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The Effects of Childhood, Adult, and Community Socioeconomic Conditions on Health and Mortality among Older Adults in China

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Abstract

Using a large, nationally representative longitudinal sample of Chinese aged 65 and older, this study examines the effects of childhood, adult, and community socioeconomic conditions on mortality and several major health outcomes. The role of social mobility is also tested. We find that childhood socioeconomic conditions exert long-term effects on functional limitations, cognitive impairment, self-rated health, and mortality independent of adult and community socioeconomic conditions. Achieved conditions matter for most outcomes as well, considering that adult and community socioeconomic conditions have additional impacts on health among Chinese elders. The majority of the effects of childhood conditions are not mediated by adult and community conditions. The results also show that social mobility and health in later life are linked in complex ways and that psychosocial factors have marginal explanatory power for the effects of socioeconomic conditions. Overall, this study provides new longitudinal evidence from China to support the notion that health and mortality at older ages are influenced by long-term and dynamic processes structured by the social stratification system. We discuss our findings in the context of the life course and ecological perspective, emphasizing that human development is influenced by a nexus of social experiences that impact individuals throughout life.

Keywords

Socioeconomic status; Social mobility; Aging; Mortality; Self-rated health; Disability; China

Introduction

It has been argued that research incorporating both childhood and adult socioeconomic conditions can help us better understand the relationship between socioeconomic conditions and health at older ages (Hayward and Gorman 2004; Preston et al. 1998). The life course perspective on socioeconomic conditions and health contends that human development and aging are lifelong processes; thus, a better understanding of socioeconomic conditions and health requires a long-term perspective that fully recognizes how socioeconomic conditions can affect health from birth until death (Alwin and Wray 2005). Socio-ecological theory argues that community socioeconomic conditions also play a significant role in determining variation in individuals' health (Kawachi and Berkman 2003a; Subramanian et al. 2006).

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Although the two frameworks are widely accepted in the literature, studies that incorporate both are rare.

Drawing from the life course perspective and the social ecological framework, the current study explores how childhood and adult socioeconomic conditions, as well as community socioeconomic development, independently and jointly affect healthy aging—defined by a complex host of health-related outcomes in later life. Using nationally representative longitudinal data of adults aged 65 and older in China, this multilevel and multistage integrative study provides new evidence about whether the external validity of the status-health link that is frequently observed in Western societies also exists in China, a distinct setting given its population size, level of development, and rapid social and economic transformations.

Background

Adult Socioeconomic Conditions and Health

The link between health and socioeconomic conditions in adulthood has been observed in many societies. A series of review articles have consistently shown that morbidity and mortality risks are inversely related to income, education, and occupational status (Deaton 2003; Robert and House 2000). These reviews often emphasize the difficulty of assessing the direction of causation; however, evidence from longitudinal studies demonstrates that the causation argument for the association between socioeconomic conditions and health is strong, net of social selection (Marmot 1999).

Although some studies have found that socioeconomic differences in health are weaker among older adults (von dem Knesebeck et al. 2000), a large body of work has shown that these inequalities in health and mortality extend into older ages (Marmot and Shipley 1996; O'Rand 1996; van Rossum et al. 2000; Yao and Robert 2008). For example, some scholars have shown that education is the most important nonbiological correlate of good cognitive performance in American and Korean older adults (Anderson et al. 2007; Lee and Jeon 2005) and that lower education and income are associated with some forms of functional limitation and disability among American, French, and German older adults (Davin et al. 2005; von dem Knesebeck et al. 2000).

However, the link between socioeconomic conditions and health is not homogeneously ubiquitous. For instance, von dem Knesebeck and colleagues (2003) found that associations between self-rated health and socioeconomic conditions (measured by income, education, occupation, assets, and homeownership) were stronger and more consistent in Germany than in the United States. They further reported that income was a better measure of socioeconomic condition than education, occupation, assets, and homeownership when predicting self-rated health, functional limitation, and depression. Moreover, the latter four variables were not consistently associated with health in Germany, and their associations were even less clear in the United States. Additional findings from the United States documented an insignificant effect of socioeconomic conditions on health among elders (Alley et al. 2007; Christensen et al. 2001), and one study from Taiwan found that higher education was associated with higher levels of disability (Chiu et al. 2005). Taken together, these studies suggest that the socioeconomic impacts on health may be specific to different indicators of socioeconomic conditions and the location.

Despite the variations in the literature, the majority of evidence, particularly in Western nations, indicates positive associations between socioeconomic conditions and health. Explanations for the associations broadly fall into two categories: psychosocial factors (e.g., health practices and social support) and material resources (e.g., housing conditions and

access to healthcare) (Feinstein 1993; Williams 1990). For example, Williams (1986) found that smoking, obesity, and alcohol consumption explained a substantial portion of educational differences in mortality in the Tecumseh Community Health Study. Recent trends in obesity also show an inverse socioeconomic gradient (Ball and Crawford 2005) and suggest that individuals with poorer socioeconomic conditions are more likely to suffer higher levels of morbidity and mortality than their advantaged counterparts because of unhealthy lifestyles. Social support is another likely mediator linking socioeconomic conditions to health. Research has shown that persons in lower social strata are less socially connected (Berkman and Lester 1983), and despite increased involvement with friends and family, individuals in poor socioeconomic conditions face greater stress from these networks (Belle 1982). Nevertheless, recent evidence from Western studies has indicated that the associations between socioeconomic conditions and self-rated health were mediated only marginally by social support (Gorman and Sivaganesan 2007; Koster et al. 2005). Evidence suggesting mediating effects of other psychosocial factors (such as church attendance) (Veenstra 2000) and material resources (such as access to and quality of health care) (Smedley et al. 2003) has also emerged, but the literature is still sparse. To date, consistent evidence about the mechanisms underlying the associations between socioeconomic conditions and health is not readily available.

Life Course Approach

Although adult socioeconomic conditions remain the most commonly addressed aspects of health disparities, there is a growing recognition that conditions early in life have long-term effects on health and mortality at older ages (Everson-Rose et al. 2003; Moody-Ayers et al. 2007). According to Preston et al. (1998), the pathways linking childhood conditions to later health and survival may be direct or indirect. *Direct mechanisms* refer to the fact that adverse conditions experienced early in life have long-term negative effects on health at old ages, independent of achieved status in adulthood. This argument is consistent with cumulative disadvantage theory (Dannefer 2003), suggesting that initial health deficits attributable to early-life circumstances lead to additional disadvantages across the life course. Alternatively, *indirect mechanisms* suggest that advantaged early-life conditions contribute to greater educational attainment and higher achieved social status in adulthood, which protect health, reduce disability, and lower mortality in later life. In practice, the indirect effect perspective suggests that if early-life conditions affect later-life health primarily through achieved adulthood status, then the effects of adult socioeconomic conditions will be stronger than childhood socioeconomic condition when examined simultaneously.

The evidence regarding these mechanisms is mixed. Some studies have shown that the association between childhood conditions and health in older life is largely indirect and attributable to socioeconomic achievement and lifestyle in adulthood (Hayward and Gorman 2004; Marmot et al. 2001; Robert and House 2000). Conversely, O'Rand and Hamil-Luker (2005) documented enduring effects of early disadvantage and childhood illness on the risk of heart attack in later life and suggested that cumulative adversity in childhood influences old-age health. Gilman and colleagues (2002) also found that children from lower parental occupations at the time of the respondents' birth and seventh year had nearly a twofold increase in the risk of major depression in adulthood compared with those from the highest socioeconomic conditions, independent of adult socioeconomic conditions.

Studies of social mobility that consider socioeconomic experiences from childhood and adulthood have also produced inconsistent results. For example, an early study found that upward social mobility was positively linked to the incidence of heart disease (Syme et al. 1965), whereas more recent studies showed that favorable conditions in adulthood may compensate for childhood disadvantages, and downward social mobility may exacerbate

adult health outcomes (Hart et al. 1998; Luo and Waite 2005; Turrell et al. 2002). However, these patterns are based on limited research, and the sources of these inconsistencies cannot be identified with certainty. To adjudicate between direct and indirect hypotheses, considerably more work is needed to disentangle the independent, mediating, and cumulative effects of socioeconomic conditions on health at different stages of life. Conceivably, social conditions may affect health throughout the life course, and these effects may vary by different health outcomes and the different socio-environmental and historical contexts of local settings. We argue that a more fruitful strategy is to explore specific patterns of health in specific settings, rather than applying an overarching universal model.

Community Socioeconomic Conditions and Health

Beyond the individual level, macro socio-ecological factors also have significant influences on individual health (Kawachi and Berkman 2003b). For example, a number of U.S. and U.K. studies reported that community socioeconomic conditions were health promoting for older adults, despite controls for individual and household socioeconomic status (Cagney et al. 2005; Lang et al. 2008a, b; Wen et al. 2005; Wen et al. 2006; Yao and Robert 2008).

Several explanations have been proposed for the contextual influences of community conditions on individual health. In general, the beneficial effects of community conditions may occur because of the health-promoting resources of the social, physical, and service environments of local neighborhoods (Macintyre et al. 2002; Wen et al. 2003). Socioeconomically resourceful communities often enjoy a desirable physical environment equipped with, for example, greater amounts of green space (Ellaway et al. 2005); better access to neighborhood amenities, such as recreational options (Wen and Zhang 2009); high-quality food (Dubowitz et al. 2008); and health and social services (Andersen et al. 2002). Higher community socioeconomic conditions are also positively associated with local interpersonal features, such as neighborly trust and social cohesion (Kawachi and Berkman 2003a; Wen et al. 2006, 2007).

This literature highlights the importance of a multilevel approach to health and behavior. Multilevel analytical strategies have been widely used to disentangle the contextual effects of community socio-ecological features on health outcomes from the compositional effects of residents' characteristics (Kawachi and Berkman 2003a). Scholars using this approach typically examine achieved socioeconomic conditions in adulthood along with community environment, but they rarely examine childhood conditions simultaneously in the same study.

Socioeconomic Conditions and Health in China

Recent evidence corroborates that socioeconomic conditions experienced in adulthood play a salient role in health and aging in China. Research has shown that traditional socioeconomic conditions measured by education, economic independence, and occupational status are protective against mortality (Liang et al. 2000; Zhu and Xie 2007), cognitive impairment (Zhang et al. 2008), self-rated fair or poor health (Liu and Zhang 2004), and functional limitations or disability (Beydoun and Popkin 2005; Liang et al. 2003) among older and oldest-old adults in China. Childhood conditions have also been found to influence self-rated health, physical disability, and cognitive impairment among the oldest-old Chinese (Zeng et al. 2007; Zhang et al. 2008).

It is noteworthy that the measures of socioeconomic conditions used in Chinese studies are somewhat different from those used in Western studies. For example, Liang et al. (2003) and Zhu and Xie (2007) used urban-rural residence as a proxy indicator of status, and Liang et

al. (2003) identified 12 household luxury goods (e.g., TV, telephone) as measures of household economic well-being. Similarly, Zimmer et al. (2007) used the amount of savings in the bank as an indicator for household economic status and place of birth (urban or rural) as a surrogate indicator of childhood socioeconomic conditions.

Such indicators of socioeconomic conditions are reasonable, reflect the uniqueness of the culture and socioeconomic system in China (Luo and Wen 2002; Zhu and Xie 2007; Zimmer and Kwong 2004), and are more predictive of health among older Chinese than conventional Western socioeconomic measures. Zimmer and Kwong (2004) found that the amount of family savings in the bank (used as a proxy of economic status) was the strongest socioeconomic predictor of better self-rated health and fewer functional limitations among older adults in urban China, although it also was positively correlated with chronic conditions (e.g., cardiovascular disease). Zimmer and colleagues (2007) further showed that being a governmental officer (as proxy for adult socioeconomic conditions) significantly reduced mortality risk.

General Limitations in the Current Literature

For developing countries where socioeconomic resources are more deficient and epidemiological transitions (Omran 1971) are still unfolding, evidence regarding which aspects of socioeconomic conditions at different life stages matter most for specific health outcomes among older adults remains incomplete. Alwin and Wray (2005) provided an illuminating framework for how social status affects health throughout the life course by simultaneously considering longitudinal exposure to socioeconomic conditions and the multilayered social contexts that shape both proximate and macro-level risks and resources. However, this framework has not been adequately tested in developing countries because of limited data and the lack of attention to changing socioeconomic conditions across ages. Much of the existing literature uses single-time and single-level measurements that reflect neither the temporal pattern of individuals' social status nor their dynamic experiences of navigating through the social stratification system over a lifetime (Hayward and Gorman 2004).

Another limitation is that most studies have examined only one dimension of health. Although some researchers have attempted to operationalize a more holistic view of health by including both traditional and new health indicators (Beydoun and Popkin 2005; Grundy and Holt 2001), this framework is not well studied, especially in developing countries like China where such data are rare. Presumably, socioeconomic conditions affect different dimensions of health nonuniformly, and thus the link between socioeconomic conditions and health depends on the individual measures. Indeed, recent reviews on social relations and health have called for the inclusion of multiple health outcomes (Seeman 1996) and diverse socioeconomic indicators (Braveman et al. 2005) in the same study.

To the present day, limited measures of socioeconomic conditions are used in empirical investigations. Income, education, and occupation are the three indicators of socioeconomic status that dominate the health inequality literature, particularly in Western research (Shaw et al. 1999; von dem Knesebeck et al. 2000). However, these measures may not fully reflect socioeconomic resources in some settings. Therefore, it is important to consider other, culturally sensitive measures to capture a broader spectrum of associations between socioeconomic conditions and health.

Although several studies have investigated associations between individual-level socioeconomic conditions and health and mortality at older ages in China (Zeng et al. 2007; Zhang et al. 2008; Zhu and Xie 2007), the mechanisms explaining these links among Chinese elders, who constitute a rapidly growing segment of the population, have rarely

been explored. One study of the non-elderly adult population in China showed that material factors, such as availability of tap water and housing crowdedness, yielded considerable explanatory power for the association between household income and self-rated health and disability (Luo and Wen 2002). However, health behaviors such as smoking and drinking did not share the same negative distribution across income levels as in Western societies and had little impact on the health-income link among Chinese adults (Luo and Wen 2002). It is not known whether these patterns also exist among older Chinese adults.

Finally, almost no research examines the effects of social mobility on health and mortality among older adults in China. Social mobility is an important life course concept reflecting trajectories of socioeconomic conditions from childhood to adulthood (Luo and Waite 2005). Investigating how social mobility influences health and aging would provide a greater understanding of the patterning of socioeconomic disparities in health and help illuminate the relative contributions of childhood and adult socioeconomic conditions to health at older ages. Considering the shortcomings of extant research, this study incorporates individual-level socioeconomic measures from both childhood and adulthood while including community-level factors to test their associations with cognitive impairment, functional disability, self-rated health, and mortality in a nationally representative sample of elders aged 65 or older in China.

Data and Method

Data

We used data from the third and fourth waves of the Chinese Longitudinal Healthy Longevity Survey (CLHLS) conducted in 2002 and 2005. Initiated in 1998, the CLHLS was conducted in a randomly selected half of the counties/ cities in 22 provinces of China. The CLHLS aimed to interview all centenarians who voluntarily participated and offered informed consent in the sampled counties/cities. For each centenarian, one nearby octogenarian and one nearby nonagenarian with predesignated age and sex were randomly selected and interviewed; the term *nearby* refers to the same village or street, or the same town, county, or city, when applicable. This sampling design ensures comparable numbers of randomly selected male and female octogenarians and nonagenarians at each age from 80–99. Starting in 2002, the CLHLS extended its sample to cover younger elders aged 65–79. The CLHLS collected information on childhood and adult socioeconomic conditions, health practices, and health status. The date of death for respondents who died between survey waves was collected from death certificates or the next of kin if death certificates were unavailable. The data quality of the CLHLS is high, according to systematic assessments of age-reporting and the reliability, validity, and consistency of numerous measures and randomness of attrition (Gu and Dupre 2008). The third wave of the CLHLS collected data from 4,845 elders aged 65–79 who were not the target population in the 1998 and 2000 waves, and 10,952 oldest-old elders aged 80–105. Of the 15,797 interviewees in the 2002 wave, 8,099 (51.3%) were reinterviewed in the 2005 wave; 5,703 (36.1%) died before the 2005 follow-up; and 1,995 (12.6%) were lost to follow-up and could not be linked to survival information.

Community Definition

Defining local communities or neighborhoods is challenging and debatable. In Western societies, many studies have used administrative definitions (such as census tract, electoral ward, or ZIP code) (Kawachi and Berkman 2003b) because of their availability in census data. Although this approach may lead to misspecification problems and underestimate area effects, it is a conservative strategy that takes advantage of existing data to study place effects on health. Following this approach, we used county or city district as a proxy for

community. Although census data are collected decennially in China, few scholars have used this rich information to examine the effects of community socioeconomic conditions on health net of the impacts of individual sociodemographic characteristics (including early-life conditions).

Dependent Variables

We examined mortality risk from 2002 to 2005 and three health outcomes in 2005. Activity of daily living (ADL) disability is defined as self-reported difficulty with any of the following activities: bathing, dressing, eating, indoor transferring, toileting, and continence. The validity and reliability of self-reported ADLs in the 2002 wave of the CLHLS has been reported elsewhere (Gu 2008). Following established research (e.g., Crimmins et al. 1996), and given that different categorizations of ADL functioning yielded similar results, we dichotomized ADL into “disabled” (having at least one ADL limitation, coded as 1) and “active” (no ADL limitation).

Cognitive impairment was measured by the Chinese version of the Mini-Mental Status Examination (MMSE), adapted from the original MMSE (Folstein et al. 1975). It tests seven aspects of cognitive functioning: orientation, registration, copy and design, calculation, recall, naming, and language (repetition, reading and obeying, writing, and commands). The Chinese version of the MMSE reflects the cultural and socioeconomic contexts in China and makes the questions more easily understandable and answerable for those oldest-old Chinese whose cognitive functioning is normal (Zeng et al. 2002). Recent studies demonstrated that the measure is reliable and valid (Gu 2008; Zhang et al. 2008). We dichotomized respondents as cognitively impaired if they had an MMSE score less than 23 (coded as 1). Other classifications of cognitive impairment were tested and produced only minor differences in the results; the binary categorization was thus selected for intuitive interpretation.

Self-rated health was assessed by asking respondents, “In general, would you say your health is: (1) very good, (2) good, (3) fair, (4) bad, or (5) very bad?” We dichotomized the responses into good health (very good/good/fair, coded as 0) versus poor health (bad/very bad, coded as 1) for parsimony and to account for its highly skewed distribution; other categorizations did not produce qualitatively different results. Research shows that self-rated health has high predictive validity for mortality, physical disability, chronic disease status, health behaviors, and health care utilization (Chen and Wu 2008; Ferraro et al. 1997). It also captures an overall sense of well-being, commensurate with the World Health Organization’s definition of health—not just referring to the absence of disease but also drawing on the mental, physical, and social dimensions of well-being (Hill et al. 2005).

Independent Variables

High childhood socioeconomic conditions were measured by using six dichotomous proxy indicators: born in an urban area, father had a white-collar job, both parents were alive at child’s age 10, had access to health care, did not often go to bed hungry, and arm length among the top 90% of the sample. Arm length was measured on site at the interview and is used as a proxy for childhood nutritional status (Zhang et al. 2010). All six variables are well validated and are used frequently in the literature on the childhood socioeconomic conditions for Chinese elders (Gunnell 2002; Hayward and Gorman 2004; Jeong et al. 2005; Zeng et al. 2007).

Measures of high adult socioeconomic conditions included current residence in urban areas, had a white-collar job before retirement, self-perceived better living condition compared with neighbors, economic independence (i.e., if daily expenses were paid by respondents’

retirement wage/pension or other income), received any formal education, and currently has access to health care services. These variables were all coded as dummy variables. Previous work has shown that our measures of education (i.e., any schooling) and income (i.e., economic independence and living conditions) are robust indicators of the socioeconomic resources available to older adults in China (Zeng et al. 2007; Zhang et al. 2008; Zhu and Xie 2007). Preliminary analyses demonstrated that the substantive conclusions were unchanged when we used other classifications of years of schooling. Recent evidence also supports the use of current urban-rural residence and access to health care as good proxies of socioeconomic status in contemporary China (Luo and Wen 2002; Zhu and Xie 2007; Zimmer and Kwong 2004).

We created two composite indices of childhood and adult socioeconomic conditions by summing their respective measures. The summation of individual socioeconomic condition indicators enables us to capture the cumulative effects of socioeconomic conditions and detect effects that may be small with a single indicator. This approach has often been used to capture cumulative deficits in health among elders in aging studies (e.g., Kulminski et al. 2008). The indices were further categorized into three equal groups: low, middle, and high. A social mobility variable was subsequently created with five categories measuring socioeconomic changes from childhood to adulthood: stable low (low in both childhood and adulthood), downward (high in childhood and middle or low in adulthood, or middle in childhood and low in adulthood), stable middle (middle in both childhood and adulthood), upward (low in childhood and middle or high in adulthood, or middle in childhood and high in adulthood), and stable high (high in both childhood and adulthood). This operationalization of social mobility is similar to measures previously used (Luo and Waite 2005; Turrell et al. 2002), and alternative categorizations yielded similar results.

All indicators for community socioeconomic conditions were measured as of the survey date. These include per capita gross domestic product (GDP), average years of schooling, number of hospital beds per 1,000 persons, labor force participation rate, and proportion of urban population. These variables, obtained from the National Bureau of Statistics in China (2003), reflect several dimensions of community development and resources that have been frequently linked to individual health (Kawachi and Berkman 2003b; Robert 1999; Yen and Syme 1999). To facilitate the analyses, all community-level variables were dichotomized (except per capita GDP), based on cut points as follows: 7.5 years for average years of schooling, 2 per 1,000 persons for hospital beds, 70% for labor force participation rate, and 40% for proportion of urban residents. We created three categories of per capita GDP, including low (less than $365), medium ($366–$745), and high ($746– $2,367), based on the World Bank categorization in 2002 for community per capita GDP in China (World Bank 2002).

Individual-level control variables included three demographic variables: age, sex, and ethnicity (Han vs. Non-Han). In analyzing the mortality risk from 2002 to 2005, we also controlled for individual health conditions at baseline. A set of family/social support and behavioral variables were examined as hypothesized mediators linking socioeconomic conditions to health and mortality in later life. These items included ever smoked in the past five years (yes vs. no), ever used alcohol in the past five years (yes vs. no), exercised regularly in the past five years (yes vs. no), participated in religious activities (yes vs. no), number of living children, high proximity to children (i.e., living in the same household or in the same village/on the same street with at least one child), marital status (married vs. nonmarried), and an index encompassing a range of leisure activities that were totaled based on engagement (gardening, raising poultry or pets, outdoor activities, reading, playing cards/mahjong, listening to radio/watching TV, and social activities). These leisure activities have been shown across disciplines to impact various health conditions at older ages (e.g.,

Andersen et al. 2002; Preston et al. 1998; Sun and Liu 2006). At the community level, we included a lagged pollution index obtained from the 1995 China Database for Natural Sciences (available online at http://www.naturalresources.csdb.cn/zy/english/database.asp) to account for an important environmental factor for health (Balfour and Kaplan 2002; Standtröm et al. 2003).

Analytical Strategy

We used two-level random-intercept logistic regression models to examine the effects of childhood, adult, and community socioeconomic conditions on three health outcomes. The random-intercept and fixed-slope design is a widely used approach in multilevel analyses (Raudenbush et al. 2004) that assumes the community-level variables are associated only with the intercept at the individual level. With the exception of social mobility, all individual variables were centered at their group means according to conventional multilevel analyses (Hox 2002). We also assessed multicollinearity among covariates, and the largest variance inflation factor was lower than 3, indicating no alarming multicollinearity biases in the models (Chandola 2001). We used multiple imputation methods to reduce the influence of missing data—which was never greater than 6%—on our analyses and inferences (see Allison 2002).

We estimated four additive models for each of the three health measures adjusting for age, sex, and ethnicity. These analyses included respondents who were interviewed in 2002 and survived to 2005. Model 1 examined the impacts of childhood socioeconomic conditions on health; Model 2 added adult socioeconomic conditions to Model 1; Model 3 further included community-level socioeconomic factors to Model 2; and Model 4 further added the measures of family/social support and health practices. This strategy allowed us to test whether childhood socioeconomic conditions affected health through sequential pathways of adult and community socioeconomic conditions and psychosocial factors among older adults in China. We examined the associations between social mobility and health outcomes by estimating two additive models: the first included social mobility with community socioeconomic conditions, and the second model added family/social support and health practices.

For mortality risks, we fit five additive Weibull hazard regression models based on exact survival times (in terms of days) for subjects from 2002 to 2005, while adjusting for within-community correlations. The first four of these models had identical model specifications to those for the three health outcomes, with the fifth model further adjusting for baseline health in 2002. For mortality risks associated with social mobility, we used two models that were analogous to the three health outcomes and added a third model that further adjusted for baseline health in 2002. Persons lost to follow-up (i.e., no survival information available in 2005) were dropped from the sample based on preliminary results that were comparable when including the censored observations using multiple imputation (Allison 2002).

Sensitivity tests based on sex- and age-stratified (ages 65–79 and ages 80 or older) analyses produced largely similar results. Therefore, we present results for the full sample. We did not use weights in our models because the weight variable available in the CLHLS reflects sampling only by age and sex, and we controlled for these factors in the model—a common and acceptable approach used in multivariate regression modeling (see Winship and Radbill 1994). All analyses were conducted using Stata 10.0.

Results

Table 1 reports sample statistics of the variables included in the analysis. The sample size for the mortality analyses was 13,802 individuals, which was reduced to 8,099 individuals

for the health-outcome analyses because of the 5,703 deaths that occurred during the three-year study period. As expected, the baseline health status of the restricted health-outcome sample is better than the full mortality sample. In addition, the health-outcome sample is slightly more advantaged in childhood and adult conditions as well as social mobility compared with the mortality sample. This comparative pattern, albeit crude, seems reasonable considering that socioeconomic resources are salubrious and that the health-outcome sample consists entirely of survivors. However, the two analytic samples do not appear much different in terms of community resources.

Tables 2, 3, 4, 5, and 6 present the findings from the multivariate regression analyses. According to Model 1 in Table 2, four of six childhood socioeconomic indicators are significantly associated with the likelihood of cognitive impairment in later life. Specifically, higher socioeconomic status—measured by born in an urban area, father had a white-collar job, went to bed not hungry, and arm length among the top 90%—is associated with 13%–37% reductions in the odds of the respondents' becoming cognitively impaired during the study period (i.e., [odds ratio in Model 2–odds ratio in Model 1] / [odds ratio in Model 1]). Most of the childhood socioeconomic effects become insignificant when adult socioeconomic variables are included in Model 2. Childhood nutritional status is an exception, with a negative association with cognitive impairment despite controlling for a variety of covariates. Models 2 and 3 demonstrate that higher adult educational attainment, greater per capita GDP, and higher overall community educational attainment exhibit strong preventive effects net of childhood conditions. In addition, community conditions do not contribute to the effects of childhood or adult socioeconomic conditions (Models 2–3).

Table 3 shows that fewer socioeconomic factors are associated with the odds of ADL disability compared with cognitive impairment. Having both parents alive at age 10 is the only significant childhood socioeconomic factor indicating a protective effect independent of adult and community conditions (Models 1–4). Somewhat surprisingly, socioeconomic conditions in adulthood—such as currently living in an urban area and economic independence—are positively associated with higher odds of disability. In addition, elders from communities with the highest levels of per capita GDP (Model 3) are more likely to have an ADL disability.

Table 4 reports that having been born in an urban area, having a father with a white-collar job, and having access to health care in childhood correspond to reduction in the odds of poor self-rated health by 26%, 29%, and 14%, respectively (Model 1). Although currently having access to health care is associated with a 27% decrease in the odds of poor self-rated health (Model 2), adult conditions hardly change the magnitude of the effects of childhood conditions. Models 2–4 indicate that community conditions are not significant predictors of self-rated health and thus do not explain the effects of childhood and adult conditions.

Table 5 shows that those having had both parents alive at age 10, having good nutrition in childhood, economic independence, and living in communities with higher labor force participation exhibit lower rates of mortality than their respective counterparts (Models 1–4). Access to health care in adulthood significantly reduces mortality until individual-level psychosocial factors are taken into account (Models 3–4). Family support and health practices explain a small portion of the hazard rates related to healthcare access and economic dependence, but not the effects of childhood conditions (Models 3–4). Moreover, born in an urban area becomes significant after adult social conditions are taken into account; this finding suggests that, with childhood, adult, and community socioeconomic conditions held constant, elders born in urban China had an 11%–13% higher risk of dying during the survey period than those born in rural areas (Models 2–4).

A consistent finding for all outcomes in the analysis is that psychosocial factors had marginal explanatory power for the effects of socioeconomic conditions. Nonetheless, factors such as the number of living children and leisure-time activities show significant health benefits independent of social conditions. Uniquely and negatively linked to mortality but not health status are marriage, religious involvement, and participation in regular exercise in the past five years.

The results in Table 6 show that social mobility has stronger associations with cognitive status and mortality than physical disability and self-rated health. For cognitive status, stable high status throughout life is the most beneficial category, followed by upward mobility and downward mobility, with stable low and stable middle representing the worst scenarios for cognitive health. For mortality, the results suggest a dose-response relationship, with social mobility ranging from stable low as the most disadvantageous to stable high as the most protective. The monotonic pattern of this relationship becomes less clear after psychosocial factors are included, although the disadvantage of stable-low mobility is still apparent. Adjusting for baseline health in Models 2 and 3 shows that the effects of social mobility are eliminated for all categories except stable high.

Discussion

Using a large-scale, nationwide longitudinal survey of elders in China in 2002 and 2005, we examined how childhood, adult, and community socioeconomic conditions affect cognitive status, ADL disability, self-rated health, and mortality among adults aged 65 and older. Drawing from life course and socio-ecological perspectives, this study extends three recent studies (Zeng et al. 2007; Zhang et al. 2008; Zhu and Xie 2007) on the associations of socioeconomic conditions with healthy aging in several important ways. Specifically, it (1) examines multiple health outcomes and mortality, (2) addresses the health effects of childhood, adult, and community socioeconomic conditions; social mobility; and their mediating relationships, (3) explores additional mediating effects of psychosocial factors, and (4) includes a wider age range of elders in China (aged 65 and older).

A key finding from this research is that childhood conditions exert long-term effects on health and aging independent of adult and community conditions; however, achieved status and community conditions exert additional health impacts on Chinese elders for most health outcomes. Variations in the strength of the effects of childhood conditions are observed on different measures of health, with stronger associations found with cognitive functioning and mortality than with ADL disability and self-rated health. Only for cognitive impairment do we observe some explanatory power of adult conditions; the effects of adult conditions and community conditions do not mediate any of the effects of childhood conditions on other health outcomes. Therefore, evidence from this study suggests that childhood conditions may be directly associated with cognitive, physical, and self-rated health and mortality risk for older adults in China. Adult socioeconomic conditions play only a small role in the association between childhood conditions and the health outcomes at older ages. This finding is consistent with recent evidence from studies of older adults in Western societies (Luo and Waite 2005; O'Rand and Hamil-Luker 2005) and of the oldest-old in China (Zeng et al. 2007; Zhang et al. 2008).

Overall, the results provide support to the cumulative advantage/disadvantage hypothesis (Dannefer 2003) and Preston et al.'s (1998) theory that disadvantages in early life are likely to increase health problems and mortality at older ages for individuals, regardless of adult socioeconomic conditions. Research has shown that individuals with low status often experience greater levels of stress because their social environments produce more-devastating circumstances while, in turn, providing fewer opportunities to engage in stress-

relieving activities compared with their higher-status counterparts (Baum et al. 1999; Cohen et al. 1999).

The effects of social mobility in this study are complex. For cognitive status and mortality risk, high status in childhood and adulthood (stable high) is the most protective; low status in childhood and adulthood (stable low) is the most detrimental. For self-rated health, however, only stable high is significantly protective. Upward mobility does not help compensate for the detrimental effect of early-life hardship on the likelihood of reporting poor self-rated health at older ages. Contrary to expectations, stable-high social mobility is associated with significantly higher risks of ADL disability. Syme et al. (1965) found a similarly negative effect of upward social mobility on the occurrence of coronary heart disease and speculated that the relationship was possibly due to elevated stress experienced by persons with lower socioeconomic origins who eventually reached higher status through persistent hard work. In general, the findings for social mobility are more complex than results from Luo and Waite's (2005) analysis of the U.S. Health Retirement Survey. They revealed a consistent pattern of social mobility on a host of health outcomes for middle-aged and older Americans—with stably high socioeconomic conditions being most beneficial, followed by upward mobility, the mixed patterns, downward mobility, and being stable low. Our results are more or less consistent with this pattern for two of the four health outcomes we examined. Unfortunately, there is little guiding literature on the relationship between social mobility and health at older ages in China and elsewhere. Therefore, we encourage additional research to further assess how social mobility trajectories from childhood to adulthood are linked to health in later life in China.

Results from our analyses also showed that being economically independent, living in an urban area in adulthood, and living in more developed communities were associated with poor ADL functioning. Likewise, when adjusting for adult social conditions, having been born in an urban area was associated with higher rather than lower mortality risk during the study period. Contrary to our expectations that socioeconomic resources would be health promoting, the possible explanation for this finding is threefold. First, higher rates of premature mortality among socioeconomically disadvantaged groups may leave stronger members to survive into old age. As a result, frailer individuals born in rural areas (or currently living in rural areas) would be selectively eliminated from the sample of adults aged 65 and older. Second, rural areas may have better living environments that facilitate elders' physical and social activities that help them maintain physical functioning (Gu and Zeng 2004), despite the socioeconomic deprivation. For example, the greater number of one-story houses in rural and poor areas may make it easier for elders to engage in outdoor activities; better air quality and less noise pollution in rural and undeveloped areas also may directly benefit health (Zeng et al. 2002). Third, it has been shown that elders in more urbanized communities have fewer social ties and social interactions than their rural counterparts (Thomese and van Tilburg 2000). Indeed, the unexpected urban-rural disparity in ADL disability and the positive effect of having been born in an urban area on mortality could probably be interpreted as another type of "crossover" pattern that describes the lower mortality of disadvantaged groups at older ages (Dupre et al. 2006; Preston et al. 1998). In the context of rapid and widespread urbanization in China, more attention should be paid to the consequences of urban growth on health and overall human development.

In addition to exploring the health effects of socioeconomic conditions and social mobility, we also tested whether these associations are mediated by social support, family resources, and health practices at the individual level. With few exceptions, the social and behavioral factors failed to account for the link between status and health. It is possible that mechanisms such as material resources or psychological stress play more salient roles in socioeconomic disparities in health at older ages in China. Our results are consistent with

evidence based on a younger sample (aged 16–60) in China that showed that health practices did not mediate the relationship between income and health (Luo and Wen 2002). The explanations for why socioeconomic conditions are persistently linked to health and aging in China remain elusive.

In this study, we examined a broader range of socioeconomic conditions than most other studies. Because of its unique socioeconomic system, traditional measures of social inequality are not as salient or robust in China as previously shown in Western societies. Instead, we contributed to an increasing body of work that demonstrates that different socioeconomic measures better capture socioeconomic conditions and health risks in the Chinese settings (Zeng et al. 2007; Zhang et al. 2008; Zhu and Xie 2007; Zimmer and Kwong 2004). We found that having been born in an urban area, having both parents alive at age 10, and arm length among the top 90% are suitable proxies for childhood socioeconomic conditions as well as robust predictors of later-life health outcomes and mortality. Collectively, we believe the inclusion of a wider range of socioeconomic indicators in the present study enabled us to investigate the various pathways linking multiple dimensions of socioeconomic conditions with health (Baum et al. 1999).

Several important limitations of this study are noteworthy. First and foremost, the reported results describe associations rather than causations, despite the longitudinal design of this study. In the analyses, we controlled for baseline health when examining the prospective effects of socioeconomic conditions on mortality and used baseline socioeconomic measures to predict subsequent health outcomes. This research design frames the temporal sequence of the socioeconomic and health measures in line with the hypothesized pathway of social conditions preceding health outcomes. However, considering the nature of observational studies, we cannot determine with certainty the causal directions of the associations. Second, although our study examined more aspects of socioeconomic conditions related to health compared with prior research, there may be other important socioeconomic factors that were not included. For example, adult children's socioeconomic conditions likely play a prominent role in Chinese elders' quality of life by influencing material and psychosocial resources available to their aging parents. Future studies should consider how older adults' social standing compares with their children's socioeconomic conditions in determining healthy aging. A third limitation is that the adult socioeconomic measures could not capture differences in the social contexts experienced in adulthood prior to and during older ages. For example, reporting urban residence at the time of the survey could reflect a recent relocation or long-term residence since younger adult ages. Future work should explore how socioeconomic conditions impact healthy aging across the major stages of the life course (i.e., childhood, adulthood, and late ages).

Fourth, the socioeconomic conditions of Chinese elders have dramatically changed, concomitant with widening socioeconomic gaps between the rich and the poor since economic reforms in the late 1970s. However, we could not account for this social change because of data limitations. As China rapidly transitions from a state-controlled economy to a market-driven economy, the socioeconomic patterns of Chinese elders will continue to evolve. These changes highlight the necessity of collecting socioeconomic data at multiple life stages during important societal transitions to understand the structural foundation of human experiences. Fifth, we examined the socioeconomic effects over a three-year period and presumably underestimated the community-level effects on mortality, which manifest themselves over a longer period. We suspect that a longer follow-up would detect more nuanced differences in the effects of the different aspects of socioeconomic conditions on our different health outcomes across age. Finally, the measure of social mobility did not include information from all stages of life because of data unavailability and may have introduced some degree of bias in the analyses.

In conclusion, health differences among older adults in China are shown to manifest differently according to the measurement of socioeconomic conditions and the specific health outcomes. The findings support and underscore the recent call from health-services researchers and clinic scholars for an outcome-specific and social group–specific approach that considers different mechanisms and greater number of socioeconomic measures (Braveman et al. 2005). Indeed, it should be recognized that socioeconomic conditions involve broad concepts of inequality that encompass multilevel and multidimensional factors. Accordingly, research on the associations between socioeconomic conditions and health based on limited measures should be interpreted with caution and replicated with greater specificity. The findings from this study warrant further investigation to disentangle the relative contributions of childhood, adult, and community socioeconomic conditions to health and morality while considering the pathways underlying these effects for older adults in China.

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Table 1

Sample description, CLHLS 2002–2005

Variables	Health-Outcome Sample	Mortality Sample
Individual-Level Variables		
Number of individuals	8,099	13,802
Number of deaths (2002–2005)	—	5,703
Childhood socioeconomic conditions		
% Born in urban area	14.9	14.3
% Father had a white-collar job	4.0	3.8
% Had both parents alive at age 10	68.2	63.4
% Had access to health care	43.4	42.4
% Went to bed not hungry	34.4	33.8
% Arm length among top 90%	90.7	90.1
Adult socioeconomic conditions		
% Lives in urban area	44.0	43.4
% Had a white-collar job	10.0	8.0
% Good family economic status	17.5	17.1
% Economic independence	32.4	24.8
% Received 1+ years of schooling	42.4	37.7
% Access to health care	90.3	88.5
Social mobility		
% Stable low	7.7	9.7
% Downward	35.8	38.2
% Stable middle	11.9	12.1
% Upward	20.2	19.0
% Stable high	24.4	21.0
Health indicators		
Health status at the 2002 wave		
% Cognitively impaired	25.9	40.8
% ADL disabled	16.5	29.9
% Self-rated bad health	16.3	23.4
Health status at the 2005 wave		
% Cognitive impaired	35.8	—
% ADL disabled	23.1	—
% Self-reported bad health	24.3	—
Sociodemographic variables		
Mean age	81.7	86.3
% Men	45.4	43.1
% Ethnic minorities	6.5	6.2
% Currently married	41.9	31.5
Average number of living children	3.5	3.3
% Close proximity with children	74.9	75.1

Variables	Health-Outcome Sample	Mortality Sample
Health practice and leisure activities		
Average score of social activities index	2.7	2.2
% Religious involvement	20.0	17.0
% Smoked in the past five years	25.2	23.2
% Used alcohol in the past five years	25.8	25.2
% Regular exercise in the past five years	36.9	34.0
Community-Level Variables[a]		
Number of communities	773	844
Average per capita GDP ($, 2002 value)	780.5	780.5
% Per capita GDP $366–$745	45.4	46.6
% Per capita GDP ≥$746	41.4	40.6
Average years of schooling	7.5	7.5
Years of schooling ≥7.5	45.4	46.7
Average hospital bed per 1,000 people	1.8	1.8
Hospital bed per 1,000 people ≥2	30.8	31.8
Average labor force participation rate (%)	75.3	75.2
% Labor force participation rate ≥70%	80.6	79.9
Average proportion of urban population	30.3	30.5
% Proportion of urban population ≥40%	18.9	19.2
Air pollution index	3.5	3.5

[a] All community-level variables are the average among the total communities in the corresponding samples

Table 2

Odds ratios predicting cognitive impairment for individual and community conditions, CLHLS 2002–2005

	Models[a]			
Variables	**1**	**2**	**3**	**4**
Individual-Level Socioeconomic Conditions				
Childhood socioeconomic conditions				
Born in urban area	0.77*	0.82	0.83	0.83
Father had a white-collar job	0.63**	0.72	0.74	0.74
Had both parents alive at age 10	0.90	0.93	0.93	0.94
Had accesses to health care	0.88	0.93	0.92	0.91
Went to bed not hungry	0.87*	0.91	0.91	0.90
Arm length among top 90%	0.77*	0.77*	0.77*	0.78*
Adulthood Socioeconomic Conditions				
Lives in urban areas		1.05	1.06	1.04
Had a white-collar job		0.86	0.86	0.94
Good family economic status		0.95	0.95	1.01
Economic independence		0.88	0.88	0.95
Received 1+ years of schooling		0.67***	0.67***	0.71***
Access to health care		0.83	0.83	0.89
Community Socioeconomic Conditions				
Per capita GDP $366–$745 (<$366)[a]			0.72*	0.72*
Per capita GDP $746 (<$366)[a]			0.71*	0.72*
Years of schooling ≥7.5			0.79*	0.79*
Hospital bed per 1,000 people ≥2			0.82	0.82
Labor force participation rate ≥70%			1.01	1.01
Proportion of urban population ≥40%			0.89	0.88
Individual-level control variables				
Age	1.10***	1.10***	1.10***	1.09***
Men	0.52***	0.65***	0.65***	0 64***
Non-Han minority	1.07	1.07	1.08	1.08
Currently married				0.95
Number of living children				0.97*
Close proximity to children				1.08
Leisure activity index				0.80***
Religious involvement				0.90
Smoked in the past five years				1.02
Used alcohol in the past five years				1.04
Regular exercise in the past five years				1.02
Cognitively impaired in 2002	3.12***	2.96***	2.93***	2.55***
Community-level control variables				

	Models[a]			
Variables	**1**	**2**	**3**	**4**
Air pollution index			1.12 *	1.12 *
−Log-Likelihood	3,998.9	3,978.6	3,965.3	3,919.5
N	8,099	8,099	8,099	8,099
Rho[b]	.238 ***	.239 ***	.223 ***	.229 ***

[a] Age, sex, ethnicity, and an air pollution index were included in all models as control variables

[b] Rho is the proportion of variance attributable to the community level

* $p <$ .05;

** $p <$ .01;

*** $p <$ .001

Table 3

Odds ratios predicting ADL disability for individual and community conditions, CLHLS 2002–2005

	Models[a]			
Variables	**1**	**2**	**3**	**4**
Individual-Level Socioeconomic Conditions				
Childhood socioeconomic conditions				
Born in urban area	1.22	1.14	1.14	1.16
Father had a white-collar job	0.83	0.80	0.80	0.83
Had both parents alive at age 10	0.81**	0.81**	0.81**	0.82**
Had accesses to health care	1.09	1.08	1.07	1.06
Went to bed not hungry	1.06	1.05	1.04	1.05
Arm length among top 90%	0.96	0.95	0.95	0.95
Adult socioeconomic conditions				
Live in urban area		1.20*	1.21*	1.22*
Had a white-collar job		1.06	1.05	1.16
Good family economic status		1.04	1.04	1.10
Economic independence		1.16	1.16	1.27*
Received 1+ years of schooling		1.00	1.00	1.08
Access to health care		1.04	1.04	1.09
Community Socioeconomic Conditions				
Per capita GDP $366–$745 (<$366)[a]			1.00	1.00
Per capita GDP $746 (<$366)[a]			1.42*	1.45*
Years of schooling ≥7.5			1.18	1.18
Hospital bed per 1,000 people ≥2			0.90	0.89
Labor force participation rate ≥70%			0.85	0.85
Proportion of urban population ≥40%			1.04	1.04
Individual-level control variables				
Age	1.10***	1.10***	1.10***	1.09***
Men	0.80**	0.77**	0.77**	0.79**
Non-Han minority	0.97	0.98	0.98	0.97
Currently married				0.94
Number of living children				1.01
Close proximity to children				1.15
Leisure activity index				0.78***
Religious involvement				0.98
Smoked in the past five years				0.95
Alcoholic use in the past five years				1.00
Regular exercise in the past five years				1.08
ADL disabled in 2002	4.49***	4.51***	4.42***	3.55***
Community-level control variables				

	Models[a]			
Variables	**1**	**2**	**3**	**4**
Air pollution index			1.31***	1.31***
−Log-Likelihood	3,434.8	3,430.4	3,398.9	3,358.2
N	8,099	8,099	8,099	8,099
Rho[b]	.233***	.232***	.196***	.202***

[a] Age, sex, ethnicity, and an air pollution index were included in all models as control variables

[b] Rho is the proportion of variance attributable to the community level

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 4

Odds ratios predicting poor self-rated health for individual and community conditions, CLHLS 2002–2005

	Models[a]			
Variables	**1**	**2**	**3**	**4**
Individual-Level Socioeconomic Conditions				
Childhood socioeconomic conditions				
Born in urban area	0.74**	0.77**	0.77**	0.78*
Father had a white-collar job	0.71*	0.74	0.74	0.77
Had both parents alive at age 10	0.95	0.95	0.95	0.97
Had accesses to health care	0.86*	0.88*	0.88*	0.87*
Went to bed not hungry	1.02	1.04	1.04	1.04
Arm length among top 90%	0.89	0.90	0.90	0.92
Adult socioeconomic conditions				
Lives in urban area		1.00	1.00	1.01
Had a white-collar job		0.94	0.94	0.99
Good family economic status		0.95	0.95	1.00
Economic independence		0.91	0.90	0.94
Received 1+ years of schooling		0.92	0.92	0.98
Access to health care		0.73**	0.74**	0.77**
Community Socioeconomic Conditions				
Per capita GDP $366–$745 (<$366)[a]			0.89	0.89
Per capita GDP $746 (<$366)[a]			0.88	0.88
Years of schooling ≥7.5			0.85	0.85
Hospital bed per 1,000 people ≥2			0.98	0.98
Labor force participation rate ≥70%			0.87	0.87
Proportion of urban population ≥40%			1.01	1.00
Individual-level control variables				
Age	1.03***	1.02***	1.02***	1.01***
Men	0.80***	0.86*	0.86*	0.88
Non-Han minority	0.97	0.96	0.97	0.96
Currently married				1.09
Number of living children				0.97*
Close proximity to children				1.03
Leisure activity index				0.84***
Religious involvement				0.90
Smoked in the past five years				0.87
Used alcohol in the past five years				1.05
Regular exercise in the past five years				0.88
Poor self-rated health in 2002	2.74***	2.61***	2.61***	2.35***
Community-level control variables				

	Models[a]			
Variables	**1**	**2**	**3**	**4**
Air pollution index			1.07	1.06
−Log-Likelihood	4,210.9	4,203.1	4,199.2	4,163.7
N	8,099	8,099	8,099	8,099
Rho[b]	.116***	.117***	.113***	.117***

[a] Age, sex, ethnicity, and an air pollution index were included in all models as control variables

[b] Rho is the proportion of variance attributable to the community level

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 5

Relative hazard ratios predicting mortality for individual and community conditions, CLHLS 2002–2005

	Models[a]				
Variables	**1**	**2**	**3**	**4**	**5**
Individual-Level Socioeconomic Conditions					
Childhood socioeconomic conditions					
Born in urban area	1.07	1.11*	1.11**	1.13**	1.13*
Father had a white-collar job	0.97	1.01	1.01	1.04	1.05
Had both parents alive at age 10	0.88***	0.88***	0.88***	0.92**	0.94
Had accesses to health care	0.95	0.96	0.96	0.96	0.96
Went to bed not hungry	0.98	0.99	0.99	1.00	1.01
Arm length among top 90%	0.85**	0.86**	0.86**	0.89*	0.92
Adult socioeconomic conditions					
Lives in urban area		0.99	0.99	0.98	0.98
Had a white-collar job		0.95	0.95	1.04	1.01
Good family economic status		1.00	1.00	1.06	1.10
Economic independence		0.72***	0.72***	0.83***	0.84***
Received 1+ years of schooling		1.02	1.02	1.09	1.09
Access to health care		0.86***	0.86**	0.94	1.00
Community Socioeconomic Conditions					
Per capita GDP $366–$745 (<$366)[a]			1.03	1.03	1.03
Per capita GDP $746 (<$366)[a]			1.04	1.04	1.04
Years of schooling ≥7.5			0.99	0.99	0.99
Hospital bed per 1,000 people ≥2			1.02	1.02	1.02
Labor force participation rate ≥70%			0.87*	0.87*	0.87*
Proportion of urban population ≥40%			0.95	0.96	0.96
Individual-level control variables					
Age	1.07***	1.07***	1.07***	1.04***	1.04***
Men	1.18***	1.25***	1.25***	1.41***	1.41***
Non-Han minority	0.96	0.95	0.95	0.93	0.93

	Models[a]				
Variables	**1**	**2**	**3**	**4**	**5**
Currently married				0.83***	0.83***
Number of living children				0.99	0.99
Close proximity to children				1.03	1.03
Leisure activity index				0.86***	0.86***
Religious involvement				0.85***	0.85***
Smoked in the past five years				1.05	1.05
Used alcohol in the past five years				0.98	0.98
Regular exercise in the past five years				0.90**	0.90**
Cognitively impaired in 2002					1.36***
ADL disabled in 2002					1.48***
Poor self-rated health in 2002					1.29***
Community-level control variables					
Air pollution index			1.01	1.04	1.01
−Log-Likelihood	12,701.4	12,666.5	12,662.7	12,381.9	12,217.6
N	13,802	13,802	13,802	13,802	13,802
Theta[b]	.146***	.152***	.148***	.156***	.156***

[a] Age, sex, ethnicity, and an air pollution index were included in all models as control variables

[b] Theta is the proportion of variance attributable to the community level

* $p < .05$;

** $p < .01$;

*** $p < .001$

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Table 6

Odds ratios or relative hazard ratios predicting health and mortality for social mobility and community conditions, CLHLS 2002–2005

	Odds Ratio						Relative Hazard Ratio		
	Cognitive Impaired		ADL Disabled		Poor Self-rated Health		Mortality		
Variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 3**
Social Mobility									
Stable low	—	—	—	—	—	—	—	—	—
Downward	0.82*	0.82*	0.94	0.94	0.89	0.90	0.87**	0.89*	0.92
Stable middle	0.96	1.00	0.98	1.00	1.01	1.05	0.86**	0.89*	0.94
Upward	0.73*	0.78*	1.18	1.26	0.95	1.00	0.83***	0.89*	0.92
Stable high	0.52***	0.58**	1.26	1.41*	0.73*	0.84	0.72***	0.84**	0.88*
Community Socioeconomic Conditions									
Per capita GDP $366–$745 (<$366)[a]	0.74*	0.74*	0.99	1.00	0.89	0.89	1.03	1.04	1.04
Per capita GDP $746 (<$366)[a]	0.74*	0.74*	1.39*	1.40*	0.88	0.88	1.05	1.05	1.05
Years of schooling ≥7.5	0.80*	0.80*	1.17	1.18	0.86	0.88	1.00	0.99	0.99
Hospital bed per 1,000 people ≥2	0.84	0.83	0.89	0.89	0.99	0.99	1.06	1.03	1.02
Labor force participation rate ≥70%	1.00	0.99	0.87	0.86	0.87	0.87	0.86*	0.87*	0.88*
Proportion of urban population ≥40%	0.91	0.89	1.03	1.02	0.99	0.99	0.97	0.96	0.97
Individual-level control variables									
Age	1.10***	1.09***	1.11***	1.09***	1.03***	1.01***	1.07***	1.06***	1.04***
Men	0.57***	0.58***	0.74***	0.79**	0.82**	0.86*	1.21***	1.36***	1 43***
Non-Han minority	1.05	1.05	0.99	0.99	0.96	0.95	0.95	0.92	0.94
Currently married		0.94		0.96		1.08		0.83***	0.82***
Number of living children		0.96*		0.98		0.96**		0.99	0.99
Close proximity to children		0.99		1.13		1.03		1.03	1.03
Leisure activity index		0.78***		0.79***		0.84***		0.78***	0.87***
Religious involvement		0.98		0.84		0.90		0.85***	0.89*
Smoked in the past five years		0.99		0.99		0.87		1.05	1.05
Used alcohol in the past five years		0.97		1.00		1.06		0.99	1.00

	Odds Ratio						Relative Hazard Ratio		
	Cognitive Impaired		ADL Disabled		Poor Self-rated Health		Mortality		
Variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 3**
Regular exercise in the past five years		1.02		1.06		0.86*		0.91**	0.95
Cognitively impaired in 2002	3.04***	2.60***							1.35***
ADL disabled in 2002			4.48***	3.60***					1.50***
Poor self-rated health in 2002					2.72***	2.42***			1.28***
Community-level control variables									
Air pollution index	1.12*	1.12*	1.30***	1.30***	1.06	1.09	1.02	1.00	1.00
−Log-Likelihood	3,982.6	3,930.4	3,405.8	3,366.0	4,214.0	4,173.5	12,695.0	12,399.8	12,235.8
N	8,099	8,099	8,099	8,099	8,099	8,099	13,802	13,802	13,802
Rho/Theta[a]	.214***	0.222***	0.190***	0.197***	0.113***	0.116***	0.139***	0.152***	0.153***

[a]Rho or theta is the proportion of variance attributable to the community level. Rho is for the three health indicators, while theta is for mortality

*$p < .05$;

**$p < .01$;

***$p < .001$