstensen, 2000), the socioeconomic disadvantage of Chinese women may put them at higher risk for cognitive impairment, compared to their male counterparts. It is not clear, however, whether losing a parent in early life would be more detrimental to men or women in a patriarchal society.

In a traditional Chinese family, the father has mainly served as the “bread earner” and the mother has taken the primary role of child rearing. It is thereby reasonable to assume that paternal loss could result in quite different experiences for the children compared to maternal loss. Losing both parents in early life could be even more detrimental for individuals’ well-being, both immediately and over the long term. Based on the different consequences of maternal loss and paternal loss on the offspring

(Gimenez et al., 2013; Lizardi et al., 2009) and the gender differences in cognitive function in the Chinese population (Gu & Qiu, 2003; Zeng et al., 2003), it is plausible to assume that both the gender of the lost parent and the gender of the offspring might shape the relationship between early parental loss and cognitive well-being. Using a large population-based sample of Chinese oldest old, this study examines the following questions: (1) Does the early loss of a parent lead to worse cognitive function in late life? (2) Does early parental loss increase the risk of cognitive impairment in later life? (3) Do respondents' gender and the gender of the lost parent modify the relationship between early parental loss and cognitive function? In particular, is maternal loss or paternal loss more strongly associated with cognitive function in oldest old men and women?

2.2 Data and Study Sample

This study used the 2002 wave of the CLHLS, which is the first national longitudinal survey with the largest sample of the oldest old ever conducted in China. The survey area covered over 80% of the Chinese population. The original dataset includes 16,064 respondents. The final sample includes 10,587 oldest old aged between 80 and 105 years who were interviewed in 2002 and did not report that they were diagnosed with dementia. Respondents who reported being 106 years of age or older were excluded from the analysis since researchers were unable to validate their age (Zeng & Vaupel, 2002). The CLHLS datasets present both static and dynamic information of respondents. Information was obtained concerning respondents' demographic characteristics, access to adequate healthcare services, ADL, IADL, subjective health,

cognitive function, etc. Systematic assessments of the CLHLS regarding reliability, validity, and randomness indicated that the data quality of this survey was quite good (Gu, 2008).

2.3 Measurement

2.3.1 Cognitive Function and Cognitive Impairment

The CLHLS measures cognitive function based on the Chinese version of the Mini-Mental State Examination (MMSE). The Chinese version of the MMSE scale was culturally translated from the international standard of the MMSE questionnaire and was constructed from 24 items in the original survey. Since the item "copying a figure" has a very high proportion of missing values, it was excluded from the MMSE scale used in this study. The final version of the MMSE scale includes 23 items (see Appendix). Apart from Question 6 in the scale, all the other items were dichotomized and coded as 1 if respondents were able to give a correct answer (otherwise, 0). For Question 6, 1 point was given for each food named by respondents and up to 8 points could be earned. As recommended by previous literature (Herzog & Wallace, 1997; Zhang, 2006), responses of ''unable to answer'' were counted as incorrect answers. The range of the MMSE scores is 0 to 30 points.

Following the criteria set by the international standard and suggested by previous literature (Gu & Qiu, 2003; Nguyen et al., 2003), respondents were considered as having moderate to severe cognitive impairment when they had an MMSE score lower than 18 points. Specifically, cognitive impairment was coded as 1 for MMSE scores

lower than 18 points (cognitively impaired) and 0 for scores equal to or higher than 18 points (cognitively normal). Given that the majority of the Chinese oldest old (especially women) in this study were illiterate or had very limited education, using a very low cut-off point for cognitive impairment is appropriate. This could help reduce the MMSE measurement error in that individuals who scored less than 18 points might have become cognitively impaired already, regardless of their educational level (Zhang, 2006; Zhang et al., 2008).

2.3.2 Early Parental Loss

Early parental loss was determined by whether a respondent lost a parent up to the age of 16 years. This categorical variable includes four levels: (1) no early parental loss, (2) early loss of both parents, (3) early maternal loss, and (4) early paternal loss. Each category of "early parental loss" was treated as a dummy variable in the analysis, where respondents who did not lose a parent in early life were considered as the reference group. This information is based on recall rather than records. Previous review indicates that information on early parental loss is recalled with good reliability (Brewin, Andrews, & Gotlib, 1993). 16 years of age was used as the cut-off point since previous literature suggests that losing a parent at or before the age of 16 years has the potential to affect respondents' health and well-being (e.g., Krause, 1998). In traditional Chinese society, many individuals became independent from their parents by the age of 16 years. This provides an additional rationale for using 16 years old as the cut-off point.

2.3.3 Covariates

Respondents' demographic characteristics were measured by their age in 2002, gender (women = 1; men = 0), ethnicity (Han majority = 1; minority = 0), and marital status in 2002 (married = 1; otherwise = 0). This study additionally adjusted for proxy status in the analysis since about half of the respondents (53.88%) were not able to answer the survey questions by themselves. In this survey, respondents' proxy was mostly their spouse or another family member.

Childhood SES has been indicated as a robust predictor of health status in later life (Forrest & Riley, 2004; Hayward & Gorman, 2004; Irving & Ferraro, 2006). Childhood SES was measured by the following 2 items: (1) father had a manual occupation before retirement (coded as 1; otherwise, 0); and (2) category of birthplace (rural = 1; urban= 0). In the raw dataset, respondents' and their fathers' occupation before retirement includes the following nine categories: (1) professional and technical personnel; (2) governmental, institutional, or managerial personnel; (3) agriculture, forestry, and animal husbandry worker; (4) fishery worker; (5) industrial laborer; (6) commercial or sales worker; (7) military personnel; (8) housework; and (9) others. In this study, the first two categories were combined as a "non-manual occupation" and the remaining seven categories were combined as a "manual occupation". In China, doing a manual job is generally considered as an indicator of lower SES.

Previous studies have documented that SES is a strong predictor of mortality and other health outcomes (Khang & Kim, 2005; Willson et al., 2007). In this study, respondents' adulthood SES is measured by education (no education = 1; some

education = 0), occupation before retirement (manual occupation = 1; non-manual occupation= 0), category of residence (rural = 1, urban = 0), and pension (no pension = 1; having pension = 0). Education was dichotomized into “no education” versus “some education” based on two reasons: (1) over 60% of respondents had no schooling throughout their life; and (2) for respondents who had some years of education, the majority of them had no more than 10 years of formal education. Due to the rigid rural-urban division in China, respondents’ category of residence was additionally considered as a measurement of SES. In general, individuals dwelling in urban China are believed to have more advantages in education and occupation, as compared with their counterparts living in rural China. In addition, this study controlled for whether respondents had pension after retirement since having pension was an important indicator of higher SES for the study cohort.

In this study, respondents’ health conditions were measured by ADL and chronic diseases suffered in 2002. Respondents were asked whether they had difficulty in performing the following six tasks: eating, dressing, toileting, bathing, indoor transferring, and continence. Since a relatively small proportion of respondents reported being dependent in 2 or more ADLs (about 22%), they were grouped together in the analysis. Thus, “ADL status” in this study consists of three dummy variables: “ADL independence”, “dependence in 1 ADL”, and “dependence in 2 – 6 ADLs”. Respondents were considered as “disease suffering” (coded as 1; otherwise coded as 0) if they reported suffering from at least one of the following chronic diseases in 2002: diabetes, stroke, cancer, bedsore, and other chronic diseases.

2.4 Statistical Analysis

To examine the effect of early parental loss on cognitive function, a series of ordinary least squares (OLS) models were performed. Cognitive function (MMSE scores) was predicted by four dummy variables of early parental loss – no early parental loss (reference group), early maternal loss, early paternal loss, and losing both parents early in life. I ran the OLS models for the full sample and then the sub-samples by gender. In the OLS models for the sub-samples of men and women, respondents were further divided into two sub-groups based on whether they are independent in ADL. ADL dependency was additionally used as a moderator in the gender-stratified analyses for two reasons: first, previous literature suggests that functional loss is strongly associated with cognitive decline (Mehta, Yaffe, & Covinsky, 2002; Njegovan, Man-Son-Hing, Mitchell, & Molnar, 2001); second, preliminary analysis of the data shows an interaction among early parental loss, gender and ADL dependency in predicting cognitive function. Across the four subgroups stratified by gender and ADL dependency, three models were estimated for the effect of early parental loss on cognitive function scores: Model 1 adjusted for demographic characterizes only; Model 2 further adjusted for childhood and adulthood SES; Model 3 additionally adjusted for proxy status and physical health conditions.

I used several logistic regression (logit) models to assess the effect of early parental loss on the risk of cognitive impairment. The odds ratio (OR) of cognitive impairment was calculated by entering three dummy variables of early parental loss (early maternal loss, early paternal loss, and losing both parents early in life) as

independent predictors, where no early parental loss was treated as the reference group. Four models were estimated controlling for respondents' demographic characteristics (Models 1 – 4), childhood and adulthood SES (Models 2 – 4), proxy status (Models 3 and 4), and health conditions (Model 4). I ran the models for the full sample first and then for sub-samples by gender.

2.5 Missing Data

This study has a higher proportion of missing data since the respondents are the oldest old people who may not be able to recall or answer some questions. The final sample includes 67.28% of complete cases and all the other cases have missing values for at least one variable. Among all the variables used in this study, "early parental loss" has the largest proportion of missing values (29.72%); the missing values for all the other variables did not exceed 3.5% (see Table 2.1). Multiple imputation was used to handle the missing data in that this method would result in unbiased estimates and preserves samples size and statistical power by using all available data (McCleary, 2002). All the variables used in the analysis were imputed with the MVN command in the Stata statistical software program, version 13.0 (Little & Rubin, 2002) for 50 times since the proportion of missing data was relatively high (Graham, Olchowski, & Gilreath, 2007).

2.6 Results

Table 2.1 shows the descriptive characteristics for each variable, both for the total sample and by gender. Compared to oldest old men in this survey, their female

counterparts were more advanced in age, less likely to be married, and more likely to have lower socioeconomic status. About 9 out of 10 of oldest old women (88.85%) had taken a manual job, compared with two thirds of oldest old men (63.31%). Whereas 85.65% of oldest old women had no formal education, 38.03% of oldest old men were illiterate. A notably higher proportion of men than women in the study sample received pension. Table 2.1 reported the distribution of early parental loss for both complete and incomplete cases, leading to approximately 30% of missing values. After excluding the missing cases, 71.33% of respondents reported not losing a parent early in life. About 6% of all the respondents lost both parents at/before 16 years old. For both men and women in this survey, by 16 years of age, about 9 - 10% of them lost their father only and about 13% lost their mother only (see Figure 2.1).

Table 2.1 Descriptive Statistics for Study Variables, CLHLS 2002

Variables	Full (N = 10,587)	Men (n = 4,257)	Women (n = 6,330)
Early Parental Loss (%)			
No parental loss at/before 16 yrs of age	50.13%	54.62%	47.11%
Losing both parents at/before 16 yrs of age	4.15%	3.81%	4.38%
Losing a mother only at/before 16 yrs of age	6.56%	7.63%	5.85%
Losing a father only at/before 16 yrs of age	9.44%	10.41%	8.78%
Missing	29.72%	23.53%	33.88%
Age (Range: 80 – 105 years; mean, SD)	92.22	90.2	93.58
	(7.31)	(6.72)	(7.38)
Ethnicity (%)			
Han Majority	94.53%	95.14%	94.12%
Minority	5.44%	4.81%	5.86%
Missing	.03%	.05%	.02%
Marital Status (%)			
Married	16.67%	32.42%	6.08%
Otherwise	83.33%	67.58%	93.92%
Occupation (%)			
Manual occupation	78.58%	63.31%	88.85%
Non-manual occupation	20.87%	36.27%	10.52%
Missing	.55%	.42%	.63%
Education (%)			
No education	66.51%	38.03%	85.65%
Some education	32.65%	61.36%	13.35%
Missing	.84%	.61%	1%
Current Residence (%)			
Rural	53.15%	52.38%	53.67%
Urban	46.85%	47.62%	46.33%
Father's Occupation (%)			
Manual occupation	83.77%	82.41%	84.69%
Non-manual occupation	15.02%	16.87%	13.78%
Missing	1.21%	.72%	1.53%
Birthplace (%)			
Rural	84.35%	83.7%	84.79%
Urban	15.14%	15.92%	14.61%
Missing	.51%	.38%	.6%

Table 2.1 continued.

Pension (%)			
Having pension	16.07%	30.42%	6.42%
No pension	83.88%	69.53%	93.52%
Missing	.05%	.05%	.06%
Cognitive Function (Range: 0 – 30; mean, SD)	20.27	22.49	18.77
	(9.24)	(8.62)	(9.33)
Cognitive Impairment (%)			
Moderate to Severe cognitive impairment	30.36%	21.02%	36.64%
Otherwise	69.64%	78.98%	63.36%
Chronic Diseases (%)			
Suffering from chronic diseases	6.73%	7.75%	6.03%
Otherwise	90.07%	89.34%	90.57%
Missing	3.2%	2.91%	3.4%
ADL Status (%)			
ADL Independence	60.64%	69.46%	54.71%
Dependence in 1 ADL	16.96%	14.66%	18.52%
Dependence in 2 - 6 ADLs	21.97%	15.39%	26.38%
Missing	.43%	.49%	.39%
Proxy			
Others helped answer the questions	53.88%	43.95%	60.55%
Respondents answered the questions	46.11%	56.03%	39.45%
Missing	.01%	.02%	-

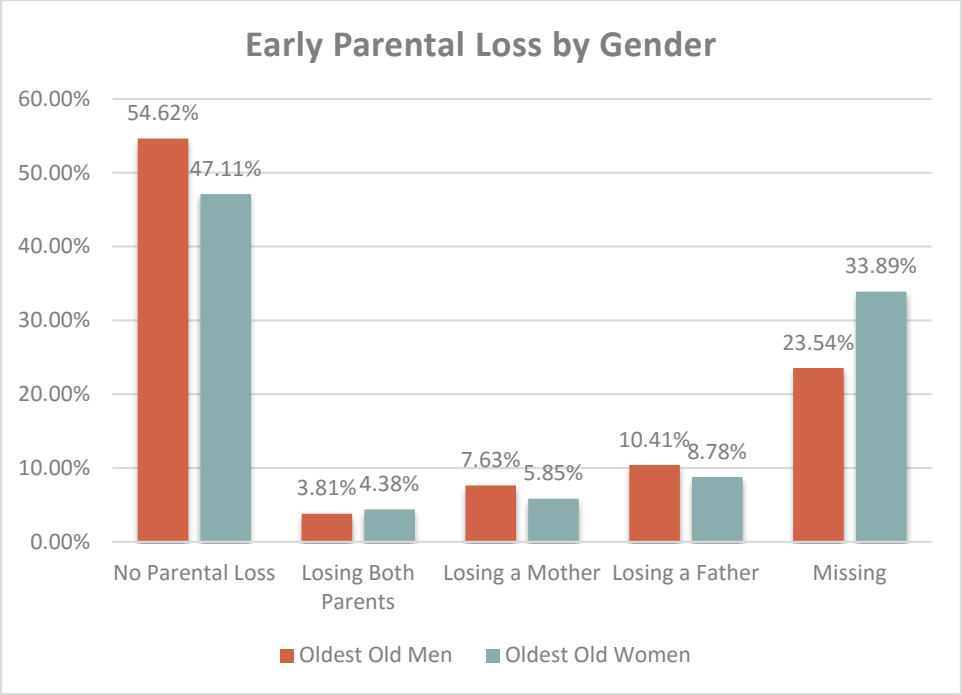

Figure 2.1 Prevalence of Early Parental Loss by Gender, CLHLS 2002

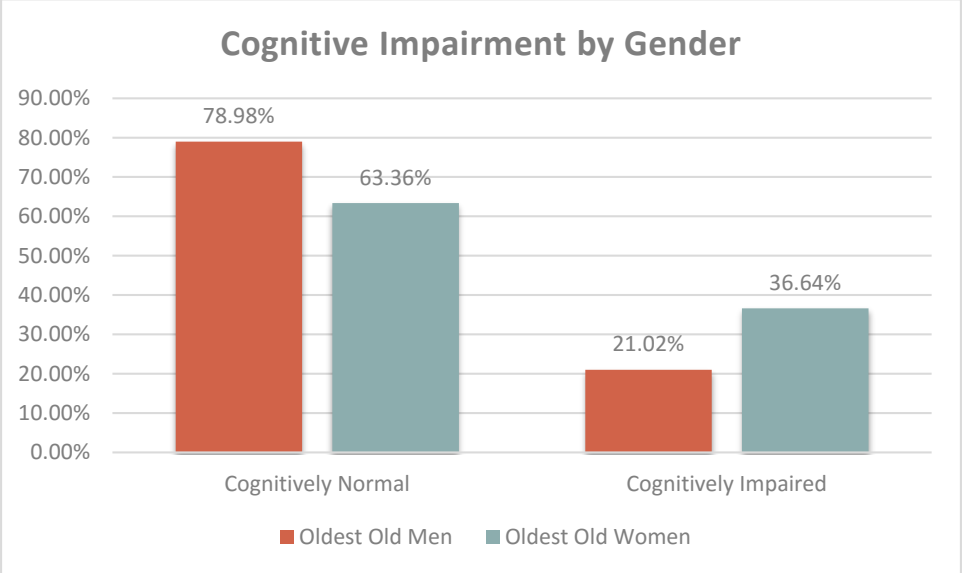

Figure 2.2 Prevalence of Cognitive Impairment by Gender, CLHLS 2002

Consistent with existing Chinese literature (Gu & Qiu, 2003; Zeng et al., 2003), oldest old women had worse cognitive function (indicated by lower MMSE scores) compared to oldest old men. Specifically, men had an average MMSE score of 22.49 out of 30 (SD = 8.62) and women had an average MMSE score of 18.77 (SD = 9.33). In addition, the prevalence of cognitive impairment in oldest old women almost double that in oldest old men (see Figure 2.2). As high as 60.64% of respondents reported that they were ADL independent. About 17% of respondents reported needing help with only one ADL and about 22% reported needing help with two or more ADLs. On average, respondents had difficulty in performing one of the six ADL tasks (mean = .95, SD = 1.54).

Table 2.2 shows the results of OLS models for the full sample, which estimated the influence of early parental loss on cognitive function, net of demographic, socioeconomic, and physical health conditions. Model 1 adjusted for respondents' demographic characteristics including age, gender, ethnicity, and marital status. According to Model 1, losing both parents and losing a mother only at/before the age of 16 years significantly decreased respondents' cognitive function scores, compared with those who did not experience early parental loss. Model 2 further controlled for respondents' and their father's SES, indicated by respondents' category of residency, category of birthplace, occupation before retirement, educational level, pension status, and their father's occupation before retirement. Consistent with Model 1, Model 2 also indicated that losing both parents early in life and early maternal loss significantly predicted lower cognitive function scores in the study sample. Model 3 additionally added proxy status to Model 2 and the effect of losing both parents in early life on

cognitive function became only marginally significant. Model 4 further included ADL dependency and chronic diseases as the covariates. After adjusting for health conditions, the contribution of early maternal loss to cognitive function remained significant ($p = .01$) and changed little in magnitude compared to previous models. The negative effect of early maternal loss on health of the offspring is consistent with findings from previous literature (Kunugi et al., 1995). Yet, the effect of losing both parents in early life on cognitive function was no longer significant.

Across the four models in Table 2.2, losing a mother at or before the age of 16 years decreased the MMSE score of the oldest old by .7 – .76 out of a total possible score of 30. Apart from early parental loss, father had a manual job, having no formal education, having no pension, and living in a rural area all significantly reduced cognitive function scores in the study sample. These findings are consistent with previous studies that indicated the detrimental effect of lower childhood and adulthood SES on health in older age (Hayward & Gorman, 2004; Irving & Ferraro, 2006; Khang & Kim, 2005; Willson et al., 2007). In addition, being ADL dependent and suffering from chronic diseases were associated with worse cognitive function. Being married was associated with better cognitive function among respondents. These associations were robust across the four models for the full sample.

Table 2.2 Cognitive Function predicted by Early Parental Loss and Covariates: Full Sample (N = 10,587)

Variables	Model 1 B (95% CI)	Model 2 B (95% CI)	Model 3 B (95% CI)	Model 4 B (95% CI)
Early Parental Loss (ref.: No Early Parental Loss)				
Losing Both Parents at/before 16	-.92*	-.91*	-.66+	-.59
	(-1.72, -.11)	(-1.71, -.11)	(-1.4,.07)	(-1.3, .12)
Losing a Mother at/before 16	-.7*	-.76*	-.75**	-.76*
	(-1.38, -.01)	(-1.44, -.08)	(-1.38, -.12)	(-1.37, -.15)
Losing a Father at/before 16	-.13	-.16	-.07	-.07
	(-.71, .46)	(-.74, .42)	(-.6, .47)	(-.58, .45)
Age (years)	-.46**	-.44**	-.27**	-.22**
	(-.49, -.44)	(-.46, -.42)	(-.29, -.25)	(-.24, -.2)
Women (vs Men)	-1.86**	-.86**	-.63**	-.33+
	(-2.21, -1.51)	(-1.26, -.46)	(-1, -.26)	(-.69, .03)
Han (vs Minority)	-1.09**	-1.38**	-.96**	-.44
	(-1.8, -.39)	(-2.08, -.67)	(-1.61, -.32)	(-1.07, .19)
Married (vs Otherwise)	1.15**	.89**	.51*	.53*
	(.68, 1.62)	(.42, 1.37)	(.08, .95)	(.11, .95)
Born in a Rural Area (vs Urban)		-.15	-.02	-.18
		(-.65, .36)	(-.48, .45)	(-.63, .27)
Father had a Manual Job (vs Non-Manual)		-.75**	-.68**	-.71**
		(-1.26, -.25)	(-1.14, -.21)	(-1.16, -.25)
Living in a Rural Area (vs Urban)		-.45*	-.36*	-.56**
		(-.815, -.1)	(-.69, -.03)	(-.88, -.24)

Table 2.2 continued.

No Education (vs Some Education)		-1.6**	-1.15**	-1.21**
		(-2.02, -1.19)	(-1.54, -.77)	(-1.58, -.83)
Manual Occupation (vs Non-Manual)		-.34	-.18	-.21
		(-.89, .22)	(-.69, .33)	(-.71, .28)
No Pension (vs Having Pension)		-1.05**	-.97**	-1.08**
		(-1.65. -.45)	(-1.52, -.42)	(-1.61, -.55)
Proxy (vs No Proxy)			-7.13**	-6.17**
			(-7.45, -6.81)	(-6.49, -5.85)
ADL Status (ref.: ADL Independence)				-.97**
Dependence in 1 ADL				(-1.37, -.57)
				-4.83**
Dependence in 2 - 6 ADLs				(-5.22, -4.44)
Suffering from Chronic Diseases (vs Otherwise)				-1.32**
				(-1.89, -.74)
_Cons	65.08	66.01	53.01	48.84
Adjusted R^2	.18	.19	.32	.36

Note: For the table, missing data were imputed 50 times.

+ p < .1; * p < .05; ** p < .01

Table 2.3 Cognitive Function predicted by Early Parental Loss and Covariates: Oldest Old Men

Variables	ADL-Independent Men n = 2,957			ADL-Dependent Men n = 1,300		
	Model 1 B (95% CI)	Model 2 B (95% CI)	Model 3 B (95% CI)	Model 4 B (95% CI)	Model 5 B (95% CI)	Model 6 B (95% CI)
Early Parental Loss (ref.: No Early Loss)						
Losing Both Parents at/before 16	-.55	-.47	-.26	-.92	-.79	-.31
	(-1.9, .8)	(-1.8, .85)	(-1.46, .95)	(-3.59, 1.75)	(-3.43, 1.84)	(-2.71, 2.09)
Losing a Mother at/before 16	-1.06*	-1.07*	-.97*	-.46	-.61	-.96
	(-1.98, -.13)	(-1.97, -.18)	(-1.8, -.14)	(-2.56, 1.64)	(-2.67, 1.44)	(-2.88, .96)
Losing a Father at/before 16	-.02	.02	.2	-.85	-.95	-.73
	(-.83, .79)	(-.78, .83)	(-.57, .96)	(-2.61, .9)	(-2.71, .8)	(-2.38, .92)
Age (years)	-.32**	-.28**	-.17**	-.36**	-.34**	-.23**
	(-.36, -.28)	(-.32, -.24)	(-.21, -.13)	(-.44, -.28)	(-.42, -.26)	(-.31, -.16)
Han (vs Minority)	-.35	-.71	-.69	2.16	1.93	.9
	(-1.44, .74)	(-1.78, .36)	(-1.68, .29)	(-.87, 5.2)	(-1.07, 4.93)	(-1.88, 3.67)
Married (vs Otherwise)	.95**	.66*	.57*	1.54*	1.06+	.69
	(.41, 1.5)	(.12, 1.2)	(.07, 1.06)	(.34, 2.73)	(-.13, 2.25)	(-.41, 1.8)
Born in a Rural Area (vs Urban)		-.4	-.17		.04	-.02
		(-1.19, .39)	(-.9, .56)		(-1.45, 1.53)	(-1.4, 1.36)
Father had a Manual Job (vs Non-Manual)		-.39	-.24		-1.86*	-1.19+
		(-1.17, .39)	(-.95, .48)		(3.38, -.33)	(-2.61, .22)
Living in a Rural Area (vs Urban)		-.85**	-.62*		-.19	-.19
		(-1.44, -.27)	(-1.15, -.08)		(-1.4, 1.01)	(-1.3, .93)

Table 2.3 continued.

No Education (vs Some Education)		-1.72**	-1.44**		-1.5**	-1.03*
		(-2.26, -1.18)	(-1.94, -.94)		(-2.6, -.39)	(-2.06, -.01)
Manual Occupation (vs Non-Manual)		.39	.46		.75	.44
		(-.35, 1.13)	(-.22, 1.14)		(-.75, 2.25)	(-.94, 1.83)
No Pension (vs Having Pension)		-1.59**	-1.48**		-2.63**	-2.67**
		(-2.36, -.83)	(-2.18, -.77)		(-4.13, -1.12)	(-4.06, -1.28)
Proxy (vs No Proxy)			-5.92**			-7.57**
			(-6.43, -5.42)			(-8.62, -6.52)
Suffering from Chronic Diseases (vs Not)			-.88			-2.6**
			(-1.95, .18)			(-3.95, -1.24)
_Cons	52.87	52.87	43.78	49.47	51.34	47.25
R^2	.09	.13	.26	.08	.11	.24

Note: For the table, missing data were imputed 50 times.

+ p < .1; * p < .05; ** p < .01

Table 2.3 shows the results of OLS models with cognitive function regressed on early parental loss and control variables among oldest old men. These respondents were further divided into two sub-groups based on whether they were independent of ADL. For oldest old men who were independent of ADL, losing a mother at or before 16 years of age significantly predicted lower cognitive function scores in Model 1, where only demographic characteristics were adjusted for. This association remained significant and changed little in magnitude in Model 2, where both demographic and socioeconomic conditions were controlled for. Model 3 further took into account proxy status and disease suffering status. In Model 3, the effect of early maternal loss on cognitive function remained significant ($p = .02$) and changed little in magnitude (from -1.07 to -.97), as compared to the previous model. This finding is contradictory to previous literature that losing the same-sex parent in childhood was associated with worse health outcomes (Takeuchi et al., 2003). Consistent with the full sample, ADL-independent men who were married had better cognitive function scores. Lower adulthood SES (living in a rural area, no education, no pension) predicted worse cognitive function among oldest old men who were ADL independent. The same three models were performed in ADL-independent men; yet, no significant association was found between early parental loss and cognitive function. Having no education and no pension both predicted lower cognitive function scores among these men who were dependent in at least 1 ADL.

Table 2.4 shows the results of OLS models for oldest old women, who were further divided into two sub-groups based on their ADL status. Three models were shown for each sub-group. Model 1 examined the effect of early parental loss on cognitive function, controlling for demographic characteristics. Model 2 further adjusted for childhood SES and adulthood SES. In Model 3, early parental loss, demographic conditions, SES, proxy and disease suffering status were simultaneously regressed on cognitive function. Among ADL-independent women, losing a parent in early life did not significantly affect cognitive function across the three models. Yet, living in a rural area and having no education significantly reduced cognitive function scores. Among ADL-dependent women, losing both parents at or before 16 years of age significantly predicted lower cognitive function scores in Models 1 and 2. This association was only marginally significant ($p = .06$) in Model 3, where all the covariates were included. Both lower adulthood SES (father had a manual job) and lower childhood SES (respondents had no education) were associated with worse cognitive function in oldest old women who were ADL dependent.

Table 2.5 shows the results of four logistic regression models for the full sample, assessing the effect of early parental loss on the odds of cognitive impairment in Chinese oldest old. According to Model 1, respondents who lost a mother by 16 years of age were at higher risk of becoming cognitively impaired (OR = 1.23, $p = .04$), independent of their demographic characteristics. This association holds in Model 2 (OR

= 1.26, p = .02), where childhood and adulthood SES were additionally adjusted for. The negative effect of early maternal loss on cognitive impairment was still significant when proxy status was additionally controlled for in Model 3 (OR = 1.29, p = .02). Model 4 is a full model that predicted the risk of cognitive impairment by early parental loss and all the demographic, socioeconomic and health covariates. According to Model 4, respondents who lost a mother in early life were 32% more likely to become cognitively impaired (p = .12), as compared to their counterparts who did not lose a parent early in life. This is consistent with the line of literature that linked maternal loss to worse health outcomes (Kunugi et al., 1995). Losing both parents and losing a father only in early life had no significant effect on cognitive impairment among respondents. Apart from early maternal loss, having no education, having no pension, and father had a manual job all predicted elevated risk of cognitive impairment in late life. Logistic regression models were also run by gender but the effect of early parental loss on cognitive impairment was not robust for each sub-group (results not shown).

Table 2.4 Cognitive Function predicted by Early Parental Loss and Covariates: Oldest Old Women

Variables	ADL-Independent Women n = 3,462			ADL-Dependent Women n = 2,867		
	Model 1 B (95% CI)	Model 2 B (95% CI)	Model 3 B (95% CI)	Model 4 B (95% CI)	Model 5 B (95% CI)	Model 6 B (95% CI)
Early Parental Loss (ref.: No Early Loss)						
Losing Both Parents at/before 16	-.32	-.49	-.39	-1.64*	-1.69*	-1.42+
	(-1.6, .96)	(-1.75, .78)	(-1.59, .8)	(-3.22, -.07)	(-3.25, -.13)	(-2.89, .06)
Losing a Mother at/before 16	-.36	-.39	-.43	-.95	-1.14	-1.09
	(-1.42, .7)	(-1.44, .67)	(-1.43, .58)	(-2.4, .5)	(-2.57, .3)	(-2.46, .27)
Losing a Father at/before 16	.15	.14	.18	-.34	-.57	-.58
	(-.76, 1.07)	(-.77, 1.05)	(-.67, 1.03)	(-1.59, .91)	(-1.82, .68)	(-1.74, .58)
Age (years)	-.4**	-.37**	-.24**	-.4**	-.38**	-.29**
	(-.44, -.36)	(-.41, -.33)	(-.28, -.21)	(-.45, -.35)	(-.43, -.32)	(-.34, -.23)
Han (vs Minority)	-1.12*	-1.46**	-.99*	.6	.53	.63
	(-2.08, -.15)	(-2.42, -.5)	(-1.89, -.1)	(-1.18, 2.39)	(-1.24, 2.3)	(-1.05, 2.3)
Married (vs Otherwise)	.95*	.85+	.35	1.69	1.65	1.17
	(.01, 1.89)	(-.08, 1.79)	(-.53, 1.23)	(-.33, 3.71)	(-.36, 3.65)	(-.73, 3.07)
Born in a Rural Area (vs Urban)		-.49	-.33		.27	.26
		(-1.33, .36)	(-1.12, .46)		(-.79, 1.32)	(-.74, 1.26)
Father had a Manual Job (vs Non-Manual)		-.31	-.51		-1.44**	-1.24*
		(-1.16, .53)	(-1.3, .27)		(-2.5, -.37)	(-2.24, -.23)
Living in a Rural Area (vs Urban)		-1.02**	-.74**		-.58	-.59+
		(-1.58, -.46)	(-1.26, -.21)		(-1.3, .14)	(-1.27, .09)

Table 2.4 continued.

No Education (vs Some Education)		-1.3**	-.76*		-1.76**	-1.46**
		(-2.1, -.5)	(-1.51, -.02)		(-2.81, -.7)	(-2.46, -.46)
Manual Occupation (vs Non-Manual)		-1.03*	-.94+		-1.37+	-1.09
		(-2.06, -.01)	(-1.89, .02)		(-2.78, .04)	(-2.43, .24)
No Pension (vs Having Pension)		-.62	-.31		-.32	-.26
		(-1.83, .59)	(-1.44, .82)		(-2.03, 1.39)	(-1.88, 1.37)
Proxy (vs No Proxy)			-5.93**			-6.89**
			(-6.44, -5.42)			(-7.66, -6.12)
Suffering from Chronic Diseases (vs Not)			-.69			-2.33**
			(-1.99, .6)			(-3.42, -1.23)
_Cons	59.06	60.62	50.35	53.62	55.63	51.64
R^2	.13	.15	.26	.08	.1	.19

Note: For the table, missing data were imputed 50 times.

+ p<.1; * p<.05; ** p<.01

Table 2.5 Odds Ratio of Cognitive Impairment predicted by Early Parental Loss and Covariates: Full Sample (N = 10,587)

Variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
Early Parental Loss (ref.: No Early Parental Loss)				
Losing Both Parents at/before 16	1.17	1.18	1.11	1.1
	(.94, 1.47)	(.94, 1.49)	(.87, 1.43)	(.85, 1.41)
Losing a Mother at/before 16	1.23*	1.26*	1.29*	1.32*
	(1.01, 1.5)	(1.03, 1.54)	(1.04, 1.61)	(1.06, 1.65)
Losing a Father at/before 16	1.01	1.03	1.01	1.01
	(.86, 1.2)	(.87, 1.22)	(.84, 1.2)	(.84, 1.21)
Age (years)	1.11**	1.11**	1.07**	1.06**
	(1.1, 1.12)	(1.1, 1.11)	(1.06, 1.08)	(1.05, 1.07)
Women (vs Men)	1.47**	1.15*	1.1	1.01
	(1.33, 1.63)	(1.02, 1.29)	(.97, 1.24)	(.89, 1.15)
Han (vs Minority)	1.44**	1.55**	1.4**	1.22+
	(1.18, 1.78)	(1.26, 1.91)	(1.12, 1.74)	(.98, 1.53)
Married (vs Otherwise)	.65**	.69**	.76**	.75**
	(.55, .76)	(.58, .81)	(.64, .9)	(.63, .89)
Born in a Rural Area (vs Urban)		.92	.9	.96
		(.79, 1.07)	(.77, 1.06)	(.81, 1.13)
Father had a Manual Job (vs Non-Manual)		1.24**	1.25**	1.27**
		(1.06, 1.44)	(1.06, 1.48)	(1.07, 1.51)
Living in a Rural Area (vs Urban)		1.12*	1.1+	1.18**
		(1.01, 1.24)	(.99, 1.22)	(1.06, 1.31)

Table 2.5 continued.

No Education (vs Some Education)	1.52**	1.42**	1.47**
	(1.34, 1.72)	(1.25, 1.62)	(1.28, 1.69)
Manual Occupation (vs Non-Manual)	1.1	1.06	1.08
	(.93, 1.31)	(.89, 1.27)	(.89, 1.3)
No Pension (vs Having Pension)	1.39**	1.41**	1.49**
	(1.15, 1.69)	(1.14, 1.73)	(1.2, 1.84)
Proxy (vs No Proxy)		6.89**	5.82**
		(6.13, 7.75)	(5.16, 6.57)
ADL Status (ref.: ADL Independence)			
Dependence in 1 ADL			1.31**
			(1.15, 1.49)
Dependence in 2 - 6 ADLs			3.02**
			(2.67, 3.4)
Suffering from Chronic Diseases (vs Otherwise)			1.42**
			(1.17, 1.73)
_Cons	1.1	1.06	1.08
	(.93, 1.31)	(.89, 1.27)	(.89, 1.3)
Adjusted R^2	1.39**	1.41**	1.49**
	(1.15, 1.69)	(1.14, 1.73)	(1.2, 1.84)

Note: For the table, missing data were imputed 50 times.

+ p<.1; * p<.05; ** p<.01

2.7 Discussion

As life expectancy increases across societies, more attention has been given to the quality of life in advanced age. A crucial aspect of the quality of late life is cognitive function, which involves verbal fluency, attention, vocabulary, speed of processing, inductive reasoning, episodic memory, etc. This study examined whether the early loss of a parent affected cognitive well-being in Chinese oldest old born in the early 1900s. This association was hypothesized to be moderated by the gender of the lost parent and the gender of the offspring. Consistent with previous literature (Kunugi et al., 1995), this study found that losing a mother in early life predicted worse health outcomes among the offspring. Specifically, early maternal loss robustly predicted lower cognitive function scores and higher risk of cognitive impairment in the oldest old. When respondents were further divided into several sub-groups stratified by gender and ADL status, the association between early maternal loss and worse cognitive function was only found in oldest old men who were ADL independent. This finding challenged results from previous work indicating that losing the same-sex parent in childhood was associated with worse health outcomes (Takeuchi et al., 2003).

Extant literature suggests that the death of a parent removes many important social and economic resources from a child's life, especially if the deceased parent was the primary income earner in the family (Champagne & Curley, 2009; Miller et al., 2011). In a traditional Chinese family, the father typically served as the "bread earner" and

largely determined the childhood SES of their offspring. There is also evidence that individuals' childhood SES significantly and positively predicted their adulthood SES (Wu, 2010). Further, toth lower childhood SES and lower adulthood SES have been linked to poorer health outcomes (Irving & Ferraro, 2006; Willson et al., 2007). In this study, lower SES in childhood and adulthood were found to predict lower cognitive function scores and higher risk of cognitive impairment in the oldest old population. Unexpectedly, however, losing a mother rather than a father in early life was detrimental to cognitive well-being in the population of interest.

One possible reason to account for this surprising finding could be related to the informal education from mother to children. The oldest old people in this study were mostly born in the late 1800s and early 1900s, when opportunities for formal education were quite limited. In particular, about two thirds of respondents in this study had no formal education at all. During this period of time, mothers were generally responsible for child rearing and were likely to pass on their personal knowledge to their children. There is evidence that children's experiences within their own families and particularly learned from their mother could facilitate their cognitive development and school achievement (Scott-Jones, 1987). Further, the brain reserve capacity theory indicates that a lack of early cognitive training could lower brain reserve and subsequently allow for cognitive problems to appear earlier in one's life course (Zhang et al., 1990). Thus, it is plausible to believe that among a population with relatively lower formal education,

the loss of a mother in early life could possibly reduce the opportunities of early intelligence development and subsequently influence cognitive well-being negatively.

Another main finding of this study is that early maternal loss predicted worse cognitive function in oldest old men rather than their female counterparts, which is contrary to some previous literature (e.g., Takeuchi et al., 2003). Given the fact that women in traditional Chinese society were more disadvantaged than men (Watson, 1991), it is possible that the negative effect of early parental loss on women was mediated by the detrimental effect of other stressful events over their life course. The literature on resilience might also shed some light on the gender differences in the association between early maternal loss and cognitive function. Resilience can be defined as a dynamic process where individuals use positive adaptations in the face of adverse conditions (Luthar, Cicchetti, & Becker, 2000). While facing traumatic events, women were generally more resilient than men (Williams & Drury, 2009). Thus, traumatic events such as the death of a parent might affect men to a larger extent than women over time.

These unexpected findings cannot be fully understood without giving attention to several limitations of the study. First, the oldest old in this study were born in the late 1800s and early 1900s, when many dramatic social changes went on in China. In 1894, the First Sino-Japanese War broke out and many people lost their lives during that period of time. In 1912, the Republican China was first established and many social

changes happened as a result. In 1973, the Second Sino-Japanese War, as the largest Asian war in the 20th century, was fought between China and Japan. Tens of millions of Chinese civilians died from war-related violence, famine, and other social issues. It is largely unknown how many children and their parents survived during the war and how such traumatic experiences could affect these children's health and well-being many decades later. The oldest old individuals in this study were mostly the "lucky survivors" of wars, famines, and political persecution. Thus, results might be somewhat different from other generations in China or populations from other countries. Second, there is a lack of information on the quality of relationship between respondents and their parents as well as other stressful events that respondents had experienced over the life course, which might further make the results biased. Third, the MMSE instrument was used to measure cognitive function and a threshold score was used to determine cognitive measurement, which might make the results less accurate as compared with using clinical tests. However, previous literature has verified the validity of the MMSE scale and the cutoff score for cognitive impairment used in this study (e.g., Zhang, 2006). Finally, some information in this study was self-reported and recalled by respondents or their proxy, which could be either overreported or underreported. For instance, due to a lack of access to clinical diagnosis of physical diseases, respondents (or their proxy) were likely to underreport the chronic diseases that they suffered from during the survey.

In spite of these limitations, this study contributes to the extant literature in several ways. First, by exploring the long-term effect of early parental loss on cognitive well-being in the oldest old, this study enriches the understandings of how health issues in advanced age may have origins rooted in very early life. Second, findings from this study indicates that oldest old men who lost a mother in early life were most vulnerable to cognitive problems, which is innovative and provides a new way of understanding the role of gender in the trauma-health association. Third, this study used an advanced statistical method to handle missing data, which provided unbiased estimates and helped reserve the sample size and power of the original data. Based on a comparison between the original data with complete cases only and the imputed data (tables not shown for the original data), the main patterns of the results were quite similar but the effects generated by the imputed data were stronger. Finally, results of this study may facilitate the understandings of the life experiences and health among the current and future generations of the oldest old population.

Although this study was based on a sample of older adults who were born about a century ago, results of this study still have empirical implications on future generations of older adults domestically and internationally. For one thing, gender inequality is still a salient issue in many countries across the world, which is likely to modify the association between social factors and well-being over time. For the case of China, a large number of women in rural areas still have relatively lower education and fewer job opportunities,

as compared to men. The gender differences found in cognitive well-being in an advanced age and its early-life predictors may benefit the study of trauma-health association today and in the future. On the other hand, although the rates of parental death are much lower nowadays in China and many other countries than the early 1900s, it should be noted that the rates of parental separation are still quite high in the modern society. This is particularly true in rural China, where a great number of men and women have emigrated from rural areas to cities, leaving millions of children to be separated from their parents and taken care of by their grandparents or other relatives. There is evidence that parental separation can be even more detrimental than parental death (Otowa et al., 2014). Thus, it will be interesting for future studies to assess the long-term effect of parental separation on cognitive health over the life course.

China's oldest old population is projected to reach 100 million in the next few decades. Learning about the patterns of the recent generations of the oldest old adults will benefit future generations in many ways. Findings from the oldest old population in China indicate that losing a mother early in life increases the risk of moderate to severe cognitive impairment, which may indicate Alzheimer's disease or other dementia. This finding lends support to the cumulative disadvantage theory and the life course inequality (Dannefer, 2003; Ferraro, 2006; Ferraro & Kelley-Moore, 2003). Early disadvantages may differentiate individuals' life experiences over the life course and lead to health inequality even at a very advanced age. Longitudinal research is needed

to examine the interrelationships in trauma, resilience, and health over the life course. Given the fact that both respondents' gender and the gender of the lost parent would shape the trauma-health association over time, policy makers should draw attention to the different needs of older men and older women in terms of healthcare. Further, since many people who experienced traumatic events had long-term traumatic memories and post-traumatic stress disorder (Zhao & Fu, 2010), the government should pay attention to the post-traumatic stress prevention.

CHAPTER 3. IS DOWNWARD SOCIOECONOMIC MOBILITY DETRIMENTAL TO HEALTH IN ADVANCED AGE? EVIDENCE FROM A NATIOANL SAMPLE OF THE OLDEST OLD

3.1 Introduction

Socioeconomic status (SES) indicates the social location of an individual in the social stratification system. Researchers generally use education, occupation and income to measure individual SES (Lantz, House, Mero, & Williams, 2005; Zeng, Gu, & Land, 2007). Lower SES in early life has been indicated to predict poor health statuses in later life (Cohen, Janicki-Deverts, Chen, & Matthews, 2010). These health outcomes include but are not limited to mortality (Hayward & Gorman, 2004), physical functioning (Haas, 2008), and self-rated health (Irving & Ferraro, 2006).

In addition to absolute measures of SES, changes in SES over time were also indicated to predict health outcomes over the life course (Johnson-Lawrence et al., 2013). Further, adulthood SES has been indicated to remediate the association between childhood SES and health in later life (Beebe-Dimmer et al., 2004; Lehman, Taylor, Kiefe, & Seeman, 2005). It is still understudied, however, whether different directions (e.g., upward, downward, stable) and dimensions (e.g., education, occupation) of SES mobility might affect health outcomes in various ways. In particular, there is little evidence on how SES mobility from childhood to adulthood could affect the health and well-being of the oldest old population, which is growing rapidly across the world.

This study asked two research questions: (1) How does SES mobility from childhood to adulthood affect cognitive health and subjective health in Chinese oldest old? and (2) Does the relationship between intergenerational SES mobility and health differ by gender? Drawn from the work of Hallqvist et al. (2004), intergenerational SES mobility in this study is defined as the change in SES from childhood to adulthood. Specifically, four directions of SES mobility were developed to measure the change of one's SES from early life to adulthood: upward mobility, downward mobility, stable with high SES, and stable with low SES.

3.2 Theoretical Background

The life course perspective suggests that previous experiences have an impact on future experiences, and may either bring beneficial or detrimental effects (Elder, 1998). Thus, stressful life events in early life might affect the well-being of individuals either positively or negatively in later life. The stress process is embedded in three levels of structural context: social stratification, social institutions, and interpersonal relationships. The systems of social stratification assign individuals to different statuses, which further lead to unequal share of social resources, power, and opportunities (Pearlin, 1989; 1999b). In traditional Chinese society, being a woman per se could be stressful since women had little power and fewer opportunities for educational and occupational advancement across the life course, as compared to a man. The SES disparities and gender inequality might be re-intensified by social institutions, which involve a series of roles, norms, and values (Pearlin, 1999b).

According to the accumulation model, the negative effect of low SES accrues over life (Cohen et al., 2010). Therefore, the risk for developing poor health in later life increases as the intensity and duration of socioeconomic disadvantage go up. Based on this model, it is possible that having lower SES from childhood to adulthood could lead to worse health outcomes, as compared to those with higher SES during any periods across the life course.

The change model indicates that a transition from lower to higher SES would lead to better health in later life (Johnson-Lawrence et al., 2013). In particular, the detrimental effect of lower SES in early life could be remediated to some extent by higher SES in later life (Cohen et al., 2010). In line with this perspective, it can be postulated that experiencing upward mobility in SES may benefit one's health and well-being, especially as compared to having low SES from childhood to adulthood or experiencing downward SES mobility.

3.3 Rural-Urban Differences and Gender Differences in the Chinese Context

This study drew attention to the oldest old adults mostly born between 1900 and 1925, who had experienced a variety of hardships due to wars and unrest. China was considered an economically and politically strong nation in the late 17th and the 18th centuries. Yet, the Chinese empire declined gradually during the Qing Dynasty – the last imperial dynasty of China that ruled from 1644 to 1911. With the expansion of the European colonial powers in Asia in the 19th and early 20th centuries, the Qing Dynasty encountered severe military and political pressure, and was overthrown by

revolutionaries in 1911. After four decades of wars and conflict (e.g., Japanese invasion, World War II, civil war), the People's Republic of China (PRC) was finally established in 1949. For a time, the Chinese Communist Party mimicked Soviet socialist policies in terms of economics, education, and social welfare (Banister et al., 2012). After the Cultural Revolution (a sociopolitical movement from 1966 to 1976), the Chinese government started to support the development of a free market, although the political administration maintained its socialist style.

Rural-urban residency in China substantially influences the availability of and accessibility to social, health, and economic resources. Compared to urban residents, rural residents generally had relatively lower income, fewer years of formal education, less access to public transportation, and poorer health conditions (Cohen-Mansfield & Frank, 2008; Reschovsky & Staiti, 2005). In 1958, the Chinese government promulgated the *hukou* system – the system of household registration required by law to control the movement of people between urban and rural areas. Individuals were broadly divided into "urban workers" and "rural workers", with limited chance of moving from the countryside to an urban area.

In the late 1970s, the Chinese Economic Reform was introduced and the role of markets and private enterprises were expanded (Yi & Chien, 2002). Since 1978, China has become one of the countries with the fastest growing economy in the world. In the meantime, the urbanization process in China expanded dramatically, with 53% of the national area urbanized in 2012 (National Bureau of Statistics of China, 2014). Therefore, many rural residents became urban residents in China. During the past few decades, a

series of investment and supportive policies led to the rapid development of economy in urban China (Zhao, 2002). A growing number of people moved from the countryside to the cities, given the limited opportunities of changing their *hukou* category.

In the Chinese context, residential mobility (e.g., moving from a rural area to an urban area) is an important indicator of SES mobility beyond educational and occupational attainments. To collect information on intergenerational mobility, we may compare individuals' and their father's educational and occupational attainments. Due to the substantial gender inequality in traditional Chinese society, the mothers of the current oldest old population barely had any chance for formal education or an occupation outside of home.

Chinese women have historically lived in a patriarchal society where they were denied formal education or high-skilled occupation. Subsequently, women mostly had lower SES than men over the life course in traditional Chinese society. This is especially true for women living in the early 1990s. Receiving formal education and taking a non-manual occupation are believed to benefit cognitive development and maintenance (Stern & Carstensen, 2000). These arguments, therefore, provide the rationale for the body of Chinese literature suggesting that older women had worse cognitive function than older men (Gu & Qiu, 2003; Zeng et al., 2003).

The social and economic transitions occurred in the past few decades have gendered consequences and lead to different life experiences for men and women (Fan, 2003). In particular, the division of labor based on gender has become a dominant mode of household production in rural China. Women who migrated from rural to urban areas

were mostly disadvantaged in the urban labor market due to their inferior social status and limited formal education (Fan, 2003). In other words, China's economic transition has shaped the life chance of migrant men and migrant women in different ways.

3.4 Data and Sample

This study used the 2005 wave of CLHLS. The CLHLS is the first national longitudinal survey with the largest sample of the oldest old in China. The CLHLS included respondents' demographic characteristics, socioeconomic conditions, social relationships, health conditions and other information. All information was obtained by face-to-face interviews. Systematic assessments of the CLHLS regarding reliability, validity, and randomness showed that the data quality in this survey was quite good (Gu, 2008). This study only included the oldest old population – respondents who were at least 80 years old. Respondents who reported being 106 years old or above were excluded from the analysis because researchers were unable to validate their age (Zeng & Vaupel, 2002). The missing values did not exceed 2% and were all excluded from the study. The final sample includes 9,844 older adults who were born between 1899 and 1925.

3.5 Measurement

3.5.1 Dependent Variables

Cognitive function was measured by the MMSE scale, which evaluated four dimensions of cognitive ability: orientation, calculation, recall, and language (Folstein,

Folstein, & McHugh, 1975). The MMSE scale used in this study includes 23 items (see Appendix). Apart from Item 6 in the scale, all the other items were dichotomized and coded as 1 if respondents were able to give a correct answer (otherwise, 0). For Item 6 (naming different kinds of food within 1 minute), 1 point was given for each food named by respondents and up to 8 points could be earned. Following the work of Zhang (2006), responses of ‘‘unable to answer’’ were counted as incorrect answers. The range of the MMSE scores is 0 to 30, where higher scores indicating better cognitive function.

Cognitive impairment was determined by whether respondents had a MMSE score lower than 18 points. Given that the majority of the study sample (especially women) were illiterate or had only a few years of education, it is appropriate to use a very low cut-off point for cognitive impairment (Nguyen et al., 2003). In the analysis, cognitive impairment was coded as 1 (cognitively impaired) if respondents had an MMSE score lower than 18 points and coded as 0 (cognitively normal) if respondents scored 18 points or more in the test.

Poor self-rated health was measured by how respondents rated their health status during the interview. This variable was coded as 1 if respondents answered “bad” or “very bad” and 0 if respondents answered “so so”, “good”, or “very good”. According to Zeng and colleagues (2007), self-rated health reflects respondents’ subjective evaluation about physical health, social status, and connection with society.

3.5.2 Independent Variables

Intergenerational socioeconomic mobility was measured by three dimensions: occupational mobility, educational mobility, and residential mobility. These variables were constructed from respondents' childhood SES and adulthood (father's) SES, indicated by occupation (manual job = 1; non-manual job = 0), education (no education = 1; some education = 0), and category of residence (rural = 1; urban= 0). In the Chinese context, doing a manual job, having no education, and born/living in a rural area are all indicators of lower SES (Zhang, 2006). Since the majority of the respondents' mother had no education and did not work outside of home throughout life, respondents' father's SES primarily determined their childhood SES. Respondents' and their fathers' occupation were divided into two groups: the "non-manual occupation" and the "manual occupation".

Intergenerational occupational mobility included four categories: (i) Downward occupational mobility (reference group): father had a non-manual occupation → respondents had a manual occupation; (ii) Upward occupational mobility: father had a manual occupation → respondents had a non-manual occupation; (iii) Stable as manual: father had a manual occupation → respondents had a manual occupation; (iv) Stable as non-manual: father had a non-manual occupation → respondents had a non-manual occupation. Three dummy variables were created for each category of occupational mobility except for the reference group – downward occupational mobility.

Intergenerational educational mobility included four categories: (i) Downward educational mobility (reference group): father had some education → respondents had

no education; (ii) Upward educational mobility: father had no education → respondents had some education; (iii) Stable with no education: father had no education → respondents had no education; (iv) Stable with some education: father had some education → respondents had some education. Three dummy variables were created for each category of educational mobility except for the reference group – downward educational mobility.

Intergenerational residential mobility included four categories (three dummy variables): (i) Downward residential mobility (reference group): born in an urban area → lived in a rural area (ii) Upward residential mobility: born in a rural area → lived in an urban area; (iii) Stable in rural areas: born in a rural area → lived in a rural area; (iv) Stable in urban areas: born in an urban area → lived in an urban area. Three dummy variables were created for each category of residential mobility except for the reference group – downward residential mobility.

3.5.3 Control Variables

Respondents' demographic characteristics were measured by their age in 2005, gender (women = 1; men = 0), ethnicity (Han majority = 1; minority = 0), and marital status in 2005 (married = 1; otherwise = 0). Proxy status was determined by whether someone else helped respondents answer the questions. In this study, 55.77% of respondents were not able to answer some or all the survey questions due to their health limitations. For these respondents, their spouse or another family member helped them completed the survey.

Respondents' physical health conditions were further adjusted for. In CLHLS, respondents were asked whether they had difficulty in performing the following six tasks: eating, dressing, toileting, bathing, indoor transferring, and continence. They were considered as "dependence in ADL" if they reported needing assistance in one or more of the six tasks (coded as 1) and were considered as "independence in ADL" if they did not need any help in performing the six task (coded as 0). Although respondents reported chronic diseases in CLHLS, this information was not included as a control variable in that the data were quite inaccurate (Zhang, 2006).

3.6 Statistical Analysis

Ordinary least squares (OLS) models were performed to examine the effect of intergenerational SES mobility on cognitive function. Specifically, cognitive function was predicted by a series of dummy variables indicating intergenerational SES mobility in occupation, education, and category of residence, where downward mobility served as the reference group. The OLS models were performed in the total sample and by gender. Respondents' demographic characteristics, proxy status, and physical health conditions were adjusted for.

Logistic regression (logit) models were used to assess the effect of intergenerational SES mobility on the risk of developing cognitive impairment and reporting poor subjective health. The odds ratio (OR) of being cognitive impaired and reporting poor health was calculated by entering three dummy variables for each dimension of intergenerational SES mobility as independent predictors, adjusting for

demographic characteristics, proxy status, and physical health conditions. These models were also performed in the total sample and by gender.

3.7 Results

3.7.1 Descriptive Characteristics of the Study Sample

Table 3.1 shows the descriptive characteristics of the study variables, both for the total sample and by gender. Among the respondents, women were more advanced in age and less likely to be married compared to men. There are some substantial differences in the socioeconomic characteristics between men and women, especially in occupational and educational attainments. About 9 out of 10 of women (90.61%) had taken a manual job, compared with two thirds of men (67.35%). The majority of women (87.11%) received no formal education, but no more than half of men (41.89%) were illiterate.

Table 3.1 Descriptive Statistics for Study Variables, CLHLS 2005

Variables	Total (N = 9,844)	Men (n = 3,963)	Women (n = 5,881)
Intergenerational Socioeconomic Mobility			
Intergenerational Occupation Mobility			
Downward occupational mobility (%)	4.6%	2.27%	6.17%
Upward occupational mobility (%)	12.88%	23.32%	5.85%
Stable as manual (%)	76.65%	65.08%	84.44%
Stable as non-manual (%)	5.87%	9.34%	3.54%
Intergenerational Educational Mobility			
Downward educational mobility (%)	7.63%	3.71%	10.27%
Upward educational mobility (%)	20.74%	40.37%	7.52%
Stable with no education (%)	61.28%	38.18%	76.84%
Stable with some education (%)	10.35%	17.74%	5.37%
Intergenerational Residential Mobility			
Urban to rural – downward mobility (%)	1.84%	1.59%	2.01%
Rural to urban – upward mobility (%)	31.59%	32.32%	31.1%
Stable in rural areas (%)	53.82%	52.79%	54.51%
Stable in urban areas (%)	12.75%	13.3%	12.38%
Demographic Characteristics			
Age (Range: 80 – 105 years; mean, SD)	92.37 (6.92)	90.52 (6.31)	93.61 (7.03)
Ethnicity (%)			
Han Majority	93.63%	93.72%	93.57%
Minority	6.37%	6.28%	6.43%
Marital Status (%)			
Married	16.58%	32.53%	5.83%
Otherwise	83.42%	67.47%	94.17%
Adulthood SES			
Occupation (%)			
Manual occupation	81.25%	67.35%	90.61%
Non-manual occupation	18.75%	32.65%	9.39%
Education (%)			
No education	68.9%	41.89%	87.11%
Some education	31.1%	58.11%	12.89%
Current Residence (%)			
Rural	55.66%	54.38%	56.52%
Urban	44.34%	45.62%	43.48%

Table 3.1 continued

Childhood (Father's) SES			
Father's Occupation (%)			
Manual occupation	89.53%	88.39%	90.29%
Non-manual occupation	10.47%	11.61%	9.71%
Father's Education (%)			
No education	82.02%	78.55%	84.36%
Some education	17.98%	21.45%	15.64%
Birthplace (%)			
Rural	85.41%	85.11%	85.61%
Urban	14.59%	14.89%	14.39%
Health Conditions			
Cognitive Function (Range: 0 – 30; mean, SD)	20.05 (9.94)	22.55 (9.15)	18.36 (10.1)
Cognitive Impairment (%)			
Moderate/Severe cognitive impairment	31.9%	21.83%	38.68%
Otherwise	68.1%	78.17%	61.32%
Self-Rate Health (%)			
Poor self-rated health	24.89%	21.1%	27.44%
Otherwise	75.11%	78.9%	72.56%
ADL Status (%)			
Dependence in 1 or more ADL	33.14%	25.01%	38.62%
ADL Independence	66.86%	74.99%	61.38%
Proxy			
Others helped answer the questions	55.77%	46.3%	62.15%
Respondents answered the questions	44.23%	53.7%	37.85%

In this study, a relatively higher proportion of men experienced upward occupational (23.32%) and educational (40.37%) mobility. In contrast, only 5.85% of women experienced upward occupational mobility and 7.52% of women experienced upward educational mobility. The majority of women (84.44%) took a manual occupation and had no education, as did their father. There is only a minor gender difference in intergenerational residential mobility. For both oldest old men and women, about 30% experienced upward mobility (from rural to urban) over the life time.

Consistent with existing Chinese literature (Gu & Qiu, 2003; Zeng et al., 2003), oldest old women had worse cognitive function (indicated by lower MMSE scores) than oldest old men. Specifically, men had an average MMSE score of 22.55 out of 30 (SD = 9.15) and women had an average MMSE score of 18.36 (SD = 10.1). The prevalence of cognitive impairment in oldest old women (38.68%) almost double that in oldest old men (21.83%). One quarter of men reported needing help in one or more ADL, over one third of women were ADL-dependent. In this study, about 1 out of 4 respondents reported poor subjective health, with a slightly higher proportion in women than in men.

3.7.2 Sample Pages and Formatting Checklist

Table 3.2 shows the estimates of cognitive function (MMSE scores) by intergenerational SES mobility for the total sample and by gender. Among respondents who had no education in the total sample, those whose father also had no education got lower cognitive function scores ($b = -1.12$, $p < .01$), as compared to those whose father had some education. In other words, respondents with stable low education had

worse cognitive function than those who experienced downward educational mobility. The same pattern was found in oldest old women ($b = -1.18$, $p < .01$) but not in oldest old men. Among respondents who had some education in the total sample, those whose father also had some education (stable high education) got higher cognitive function scores ($b = 1.635$, $p < .01$) than those who experienced intergenerational downward educational mobility. The same pattern was found in female respondents ($b = 1.2$, $p < .05$) but not in their male counterparts. It should be noted that the relatively small sample size of oldest old men who experienced downward educational mobility could possibly affect the results for men.

For the total sample, respondents who were born and stayed in an urban area (stable high SES in category of residence) had higher cognitive function scores ($b = 1.51$, $p < .05$), as compared to their counterparts who were also born in an urban area but moved to a rural area (downward SES mobility) in later life. The same trend was found in oldest old women ($b = 2.47$, $p < .01$) but not in oldest old men. Further, female respondents who moved from a rural area to an urban area (upward residential mobility) had better cognitive function ($b = 1.85$, $p < .05$) than their counterparts who moved from an urban area to a rural area (downward residential mobility). No significant results were found towards the association between cognitive function and intergenerational occupational mobility for the total sample or by gender.

Table 3.2 Cognitive Function predicted by Intergenerational Socioeconomic Mobility: Total Sample and by Gender

Variables	Total (N = 9,844)	Men (n = 3,963)	Women (n = 5,881)
Intergenerational Occupation Mobility	*Downward occupational mobility (ref.)*		
Upward occupational mobility	.13	.52	-.66
	(-.76, 1.02)	(-1.16, 2.2)	(-1.9, .59)
Stable as manual	-.21	.27	-.53
	(-1.02, .58)	(-1.37, 1.91)	(-1.47, .41)
Stable as non-manual	.52	1.01	-.19
	(-.5, 1.54)	(-.79, 2.81)	(-1.64, 1.27)
Intergenerational Educational Mobility	*Downward educational mobility (ref.)*		
Upward educational mobility	.41	-.24	.16
	(-.28, 1.11)	(-1.55, 1.07)	(-.87, 1.2)
Stable with no education	-1.12***	-1.17+	-1.18**
	(-1.74, -.5)	(-2.48, .14)	(-1.89, -.46)
Stable with some education	1.63***	1.2+	1.2*
	(.85, 2.42)	(-.19, 2.59)	(.03, 2.38)
Intergenerational Residential Mobility	*Urban to rural – downward mobility (ref.)*		
Rural to urban – upward mobility	1.04+	-.67	1.85*
	(-.18, 2.26)	(-2.63, 1.29)	(.29, 3.41)
Stable in rural areas	.16	-1.57	.93
	(-1.05, 1.37)	(-3.51, .38)	(-.62, 2.48)
Stable in urban areas	1.51*	-.25	2.47**
	(.24, 2.78)	(-2.28, 1.79)	(.83, 4.1)
Covariates			
Age (years)	-.27***	-.21***	-.29***
	(-.29, -.24)	(-.25, -.17)	(-.33, -.26)
Han (vs Minority)	-.47	-.5	-.38
	(-1.13, .19)	(-1.5, .5)	(-1.25, .5)
Married (vs Otherwise)	.41+	.21	.02
	(-.05, .86)	(-.33, .74)	(-.92, .96)
Proxy (vs No Proxy)	-6.21***	-6.08***	-6.27***
	(-6.57, -5.85)	(-6.61, -5.55)	(-6.76, -5.79)
Dependence in ADL	-4.79***	-4.52***	-4.79***
(vs ADL Independence)	(-5.16, -4.41)	(-5.12, -3.91)	(-5.27, -4.31)
_Cons	50.09	47.07	51.71
Adjusted R^2	.33	.29	.32

Note: The table reported the OLS regression coefficients and the 95% confidence intervals (CI).
+ p < .1; * p < .05; ** p < .01; *** p < .001

3.7.3 Intergenerational SES Mobility and Cognitive Impairment

Table 3.3 shows the estimates of the odds ratios of cognitive impairment by intergenerational socioeconomic mobility for the total sample and by gender. In the male sample, compared to participants who experienced downward occupational mobility, those who were stable with a non-manual occupation were 52% less likely to become cognitively impaired. This trend was found neither in the total sample nor in the oldest old women.

In the total sample, respondents who were stable with no education were 42% more likely to become cognitively impaired than those who experienced downward educational mobility. The same trend was found in the female sub-sample (OR = 1.41, $p < .01$) but not in their male counterparts. Further, a comparison of the confidence intervals for the estimates of intergenerational educational mobility indicated that having stable low education predicted significantly higher risk of cognitive impairment than having upward educational mobility. This trend was found in both the total sample and the female sample. There was also evidence that respondents who were stable with some education across generations were 34% less likely to have cognitive impairment than those who experienced downward educational mobility. This pattern was found in the total sample but not in the sub-samples by gender.

Oldest old women who were born and stayed in an urban area were 39% less likely to become cognitively impaired than those who were also born in an urban area but stayed in a rural area in later life. Among oldest old men whose father had a non-manual job, those who also had a non-manual job (stable high occupation) before

retirement were 52% less likely to have cognitive impairment than those who had a manual occupation (downward occupational mobility).

3.7.4 Intergenerational Socioeconomic Mobility and Subjective Health

Table 3.4 shows the estimates of the odds ratios of reporting poor subjective health predicted by intergenerational socioeconomic mobility for the total sample and by gender. For the total sample, respondents who were born and stayed in an urban area were 35% less likely to report poor self-rated health, as compared to those who were also born in an urban area but moved to a rural area in later life. The same trend was found in oldest old women (OR = .55, $p < .05$) but not in oldest old men. No significant results were found for educational or occupational mobility.

Table 3.3 Odds Ratios of Cognitive Impairment predicted by Intergenerational Socioeconomic Mobility: Total Sample and by Gender

Variables	Total (N = 9,844)	Men (n = 3,963)	Women (n = 5,881)
Intergenerational Occupation Mobility	*Downward occupational mobility (ref.)*		
Upward occupational mobility	.89	.56+	1.15
	(.67, 1.18)	(.31, 1.02)	(.79, 1.67)
Stable as manual	.98	.64	1.09
	(.77, 1.25)	(.36, 1.14)	(.83, 1.43)
Stable as non-manual	.82	.48*	1.07
	(.58, 1.16)	(.25, .94)	(.68, 1.7)
Intergenerational Educational Mobility	*Downward educational mobility (ref.)*		
Upward educational mobility	.95	1.14	.98
	(.76, 1.19)	(.69, 1.87)	(.72, 1.34)
Stable with no education	1.42***	1.52+	1.41**
	(1.17, 1.73)	(.93, 2.5)	(1.14, 1.74)
Stable with some education	.66**	.69	.8
	(.5, .87)	(.4, 1.19)	(.55, 1.14)
Intergenerational Residential Mobility	*Urban to rural – downward mobility (ref.)*		
Rural to urban – upward mobility	.77	.91	.74
	(.52, 1.14)	(.42, 1.98)	(.47, 1.18)
Stable in rural areas	.99	1.17	.97
	(.67, 1.46)	(.55, 2.52)	(.61, 1.53)
Stable in urban areas	.69+	.95	.61*
	(.46, 1.05)	(.43, 2.12)	(.37, .99)
Covariates			
Age (years)	1.07***	1.06***	1.08***
	(1.06, 1.08)	(1.05, 1.08)	(1.07, 1.09)
Han (vs Minority)	1.16	1.12	1.17
	(.95, 1.43)	(.77, 1.62)	(.91, 1.5)
Married (vs Otherwise)	.85+	.88	.99
	(.73, 1)	(.72, 1.07)	(.73, 1.35)
Proxy (vs No Proxy)	4.85***	6.01***	4.31***
	(4.31, 5.46)	(4.9, 7.39)	(3.72, 4.99)
Dependence in ADL	2.57***	2.59***	2.52***
(vs ADL Independence)	(2.32, 2.86)	(2.15, 3.13)	(2.22, 2.86)
_Cons	0	0	0
Log Likelihood	-4739.45	-1618.29	-3107.7

Note: The table reported the odds ratios of cognitive impairment and the 95% CI.

+ p < .1; * p < .05; ** p < .01; *** p < .001

Table 3.4 Odds Ratios of Poor Self-Rated Health predicted by Intergenerational Socioeconomic Mobility: Total Sample and by Gender

Variables	Total (N = 9,844)	Men (n = 3,963)	Women (n = 5,881)
Intergenerational Occupation Mobility	*Downward occupational mobility (ref.)*		
Upward occupational mobility	1	1.29	1.01
	(.76, 1.32)	(.69, 2.4)	(.7, 1.44)
Stable as manual	1.07	1.33	1.05
	(.84, 1.36)	(.72, 2.44)	(.8, 1.37)
Stable as non-manual	.76+	.95	.75
	(.54, 1.05)	(.48, 1.87)	(.47, 1.18)
Intergenerational Educational Mobility	*Downward educational mobility (ref.)*		
Upward educational mobility	.88	.84	.86
	(.71, 1.1)	(.54, 1.3)	(.63, 1.17)
Stable with no education	1.09	.99	1.13
	(.91, 1.32)	(.64, 1.53)	(.91, 1.39)
Stable with some education	.91	.77	1.1
	(.71, 1.17)	(.48, 1.24)	(.78, 1.55)
Intergenerational Residential Mobility	*Urban to rural – downward mobility (ref.)*		
Rural to urban – upward mobility	.74	.92	.69
	(.51, 1.07)	(.45, 1.87)	(.45, 1.07)
Stable in rural areas	.86	1.3	.72
	(.6, 1.23)	(.64, 2.63)	(.47, 1.12)
Stable in urban areas	.65*	.93	.55*
	(.44, .95)	(.44, 1.95)	(.34, .87)
Covariates			
Age (years)	.99***	.98*	.99*
	(.98, .99)	(.97, 1)	(.98, 1)
Han (vs Minority)	1.11	1.14	1.1
	(.9, 1.37)	(.8, 1.62)	(.85, 1.43)
Married (vs Otherwise)	1.19*	1.16	1.34*
	(1.03, 1.38)	(.97, 1.39)	(1.02, 1.77)
Proxy (vs No Proxy)	2.56***	2.44***	2.63***
	(2.28, 2.87)	(2.04, 2.92)	(2.26, 3.06)
Dependence in ADL	3.09***	3.58***	2.85***
(vs ADL Independence)	(2.78, 3.43)	(2.98, 4.3)	(2.5, 3.25)
_Cons	.44	.29	.47
Log Likelihood	-4975.21	-1826.43	-3140.86

Note: The table reported the odds ratios of reporting poor self-rated health and the 95% CI.
+ p < .1; * p < .05; ** p < .01; *** p < .001

3.8 Discussion

This study examines (1) whether SES mobility from childhood to adulthood affects the cognitive health and subjective health in Chinese oldest old; and (2) whether the association between intergenerational SES mobility and health differs by gender. Results indicated that experiencing downward intergenerational SES mobility was detrimental to both cognitive well-being and subjective health, as compared to experiencing upward SES mobility or stable high SES. These relationships varied across gender and were mostly found in oldest old women rather than their male counterparts. Further, having stable low SES predicted higher risk of cognitive impairment than having downward or upward SES mobility. These findings supported the change model, which claims that the transition from lower to higher levels of SES predicts better health outcomes in later life (Johnson-Lawrence et al., 2013). In addition, results of this study lend support to the accumulation model, which emphasizes the accumulative effect of low SES from early life to later life (Cohen et al., 2010).

Compared to intergenerational mobility in occupation and category of residence, intergenerational educational mobility is a more robust predictor of cognitive health in advanced age. The brain reserve capacity theory suggests that a lack of education in early life could lower brain reserve and subsequently allow for cognitive problems to appear earlier in life (Zhang et al., 1990). Thus, having downward educational mobility or stable low education could both be detrimental to the development of cognitive ability and subsequently lead to cognitive problems in advanced age. The fact that intergenerational SES mobility affects cognitive health more than self-rated health may

imply that objective health is more likely to be affected by the transition of SES across generations than subjective health.

The gender difference in the association between intergenerational SES and health is noteworthy. In this study, the negative effect of downward residential mobility was found in female participants rather than their male counterparts. This could be partially explained by the fact that men generally have more advantages than women, especially in rural areas. Living in a rural area could be extremely detrimental to the quality of life in women, but not necessarily in men. Moving from a city to the countryside could be extremely stressful for women in that the gender gap in resources and opportunities is much bigger in rural areas than in urban areas.

The detrimental effect of downward educational mobility and stable low education on cognition was found in oldest old women rather than in oldest old men. This gender disparity might result from the gender segregation in the labor market (Fan, 2003) given the same levels of education. The advantage of having stable high SES in occupation (both respondents and their father had a non-manual lifetime occupation) was found in oldest old men rather than oldest old women. Yet, this may not indicate any actual gender differences in that the proportion of women who had stable high SES was extremely small in this study.

3.8.1 Limitations

Several limitations of this study should be noted. First, the intergenerational residential mobility was determined by respondents' birthplace and current category of residence, which could be somewhat biased. It is quite possible, for instance, that some respondents moved from a rural area to an urban area immediately after they were born. It is also possible that participants may have moved between rural and urban areas for several times over the life course. Second, the respondents were the "lucky survivors" of wars and other historical events since the 1900's. Thus, they might represent the more robust older adults who made it to an advanced age rather than all the Chinese older adults born around 1900's. Finally, there is a lack of information on the education and occupation of the female respondents' husbands in this study. For the current study cohort, women's SES might be largely affected and even determined by their husband's SES.

3.8.2 Strengths and Future Directions

Given the limitations discussed above, this study contributes to the extant literature in several ways. First, it is one of a very small number of studies that drew attention to the long-term effect of international mobility on health in later life, with particular attention to cognitive well-being and subjective health in the oldest old population. Second, by incorporating multiple theoretical perspectives into the interpretation of the SES mobility-health association, this study extended existing frameworks for studying intergenerational SES mobility and health in advanced age. The

use of such frameworks to guide future research will help scholars interested in similar issues to extend the present study in many disparate directions. Third, results of this study point to different dimensions of intergenerational SES mobility that could affect the health status of men and women in different ways. Future research is needed to assess intergenerational and intragenerational SES mobility simultaneously for the same population. This is very important because individuals' intragenerational residential mobility and occupational mobility could affect their health and well-being throughout life (e.g., Stokols, Shumaker, & Martinez, 1983).

CHAPTER 4. SOCIOECONOMIC STATUS, PERCEIVED FINANCIAL STRAIN, AND SUBJECTIVE HEALTH IN CHINESE OLDER ADULTS

4.1 Introduction

Previous studies have documented the association between socioeconomic status (SES) and health at different life stages. Health disparities have been found not only dichotomously between high-SES and low-SES groups, but across the socioeconomic hierarchy in a gradient pattern (e.g., Adler et al., 1994; Huijts, Eikemo, & Skalická, 2010). Individual SES has been mostly measured by one's education, occupation, and income in adulthood (Cohen et al., 2008; Kuper, Adami, Theorell, & Weiderpass, 2007; Maty, Everson-Rose, Haan, Raghunathan, & Kaplan, 2005). It is well established that low-SES individuals have poorer health status than their high-SES counterparts on a variety of health outcomes, ranging from mortality (Khang & Kim, 2005; Lantz et al., 2005) and morbidity (Bosma et al., 2005; Chaix, Isacsson, Rastam, Lindström, & Merlo, 2007) to physical functioning (Haas, 2008; Zimmer & House, 2003) and self-rated health (Enroth, Raitanen, Hervonen, & Jylhä, 2013; Willson et al., 2007).

Apart from adulthood SES, childhood SES, mostly measured by parental SES during one's childhood, is also salient to health in late life. Two theoretical models have been proposed to document the mechanisms that link early conditions to health in later life. According to the latency model, early life circumstances may have a direct

association with health outcomes in later life. If this model holds, childhood adversity would be associated with poor health even after controlling for circumstances in adulthood. Low childhood SES can be considered as an early life adversity, which has been linked to multiple health outcomes in late life, independent of what happens in adulthood. Jeong et al. (2005) reported that early life nutritional deprivation was associated with short arm length and height and cognitive impairment in later life. Kittleson and colleagues (2006) found that low childhood SES was associated with an increased incidence of coronary heart disease before 50 years of age among men with high adulthood SES.

The pathways model suggests that early life circumstances may indirectly influence health via late-life conditions. If this model holds, the association between childhood SES and health in late life should be attenuated when adult SES is controlled. A growing body of literature has indicated that the effect of early socioeconomic disadvantage on health could be mediated by several adult pathways such as achieved SES in adulthood (Beebe-Dimmer et al., 2004; Hayward & Gorman, 2004; Irving & Ferraro, 2006).

Despite substantial research on socioeconomic health disparities, most relevant studies used objective measures of SES only and failed to investigate the effect of subjective social standing on health. In an earlier study on the subjective measures of SES and health, Wilkinson (1999) argued that it was inequality resulting from relative

standing rather than absolute levels of SES that were important for health. In light of this finding, scholars interested in socioeconomic health disparities have shifted attention from objective SES to subjective SES, defined as people's subjective perceptions of their rank in the socioeconomic hierarchy compared to others (Adler, Epel, Castellazzo, & Ickovics, 2000; Kraus, Adler, & Chen, 2013). There is evidence that subjective SES is related to health status across a number of measures and samples (e.g., Singh-Manoux, Adler, & Marmot, 2003), even after adjusting for objective measures of SES (e.g., Cohen et al., 2008; Hu, Adler, Goldman, Weinstein, & Seeman, 2005). Adler and colleagues (2000) used a one-item measure of where individuals place themselves on the social hierarchy and found that higher subjective status predicted better health trajectories through psychological factors. Operario, Adler and Williams (2004) used a national sample and showed that subjective SES was associated with self-reported health after controlling for education, income, and occupation. A recent study indicated that better subjective SES predicted lower risk for developing a cold, independent of objective SES (Cohen et al., 2008).

The present study aims at investigating the socioeconomic health disparities in older adults, who are more likely than their younger counterparts to face the challenge of managing financial resources in ways to meet their needs (Mendes et al., 1994). This challenge has the potential to become a source of stress proliferation for older adults, which further affects their health and well-being. This form of stress proliferation,

commonly termed as financial strain, has been indicated to affect health through direct and indirect pathways. Kahn and Pearlin (2006) studied American men and women 65 years and older and reported that long-term financial hardship was reflected in a range of health outcomes in later life. Cambois and Jusot (2010) found that lifelong financial and housing problems were associated with multiple health outcomes in French people aged 35 years and over, even after controlling for traditional measures of SES such as education and income. There is also evidence that recurrent financial strain, especially during adulthood, was associated with poor health among African Americans (Szanton, Thorpe, & Whitfield, 2010). Results from a three-decade longitudinal study showed that accumulated financial strain had long-term effects on women's health during middle and later life (Shippee, Wilkinson, & Ferraro, 2012).

Given the strong evidence that SES and financial strain are both associated with health in older age, extant literature contains few examinations of the two variables simultaneously. It is largely unknown whether the well-established SES-health association will persist when financial strain is taken into account. In fact, there is some evidence that the income-health association is attenuated after adjusting for other economic variables. Chou, Chi and Chow (2004) used a community sample of older adults in Hong Kong and found that financial strain was a significant moderator in the link between different major resources of income and depression. Zimmerman and Katon (2005) used a sample representative of 30-year old adults in the U.S and reported

that the effect of income on depression was no longer significant after controlling for employment status and debts-to-assets. Drawing on a sample of low-income Latino older adults, Aranda and Lincoln (2011) stated that financial strain mediated the effect of education on depressive symptoms.

This article will extend previous literature on socioeconomic health disparities in three ways. First, whereas previous research has mostly used individual income, education, and occupation to measure SES, this study accounted for three dimensions of SES: childhood SES (father's education, father's occupation, and category of birthplace), adulthood SES (individual income, education, occupation, and category of residence), and subjective SES. Second, SES and financial strain were included in the same analytic model to predict subjective health. Third, this study used a national sample drawn from mainland China and addresses the rural-urban division, which is key to understand the health and wealth inequalities in China. This is very important because the rural-urban gap in China is much larger than that found in most other developing countries (Eastwood & Lipton, 2004; Knight, Shi, & Song, 2006). It is argued that the rural-urban differences have accounted for a large share of income inequality (Atinc, 1997), health inequality (Zeng & Vaupel, 2002) and health care inequality (Shi, 1993) in China.

4.2 Data and Sample

This study used data from the third (2002) and the fourth (2005) waves of CLHLS. The CLHLS is the very first national longitudinal survey with the largest sample of the oldest-old ever conducted in China. The survey randomly selected a sample of older adults from 22 provinces in China, which covered over 80% of the total Chinese population. Systematic assessments of the CLHLS regarding reliability, validity and randomness showed that the data quality in this survey was quite good (Gu, 2008).

In 2002, 16,064 older adults aged 62–117 years were interviewed at home. In the 2005 survey, 2,015 respondents were lost to follow-up and 5,874 respondents were deceased. These respondents were excluded from the analysis. The final sample of this study consisted of 8,175 respondents. Over half of the variables in this study have missing data. Multiple imputation was used to handle missing data. Findings were robust as compared to alternative strategies of addressing missing data.

4.3 Measurement

4.3.1 Subjective Health

Data on respondents' subjective health were obtained from their self-rated health in 2005. Respondents were asked to rate their health as "very good," "good," "fair," "poor," or "very poor". To facilitate analysis, "poor," and "very poor" were

combined as “reporting poor health” (coded as 1); the other three answers were combined as “not reporting poor health” (coded as 0).

4.3.2 Socioeconomic Status

This study measured respondents’ SES at three dimensions: childhood SES, adulthood SES, and subjective SES. Following Zeng and colleagues (2007), childhood SES was measured by the following 3 items: (1) father had a non-manual job before retirement (coded as 1; otherwise, 0); (2) father received some years of schooling (coded as 1; otherwise, 0); and (3) category of birthplace (urban = 1; rural = 0).

Adulthood SES was measured by 4 items: (1) annual household income per capita in 2001 (≤ 2,300 RMB or “poverty”, coded as 1; >2,300 RMB or “not in poverty”, coded as 0; (2) had a non-manual job before retirement (coded as 1; otherwise, 0); (3) received some years of schooling (coded as 1; otherwise, 0); and (4) category of residence (urban = 1; rural = 0). The cut-off point for poverty in this study is determined by the international poverty line in 2001, which was “one dollar per day” or about 2,300 RMB annually.

Subjective SES in this study was measured by the question “how do you rate your economic status compared with other local people (in 2002)?” Response categories include “very rich,” “rich,” “so so,” “poor,” and “very poor”. In this study, “poor,” and “very poor” were combined as “worse perceived SES” (coded as 1; otherwise, 0).

4.3.3 Perceived Financial Strain

Data on respondents' perceived financial strain were derived in 2002 from the question "are all financial resources enough for your life?" Respondents were considered as suffering from subjective financial strain if they answered "no" (coded as 1; otherwise, 0).

4.3.4 Covariates

This study adjusted for respondents' demographic characteristics, physical health conditions, and other financial and social resources. Demographic characteristics include respondents' validated age measured in years, gender (female = 1; male = 0), ethnicity (Han majority = 1; minority = 0) and marital status (married = 1; otherwise = 0). Physical health is measured by (1) whether respondents suffered from any of the following 10 chronic diseases in 2002: hypertension, diabetes, heart disease, stroke or CVD, tuberculosis, cancer, Parkinson's disease, bedsore, arthritis, and dementia (suffered from at least one disease = 1; otherwise = 0); (2) whether respondents had difficulty in performing the following ADL in 2002 (Cronbach's $\alpha = .93$): (1) bathing; (2) dressing; (3) toileting; (4) indoor transferring; (5) eating; (6) incontinence; (7) visiting neighbors by oneself; (8) shopping by oneself; (9) cooking meals by oneself; (10) washing clothing by oneself; (11) lifting objects of 5 kg; (12) crouching and standing up for 3 times; and (13) using public transportation. Respondents were considered as being

ADL disabled (coded as 1) if they needed assistance in performing at least one of these activities (otherwise = 0).

Basic financial and social resources controlled in this study include whether respondents had a pension in 2002 (yes = 1; no = 0), had access to adequate medical service in 2002 (yes = 1; no = 0), had a personal bedroom in 2002 (yes = 1; no = 0), and attended religious activities in 2002 (yes = 1; no = 0). This study additionally adjusted for whether other people helped respondents answered the questions (proxy = 1; otherwise = 0).

4.4 Analytical Strategy

This study performed statistical analyses for rural and urban samples separately because previous research has documented different patterns of wealth and health patterns in rural and urban China (Atinc, 1997; Zeng & Vaupel, 2002). Logit regression models were used to estimate how SES and perceived financial strain in 2002 predicted subjective health in 2005.

Three reduced models were used to analyze whether the three dimensions of SES predicted self-rated health respectively. Model 1 predicted the effect of childhood SES (father's occupation, father's education, and category of birthplace) on self-rated health, adjusting for all covariates. Model 2 predicted the effect of adulthood SES (poverty, occupation, education) on self-rated health, adjusting for all covariates. Model

3 examined the time-lag effect of subjective SES in 2002 on self-rated health in 2005, adjusting for all covariates. An expanded model (Model 4) was additionally used to determine whether the effect of childhood SES was attenuated after introducing adulthood SES. If the effect of childhood SES is substantially attenuated, this would support the pathways model which suggests that childhood SES indirectly affects health. If the effect of childhood SES is not reduced, this would support the latency model and suggest that childhood SES may have a direct effect on health. Finally, a full model (Model 5) was used to examine whether the effect of SES on health was attenuated after introducing perceived financial strain. If the effect of SES is substantially reduced, this would suggest that perceived financial strain could be a potential pathway underlying the socioeconomic health disparities. If the effect of SES is not attenuated, this would lend support to the robustness of SES in determining health.

4.5 Results

4.5.1 Description of the Sample

The descriptive characteristics of the study sample stratified by the category of residence are shown in Table 4.1. The urban sample includes 3,591 respondents with an average age of 82.02 years in 2002. The majority were women (55.03%), Han majority (95.46%), and unmarried (59.79%). The rural sample includes 4,584 respondents with an average age of 81.53 years in 2002. Similar to the demographic pattern of the urban

sample, the majority of the rural respondents were also women (54.67%), Han majority (92.91%), and unmarried (60.84%).

There were some rural-urban differences in respondents' socioeconomic characteristics. Consistent with previous findings on the urban advantage among Chinese older adults, a higher proportion of urban respondents reported higher levels of childhood SES (father had a non-manual job, father had some education, born in an urban area) and adulthood SES (not living in poverty, had a non-manual job, had some education), as compared to their rural counterparts. In addition, more rural older adults reported having perceived financial strain than urban respondents. Although living in a rural area generally indicates lower adulthood SES, the proportion of reporting poor health and becoming ADL disabled was very similar for rural and urban older adults. In this survey, the access to the most basic financial and social resources in 2002 did not vary by the category of residence, except that a much higher proportion of urban respondents (40.63%) had pension than their rural counterparts (7.44%).

Table 4.1 Descriptive Statistics for Study Variables, CLHLS 2002-2005 (N = 8,175).

	Urban n = 3,591		Rural n = 4.584	
Variables	Observed	Missing	Observed	Missing
Demographic Characteristics				
Age (range=62-117; mean, SD)	82.02 (10.68)		81.53 (11.08)	
Female (vs. male; %)	55.03		54.67	
Han majority (vs. minority; %)	95.46	.03	92.19	
Married (vs. unmarried; %)	40.21		39.16	
Adulthood SES				
Poverty (vs. not in poverty; %)	34.98	3.40	67.58	4.54
Had a non-manual job (vs. otherwise; %)	17.66	.47	3.88	.28
Some education (vs. no education; %)	50.60	.56	35.45	.26
Childhood SES				
Father had a non-manual job (vs. otherwise; %)	6.35	.92	2.01	.61
Father had education (vs. no education; %)	24.09	5.21	15.92	3.75
Born in urban (vs. rural; %)	28.91	.33	3.64	.17
Subjective SES				
Worse perceived SES (vs. better; %)	21.25	.31	14.55	.28
Financial Strain				
Having insufficient money (vs. sufficient; %)	15.32	.03	22.56	.07
Self-Rated Health				
Reporting poor health in 2005(vs. not; %)	23.09		25.13	
Functional Limitations				
ADL disabled in 2002 (vs. not; %)	56.25		57.48	
ADL disabled in 2005 (vs. not; %)	67.45		66.25	
Suffering from chronic diseases (vs. not; %)	47.70		42.54	
Other Financial and Social Resources				
Having pension (vs. not; %)	40.63	.08	7.44	.07
Having adequate medical service (vs. not; %)	92.98		88.02	.02
Having one's own bedroom (vs. not; %)	73.24	.03	73.65	.15
Attending religious activities (vs. not; %)	18.49	.06	21.16	
Proxy (vs. not; %)	26.79		28.60	.07

4.5.2 Three Dimensions of SES and Subjective Health

Tables 4.2 and 4.3 reported the odds ratios (with 95% confidence intervals) for reporting poor health among urban and rural respondents respectively. The first three models explored the association between SES and subjective health, adjusting for all covariates. Model 1 predicted the effect of childhood SES on self-rated health. Model 2 predicted the effect of adulthood SES on self-rated health. Model 3 examined the effect of subjective SES on self-rated health.

Urban older adults whose father had a non-manual job were 37.4% ($p < .05$) less likely to report poor health compared to their counterparts whose father had a manual job. Those born in an urban area were less likely to report poor health compared to those born in a rural area; however, this association was only marginally significant (OR = .839; $p < .10$). Being in poverty in older age increased the chance of reporting poor health 3 years later by 30.3% ($p < .01$). Contrary to previously documented significant relationship between subjective SES and health (e.g., Goodman et al., 2001; Singh-Manoux et al., 2003), this study did not find significant association between subjective SES and self-rated health for urban respondents (OR = .82; $p < .10$). For rural older adults, none of the socioeconomic measures were significant predictors of subjective health in older age, expect that having some education significantly decreased the chance of reporting poor health in Model 4 (OR = .83; $p < .05$). This finding contradicts

with some previous studies indicating the robust socioeconomic disparities in self-rated health (e.g., Enroth et al., 2013; Willson et al., 2007).

Model 4 examines whether the effect of childhood SES on health was attenuated after introducing adulthood SES. For urban respondents, the effect of childhood SES (father had a non-manual job) held after introducing adulthood SES to Model 1 (OR = .65; $p < .05$). Poverty still significantly predicted poor subjective health (OR = 1.29; $p < .05$). These findings provide some evidence for the latency model, which suggests that childhood SES has a direct effect on health in late life. For rural respondents, when childhood and adulthood SES were included in the same model, individual education became the only significant socioeconomic predictor of self-rated health. If respondents received some years of schooling, their chance of reporting poor health would be reduced by 16.8% ($p < .05$).

4.5.3 Perceived Financial Strain, SES, and Subjective Health in Older Age

Model 5 is a full model, which examines whether the effect of SES on health was attenuated after adjusting for perceived financial strain. In the urban sample, having financial strain increased the chance of reporting poor health by 45.5% ($p < .01$). Whereas the effect of childhood SES (father had a non-manual job) still held after introducing financial strain (OR = .65, $p < .05$), the effect of adulthood SES (living in poverty) was significantly attenuated and was no longer significant (OR = 1.21, $p < .10$).

This finding suggests that financial strain may serve as a pathway underlying the association between adulthood SES and subjective health for urban older adults. In the meantime, this study lends support to the robustness of childhood SES in predicting health in late life.

For rural older adults, having financial strain in older age increased the chance of reporting poor health by 36.7% three years later ($p < .01$). The effect of education on subjective health in Model 5 was slightly attenuated compared to Model 4. Results for rural respondents indicate that it was the feeling of having insufficient money, rather than people's subjective or objective socioeconomic position, that shaped subjective health in older age. Findings for both rural and urban older adults are consistent with previous studies documenting the importance of financial strain on health (e.g., Shippee et al., 2012; Szanton et al., 2010).

Apart from SES and financial strain, some other factors also predicted self-rated health in late life. For urban older adults, getting older and having poor physical health in 2002 (being ADL disabled, suffering from chronic diseases) significantly increased the chance of reporting poor health in 2005. Having adequate medical service in 2002 significantly reduced the chance of reporting poor health in 2005. For rural respondents, having poor physical health in 2002 significantly increased the chance of reporting poor health in 2005. Having adequate medical service, having one's own bedroom, and attending religious activities all benefited rural older adults' subjective health.

Table 4.2 Odds Ratios for Reporting Poor Health among Older Adults in Urban China, CLHLS 2005 (N = 3,591)

Variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Independent Variables					
Socioeconomic Status					
Father's job was non-manual (vs. manual job)	.63*			.65*	.65*
	(.42, .94)			(.43, .98)	(.43, .98)
Father had some schooling (vs. no schooling)	.93			.95	.95
	(.75, 1.14)			(.77, 1.18)	(.77, 1.18)
Born in urban (vs. rural)	.84+			.85	.86
	(.69, 1.02)			(.7, 1.04)	(.7, 1.04)
Poverty (vs. not in poverty)		1.3**		1.29*	1.21+
		(1.08, 1.58)		(1.06, 1.56)	(.99, 1.47)
Non-manual job (vs. manual job)		.93		1	1.03
		(.71, 1.21)		(.76, 1.31)	(.78, 1.36)
Received some schooling (vs. no schooling)		.87		.92	.91
		(.71, 1.07)		(.74, 1.14)	(.74, 1.13)
Worse subjective SES compared to others (vs. better)			.82+		.91
			(.67, 1.02)		(.73, 1.14)
Financial Strain					
Having insufficient money (vs. sufficient)					1.46**
					(1.15, 1.85)
Control Variables					
Age	1.01**	1.01**	1.01**	1.02**	1.02**
	(1, 1.02)	(1, 1.03)	(1, 1.03)	(1, 1.03)	(1.02, 1.03)

Table 4.2 continued.

Female (vs. male)	1.13	1.07	1.11	1.12	1.11
	(.93, 1.38)	(.87, 1.31)	(.91, 1.34)	(.91, 1.38)	(.9, 1.37)
Han majority (vs. minority)	1.01	1.06	.99	1.06	1.03
	(.68, 1.49)	(.71, 1.57)	(.67, 1.47)	(.72, 1.58)	(.69, 1.52)
Married (vs. unmarried)	1.19	1.19	1.19	1.19	1.18
	(.96, 1.48)	(.96, 1.48)	(.96, 1.48)	(.96, 1.48)	(.95, 1.47)
ADL disabled (vs. not)	1.75***	1.75***	1.75***	1.74***	1.72***
	(1.42, 2.15)	(1.43, 2.16)	(1.43, 3.08)	(1.42, 2.14)	(1.4, 2.12)
Suffering from one or more chronic diseases (vs. not)	2.63***	2.66***	2.6***	2.68***	2.68***
	(2.22, 3.12)	(2.24, 3.16)	(2.19, 3.08)	(2.26, 3.18)	(2.26, 3.18)
Having pension (vs. not)	.81*	.88	.76**	.9	.93
	(.66, .99)	(.7, 1.1)	(.63, .93)	(.72, 1.13)	(.74, 1.17)
Having adequate medical service (vs. not)	.56***	.6**	.57***	.6**	.72*
	(.42, .75)	(.44, .8)	(.42, .76)	(.45, .81)	(.53, .99)
Having one's own bedroom (vs. not)	1.03	1.07	1.05	1.06	1.09
	(.85, 1.25)	(.88, 1.3)	(.86, 1.27)	(.87, 1.29)	(.89, 1.32)
Attending religious activities (vs. not)	.98	.98	.98	.99	.98
	(.79, 1.22)	(.79, 1.22)	(.79, 1.22)	(.79, 1.22)	(.79, 1.22)
Proxy (vs. not)	1.78***	1.79***	1.8***	1.77***	1.78***
	(1.46, 2.17)	(1.47, 2.18)	(1.48, 2.19)	(1.45, 2.16)	(1.46, 2.16)

Note: For the table, missing data were imputed 10 times.

+ p < .1; * p < .05; ** p < .01; *** p < .001.

Table 4.3 Odds Ratios for Reporting Poor Health among Older Adults in Rural China, CLHLS 2005 (N = 4,584)

Variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Independent Variables					
Socioeconomic Status					
Father's job was non-manual (vs. manual job)	1.31			1.44	1.42
	(.8, 2.15)			(.87, 2.36)	(.86, 2.34)
Father had some schooling (vs. no schooling)	1			1.04	1.03
	(.82, 1.22)			(.85, 1.27)	(.85, 1.26)
Born in urban (vs. rural)	.71+			.72	.72
	(.48, 1.07)			(.49, 1.08)	(.48, 1.07)
Poverty (vs. not in poverty)		1.11		1.11	1.07
		(.94, 1.31)		(.94, 1.3)	(.91, 1.27)
Non-manual job (vs. manual job)		.74		.71	.71
		(.46, 1.19)		(.44, 1.15)	(.44, 1.14)
Received some schooling (vs. no schooling)		.84+		.83*	.84+
		(.7, 1)		(.69, 1)	(.7, 1.01)
Worse subjective SES compared to others (vs. better)			.97		1.1
			(.82, 1.23)		(.89, 1.36)
Financial Strain					
Having insufficient money (vs. sufficient)					1.37***
					(1.15, 1.63)
Control Variables					
Age	1.01+	1	1.01+	1.01	1.01+
	(2, 1.02)	(1, 1.02)	(1, 1.02)	(1, 1.02)	(1, 1.02)

Table 4.3 continued.

Female (vs. male)	1.13	1.03	1.12	1.03	1.03
	(.97, 1.31)	(.87, 1.22)	(.96, 1.3)	(.87, 1.23)	(.87, 1.23)
Han majority (vs. minority)	1.28+	1.31+	1.28+	1.3+	1.362*
	(.97, 1.68)	(.99, 1.72)	(.97, 1.68)	(.99, 1.72)	(1.03, 1.8)
Married (vs. unmarried)	1.07	1.06	1.07	1.07	1.06
	(.9, 1.28)	(.89, 1.27)	(.89, 1.28)	(.9, 1.28)	(.89, 1.27)
ADL disabled (vs. not)	1.5***	1.48***	1.49***	1.49***	1.48***
	(1.26, 1.78)	(1.25, 1.76)	(1.25, 1.77)	(1.25, 1.77)	(1.24, 1.76)
Suffering from one or more chronic diseases (vs. not)	2.2***	2.21***	2.19***	2.22***	2.21***
	(1.91, 2.53)	(1.92, 2.54)	(1.9, 2.52)	(1.93, 2.56)	(1.92, 2.55)
Having pension (vs. not)	.72*	.82	.7*	.85	.85
	(.53, .97)	(.59, 1.15)	(.51, .94)	(.61, 1.19)	(.61, 1.19)
Having adequate medical service (vs. not)	.67***	.69***	.67***	.69***	.78*
	(.55, .82)	(.57, .84)	(.55, .82)	(.56, .84)	(.63, .96)
Having one's own bedroom (vs. not)	.73***	.74***	.73***	.74***	.75***
	(.62, .86)	(.63, .87)	(.62, .86)	(.63, .87)	(.64, .88)
Attending religious activities (vs. not)	.78**	.79***	.78**	.79*	.8*
	(.65, .93)	(.66, .95)	(.65, .93)	(.66, .95)	(.67, .96)
Proxy (vs. not)	1.57***	1.54***	1.56***	1.55***	1.56***
	(1.32, 1.86)	(1.3, 1.82)	(1.31, 1.85)	(1.31, 1.84)	(1.32, 1.85)

Note: For the table, missing data were imputed 10 times.

+ p < .1; * p < .05; ** p < .01; *** p < .001.

4.6 Discussion

This study examines (1) whether different dimensions of SES affect subjective health in late life; (2) whether the socioeconomic health disparities persist when perceived financial strain is taken into account; and (3) whether these relationships vary by category of residence. For urban respondents, higher childhood SES significantly decreased the chance of reporting poor health in older age. The protective effect of socioeconomic advantage in childhood is consistent with findings from previous literature showing a negative association between early life disadvantage and health in later life (Jeong et al., 2005; Kittleson et al., 2006). The protective effect of childhood SES on poor health in the urban sample persisted after adjusting for adulthood SES and perceived financial strain, which lends support to the latency model and suggests that childhood circumstances have a direct effect on health in older age. However, this study found modest support for the protective effect of advantaged childhood SES for rural respondents. Subjective SES in this study was not significantly associated with self-rated health for both rural and urban older adults. This is inconsistent with many other studies indicating the positive association between subjective SES and health (Adler et al., 2000; Cohen et al., 2008; Hu et al., 2005). This inconsistency may be due to different designs, population of interest, and measures used across studies.

Living in poverty predicted higher risk of reporting poor health in urban older adults but not in their rural counterparts. A possible explanation is that urban inhabitants are more likely to feel relatively deprived due to the higher income disparity in urban China. In addition, the cost of living in urban China is generally much higher

than that in rural China. A rural older adult may live in poverty but feel little financial strain since the living cost is extremely low in the village he/she dwells in. An urban older adult who is above the poverty line may still feel financial pressure due to the relatively higher cost of living in the city or town he/she lives in. For urban respondents, the disadvantage of adulthood SES on health was largely attenuated after adjusting for perceived financial strain. This is consistent with the body of literature that links SES and health via financial strain (Aranda & Lincoln, 2011; Chou et al., 2004; Zimmerman & Katon, 2005). It is also plausible that financial strain serves as the mechanism underlying adulthood SES and health in later life. For rural older adults, having financial strain significantly increased the chance of reporting poor health, independent of objective and subjective measures of SES. Results for the rural sample indicated that it was the feeling of having insufficient money, rather than people's subjective and objective socioeconomic position, that affected their subjective health in later years. Findings for both rural and urban older adults are consistent with previous studies documenting the critical role of financial strain on health (e.g., Shippee et al., 2012; Szanton et al., 2010).

Previous studies have indicated multiple explanations for the effect of financial strain on health in later life. One mechanism is that financial strain reflects people's perceptions of their financial stress and adversity (Taylor & Seeman, 1999), which further affects their subjective health in older age. Another pathway that has been widely documented is that negative emotions, pessimism and a lack of control (Cohen, Kaplan, & Salonen, 1999, Gallo & Matthews, 2003) may mediate the association between financial strain and subjective health. Apart from SES and financial strain, other

social and economic resources that may affect health in later life should not be neglected. For both rural and urban older adults, having adequate medical service significantly reduced the chance of reporting poor health. For rural older adults, having one's own bedroom and attending religious activities significantly reduced the chance of reporting poor health. Whereas this study treated these variables as covariates, future studies may consider using them as key variables to predict health.

This study has several strengths, including the use of a large nationwide sample of older adults in a developing country and multiple measures of SES. In addition, this study examined an understudied research question – the effect of perceived financial strain on the socioeconomic health disparities in both urban and rural residents in China. However, several limitations should be taken into account while interpreting findings of this study. First, as is common in many studies of older adults, there is a potential problem of recall bias since most of the study variables were based on self-reported information. In this study, over 25% of respondents had difficulty answering the questions by themselves. Thus, the measures of the key variables for these respondents were based on information reported by their family members, which can be less reliable. Compared to older adults who completed the survey by themselves, those with proxies were more likely to report poor health in this study. Second, the estimates of the impact of childhood SES may be somewhat conservative due to selective mortality. A large proportion of older adults in this study have experienced traumatic events such as internal wars, famines, and the Cultural Revolution. As documented in previous research, people with poor SES in childhood and adulthood were more likely to die earlier than

their advantaged counterparts (Liang et al., 2000; Zeng et al., 2007). Thus, respondents in this study may be more resilient or have more advantageous socioeconomic conditions compared to many of their counterparts who had already passed away. Third, findings in this study are based on the time-lag effect of financial strain on health in late life. Thus, this study cannot explore the duration of financial strain and its time-varying effect on health. Finally, although the analyses adjusted for many socioeconomic and health factors such as having adequate medical service and suffering from at least one chronic disease, many other risk factors (e.g., body mass index, negative emotions) could not be controlled because the relevant information was not available in the survey.

Despite these limitations, this study broadens the extant literature on financial strain, SES and health in later life. Financial strain exacts a toll on senior citizens' subjective health, independent of their childhood and adulthood socioeconomic conditions, category of residence, and physical health. Results for urban older adults suggest that childhood SES is a robust predictor for late-life health, independent of adulthood SES and financial strain. From a policy perspective, it appears that improving the childhood socioeconomic conditions will benefit people's subjective health even many decades later. The findings presented herein underscore the importance of addressing different dimensions of SES and the rural-urban differences while investigating the SES-health association.

CHAPTER 5. CONCLUSION

5.1 Summary of Findings

Population aging is becoming a demographic trend in many developing countries such as China (Hayward & Zhang, 2001). As life expectancy increases, more attention has been given to the quality of life in advanced age. Learning about the patterns of health and well-being among the recent generations of older adults has the potential to benefit future generations of senior citizens. Drawing from the stress process model and the cumulative disadvantage theory, this dissertation investigated the long-term effect of stressful life events on health in later life. Data were derived from the 2002 and 2005 waves of the CLHLS. The three articles included in this dissertation serve to illustrate how childhood and later life stressors affect cognitive and subjective health in Chinese older adults.

The first aim of this dissertation was to examine the effect of early parental loss on cognitive well-being in Chinese oldest old and the gender differences. Chapter 2 of the dissertation focused primarily on this aim. Consistent with previous literature (Kunugi et al., 1995), this study found that losing a mother in early life predicted worse health outcomes among the offspring. In particular, early maternal loss robustly

predicted lower cognitive function scores in oldest old men. This finding challenged results from previous work indicating that losing the same-sex parent in childhood was associated with worse health outcomes (Takeuchi et al., 2003). For the overall oldest old population in this article, losing a mother in early life predicted higher risk of cognitive impairment.

Extant literature suggests that the death of a parent removes many important resources from a child's life, especially if the deceased parent was the primary income earner in the family (Champagne & Curley, 2009; Miller et al., 2011). In a traditional Chinese family, the father typically served as the "bread earner" and largely determined the childhood SES of their offspring. Unexpectedly, however, losing a mother rather than losing a father in early life was detrimental to cognitive well-being in the oldest old people.

One possible reason to account for this surprising finding could be related to the informal education from mother to children. The oldest old people in this study were mostly born in the late 1800s and early 1900s, when opportunities for formal education were quite limited. It is notable that about two thirds of respondents in this study had no formal education at all. Given the evidence that children's experiences within their own families and particularly learned from their mother could facilitate their cognitive development and school achievement (Scott-Jones, 1987), it is plausible to believe that among a population with relatively lower formal education, the loss of a mother in early life could possibly reduce the opportunities of early intelligence development and subsequently influence cognitive well-being negatively in later life.

Another main finding of this article is that early maternal loss predicted worse cognitive function in oldest old men only, which is contrary to previous literature (Takeuchi et al., 2003). Given the fact that women in traditional Chinese society were more disadvantaged than men (Watson, 1991), it is possible that the negative effect of early parental loss on women was mediated by the detrimental effect of other stressful events over their life course. The literature on resilience might also shed some light on this unexpected finding. While facing traumatic events, women were generally more resilient than men (Williams & Drury, 2009). Thus, traumatic events such as the death of a parent might affect men to a larger extent than women over time.

The second aim of this dissertation was to investigate the effect of intergenerational socioeconomic mobility on subject health and cognitive well-being in advanced age and the gender differences. Chapter 3 of the dissertation focused primarily on this aim. Results indicated that experiencing downward intergenerational SES mobility was detrimental to both cognitive health and subjective health, as compared to experiencing upward SES mobility or stable high SES. These relationships were mostly found in oldest old women rather than in oldest old men. Further, having stable low SES predicted higher risk of cognitive impairment than having downward or upward SES mobility. Results of this study lend support to the change model (Johnson-Lawrence et al., 2013) and the accumulation model (Cohen et al., 2010).

Compared to intergenerational mobility in occupation and category of residence, intergenerational educational mobility was a more robust predictor of cognitive health in advanced age. According to the brain reserve capacity theory, a lack of education in

early life could lower brain reserve and subsequently allow for cognitive problems to appear earlier in life (Zhang et al., 1990). Thus, having downward educational mobility or stable low education could both be detrimental to the development of cognitive ability and subsequently lead to cognitive problems in later life.

The detrimental effect of downward residential mobility was found in oldest old women rather than their male counterparts. This could be partially explained by the fact that men generally have more socioeconomic advantages than women, especially in rural areas. In other words, living in a rural area could lead to much hardship for women, but not necessarily for men. Moving from a city to the countryside could be extremely stressful for women because the gender gap in resources and opportunities tends to be much bigger in rural areas than in urban areas.

The third aim of this dissertation was to estimate the direct effect of different dimensions of SES and the indirect effect of perceived financial strain on subjective health and the rural-urban differences. Chapter 4 of the dissertation focused primarily on this aim. Consistent with previous literature (Jeong et al., 2005; Kittleson et al., 2006), socioeconomic advantage in childhood protected respondents from reporting poor health. The protective effect of childhood SES on poor subjective health in the urban sample persisted after adjusting for adulthood SES and perceived financial strain, which lends support to the latency model. However, this study did not find any strong evidence for the protective effect of advantaged childhood background among rural respondents. Inconsistent with previous studies (Adler et al., 2000; Cohen et al., 2008), subjective SES in this study was not significantly associated with self-rated health for

both rural and urban older adults. This inconsistency may be due to different designs, population of interest, and measures used across studies.

Being in poverty increased the chance of reporting poor health in urban older adults but not in their rural counterparts. A possible explanation is that urban inhabitants are more likely to feel relatively deprived due to the high income disparity in urban China. For urban respondents, the disadvantage of adulthood SES on health was largely attenuated after adjusting for perceived financial strain, which is consistent with the body of literature that links SES and health via financial strain (Aranda & Lincoln, 2011; Zimmerman & Katon, 2005). Among the rural respondents, it was the feeling of having insufficient money rather than the objective measures of SES that affected their subjective health in later life.

Findings from the three articles suggest that stressful life events at different time points could affect individuals' health and well-being in late life. Specifically, losing a mother before the age of 16 years, experiencing downward intergenerational socioeconomic mobility, and having financial strain were all indicated to affect cognitive well-being and/or subjective health in older age. In addition, both gender differences and rural-urban differences were found in the stress-health association.

5.2 Strengths and Limitations

Findings of this dissertation cannot be fully understood without giving attention to several limitations of the three articles. First, most of the respondents were born in the late 1800s and early 1900s, when many dramatic social changes went on in China.

The majority of individuals in this study cohorts suffered from famine, wars, and political persecution. Thus, to some extent, the oldest old individuals of this study were mostly the “lucky survivors” of a variety of social conflicts. Thus, results might be somewhat different from other generations in China or populations from other countries.

Second, there is a lack of information on some confounding variables in the analyses. For instance, in the first article (Chapter 2), there was a lack of information on the quality of relationships between respondents and their parents and other stressful events that respondents had experienced over the life course. Assuming these conditions were additionally taken into account in the analyses, results could be somewhat different from what was presented in Chapter 2. In addition, in the second article (Chapter 3), there was no information on whether respondents moved between rural and urban areas over the life course. It is possible that many participants moved between rural and urban areas for several times over the life course, then the measurement for intergenerational residential mobility based on two time points would be inaccurate. In the third article (Chapter 4), there was no information on how long respondents suffered from financial strain. It is quite possible that individuals who suffered from financial strain for a longer time (e.g., several years) might show different stress-health patterns, compared to those who were under financial strain for a shorter period of time (e.g., several months).

Third, the measurement of the study variables had some limitations. A case in point is that the MMSE instrument was used to measure cognitive function and a threshold score was used to determine cognitive measurement, which might make the

results less accurate as compared with using clinical tests. Also, by using dichotomized measures of SES and perceived financial strain, the complexities of SES and financial strain cannot be captured.

Finally, as is common in many studies of older adults, there is a potential problem of recall bias since most of the study variables were based on self-reports. In addition, some information in this study was reported by respondents' proxy and could be even more biased. Compared to older adults who completed the survey by themselves, those who relied on proxies were more likely to report poor health in the study samples.

In spite of these limitations, this dissertation contributes to the extant literature in several ways. First, by exploring the long-term effect of family trauma and stressful life events on cognitive and subjective health in older adults, this dissertation enriches the understandings of how health problems in advanced age may have origins rooted in very early life.

Second, there are some innovative findings in this dissertation. For instance, findings from Chapter 2 indicated that oldest old men who lost a mother in early life were most vulnerable to cognitive problems, which provides a new way of understanding the role of gender in the trauma-health association. Chapter 3 found that different dimensions of intergenerational SES mobility that could affect the health status of men and women in different ways. In Chapter 4, results for urban older adults suggested that childhood SES was a robust predictor of late-life health, independent of

adulthood SES and perceived financial strain. All these findings challenged previous theoretical and empirical studies to some extent.

Third, this dissertation used an advanced statistical method to handle the analyses with higher proportions of missing data, which provided unbiased estimates and helped reserve the sample size and power of the original data. Based on a comparison between the original data with complete cases and the imputed data, the main patterns of the results were quite similar but the effects generated by the imputed data were stronger.

Finally, by incorporating multiple theoretical perspectives into the stress-health association, this dissertation extended existing frameworks for studying early life stressors and health in later life. The use of such frameworks to guide future research will help scholars interested in similar issues extend the stress-health framework in many disparate directions.

5.3 Implications and Future Directions

With 122 million people aged 65 and older, China has over one-fifth of the world's older population and that population is still growing rapidly. In addition, the older population itself is aging. Learning about the recent generations of the older adults has the potential to benefit the study of and the policy making for future generations of senior citizens in China and globally. This dissertation project gave much attention to the gender differences in the stress-health association in the traditional Chinese society. Gender inequality is still a salient issue in both developed and

developing countries across the world, which has the potential to modify the association between stressful life events and health throughout life. For the case of China, a large number of women in rural areas nowadays still have relatively lower education and fewer job opportunities than men. The gender differences found in cognitive well-being at advanced age and its early-life predictors may benefit the study of stress-health association in the future.

Some stressors that mattered for the current study population might shape the health and well-being for future older adults as well. For instance, both intergenerational socioeconomic mobility and financial strain could be a source of stressor for current and future generations of older adults across diverse cultures. Further, although the rates of parental death are much lower nowadays in China and in many other countries than in the early 1900s, it should be noted that the rates of parental separation are getting higher in many places across the world. This is particularly true in rural China, where a great number of men and women have emigrated from rural areas to cities, leaving millions of children to be separated from their parents and taken care of by their grandparents or other relatives. Given the evidence that parental separation can be even more detrimental than parental death (Otowa et al., 2014), it will be interesting for future studies to investigate the long-term effect of parental separation on health and well-being over the life course.

Findings from Chapter 2 suggested that losing a mother early in life increased the risk of moderate to severe cognitive impairment, which could be an indicator Alzheimer's disease or other dementia. Given the fact that both respondents' gender

and the gender of the lost parent could shape the trauma-health association over time, policy makers should draw attention to the different needs of older men and older women in terms of healthcare. More research is needed to examine the interrelationships in trauma, resilience, and health over the life course. Findings from Chapters 3 and 4 underscored the importance of addressing different dimensions of SES and the rural-urban differences while exploring the socioeconomic disparities in health. Given that individuals' intragenerational residential mobility and occupational mobility could affect their health and well-being at different life stages (e.g., Stokols et al., 1983), future research is needed to simultaneously investigate the effect of intergenerational and intragenerational SES mobility on health.

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APPENDIX

APPENDIX

Table A.1 The CLHLS Mini-Mental State Exam (MMSE) Questions

MMSE Question	Score (Total = 30 pts)
1. What time of day is it right now (morning, afternoon, evening)?	1
2. What is the animal year of this year?	1
3. What is the date of the mid-autumn festival?	1
4. What is the season right now?	1
5. What is the name of this county or district?	1
6. Please name as many kinds of food as possible in 1 minute (1 point for each food and 8 points for those who name 8 or more foods)	8
7. Repeat the name of “table” at the first time	1
8. Repeat the name of “apple” at the first time	1
9. Repeat the name of “clothes” at the first time	1
10. $20 - $3 = ?	1
11. $20 - $3- $3 = ?	1
12. $20 - $3 - $3 - $3 = ?	1
13. $20 - $3 - $3 - $3 - $3 = ?	1
14. $20 - $3- $3 - $3 - $3 - $3 = ?	1
15. Repeat the name of “table” a while later	1
16. Repeat the name of “apple” a while later	1
17. Repeat the name of “clothes” a while later	1
18. Naming “pen”	1
19. Naming “watch”	1
20. Repeat the following sentence: “What you plant, what you will get.”	1
21. The individual is asked to follow the interviewer’s instruction: “Take the paper using your right hand.”	1
22. The individual is asked to follow the interviewer’s instruction: “Fold it in the middle using both hands.”	1
23. The individual is asked to follow the interviewer’s instruction: “Place the paper on the floor.”	1

VITA

VITA

Rong Fu received her dual-title PhD in Sociology and Gerontology from Purdue University, West Lafayette. Her main fields of study include medical sociology, health, and social gerontology. She has been doing interdisciplinary research and has publications in the fields of sociology, education, and research methods. She also has forthcoming publications and ongoing research in the fields of public health, gerontology, medical sociology, etc. Her dissertation examined how childhood and later life stressors affected cognitive health in Chinese older adults.

For the past few years, Rong Fu has engaged in both independent and collaborative research projects with faculty members and doctoral students both at and outside of Purdue. She served as a graduate research assistant for two years and a half in the Department of Sociology. She has presented many papers and posters at national scientific meetings. Her solo-author and first-author work was honored the *Emerging Scholar and Professional Organization Poster Award* (twice) and the *Task Force for Minority Issues in Gerontology Student Poster Award* (twice) at Gerontological Society of America annual meetings. She also won the 3rd Place at the Health and Disease: Science, Culture and Policy Graduate Student Poster Competition held by Purdue University. In addition, she got the Lee Student Support Fund for several times from the Society for

the Study of Social Problems (SSSP) and several travel grants such as the Purdue Graduate Student Government (PGSG) Travel Grant from Purdue University.

Rong Fu has been actively engaged in academic and social services. She participated in the Post-Earthquake Adjustment Project after the Great Sichuan Earthquake in China. She assisted with the translation of Chapters 4 and 5 of *Social Construction in Context* (1st edition) by Kenneth J. Gergen from English into Chinese. She also reviewed manuscripts for academic journals such as *Social Science & Medicine* and *Gerontology* and served as the award committee for several national awards honored by SSSP. During her time at Purdue, she served as the steering committee member for one year at the Center on Aging and the Life Course and the volunteer for several times at the Center for Instructional Excellence (CIE).

Rong Fu has over three years' independent teaching experience at Purdue University, where she taught introductory courses in sociology and social statistics. She has a strong passion for teaching and received the *Outstanding Graduate Student Instructor Teaching Award* given by the Department of Sociology, as well as the *Purdue Teaching Academy Graduate Teaching Award* and the *Graduate Teacher Certificate* honored by CIE at Purdue. After graduation, Rong Fu will become an assistant professor in the Department of Sociology at Siena College, Albany NY.