The Health Implications of Grandparents Caring for Grandchildren in China

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Objectives. Caring for grandchildren is a common and normative experience for many Chinese grandparents. This study investigates the influence of child care provision on older adults' health trajectories in China.

Method. Using data from the China Health and Nutrition Survey (1991, 1993, 1997, 2000, 2004, and 2006), we apply growth curve models to examine the effect of living arrangements and intensity of caregiving for grandchildren on older adults' health trajectories. We use propensity score weighting to take into account potential selection bias.

Results. Grandparents living in skipped-generation households do not suffer from a deficit in self-reported health, particularly when they have higher family income. Those living in three-generation households experience a slightly more rapid health decline than older adults who live independently, although the paternal grandparents in this type of household have a significant health advantage over the maternal grandparents. Among the coresiding grandparents, high intensity care for younger grandchildren accelerates health declines, whereas a lighter level of care has a protective effect. In addition, rural grandparents and grandfathers engaging in high intensity care have worse self-reported health on average.

Discussion. Our findings suggest that grandchild care does not have a universally beneficial or detrimental effect on health, but rather its effect depends on the form and level of caregiving and is further shaped by individual characteristics, as well as normative and structural contexts.

Key Words: Grandparenting—Living arrangements—Health.

INCREASED life expectancy and substantially reduced child mortality in most countries around the world mean that more and more people live to be grandparents and experience an extended period of grandparenthood. Grandparents often provide care and assistance to their grandchildren, with the levels of care provision ranging from uninvolved, to occasional babysitting, to full-time custodial care (Hirshorn, 1998; Landry-Meyer, 1999). Living arrangements also vary from not living together, to coresidence (where parents, grandchildren, and grandparents share the same residence), to "skipped-generation" households (where parents are not present) (Pebley & Rudkin, 1999). How can such varied levels of care for grandchildren influence the well-being of grandparents? Do the benefits of grandparenting (e.g., emotional reward and social support) outweigh the negative effects (e.g., psychological, physical, and financial strain) or vice versa? These questions have become more important than ever in the 21st century, as grandparents are becoming more central to family life in many countries. For example, in the United States, grandparents are fulfilling more family functions as a response to marital instability and broader demographic shifts (Bengtson, 2001; Uhlenberg, 2009; also see review by Swartz, 2009). In China, grandparents caring for grandchildren are common for many families, reflected by a high level of coresidence between grandparents and grandchildren as well as extensive sharing of child care

responsibilities in urban and rural areas (Chen, Liu, & Mair, forthcoming). Although the active involvement by grandparents undoubtedly brings numerous benefits to adult children and grandchildren alike, its implications for the well-being of the grandparents are far less clear.

The purpose of the study is thus to examine the health consequences of grandparents caring for grandchildren in China, where intergenerational ties are traditionally strong. We maintain that it is essential to understand the phenomenon in the unique historical, cultural, and socioeconomic context of China. Although caring for grandchildren can be physically and psychologically demanding for aging grandparents, at the same time, it can be a manifestation of family cohesion enjoyed by the older adults and therefore provide health benefits. We argue that the health implications of caregiving naturally depend on the structure and intensity of care and that the normative and cultural contexts also play an indispensable role. For example, in light of the persistence of patrilineal and patriarchal tradition in China, could paternal and maternal grandparents be affected differently while performing the same tasks? Does the gendered nature of care affect grandfathers and grandmothers in distinctive ways? Given the conspicuous urban/rural divide in Chinese society, could rural grandparents face additional challenges because of their vulnerable situations to begin with? These questions are vital to understanding the role of

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grandparenthood in family systems as well as the health implications of grandchild care in contemporary China.

ROLE STRAIN OR ROLE ENHANCEMENT: THE ROLE OF GRANDPARENTS IN THE CONTEXT OF CHINA

Despite the widespread nature of grandparents' care for grandchildren in China, documentation of grandparenting or its health implications has been limited (see review by Silverstein, Cong, & Li, 2007). Thus, we begin this section by first reviewing the theoretical perspectives and empirical literature in the United States and then turn to a discussion of the role of grandparenthood in the context of China.

Theoretically, both positive and negative health effects of grandparents caring for grandchildren are plausible. Role strain theory posits that individuals occupy multiple social roles and therefore face an array of demanding or competing role obligations (Goode, 1960). Consequently, role strain arises or increases when an individual faces multiple roles and has to juggle between intense and conflicting role demands. According to the stress process model, when such role overload or role strain exceeds an individual's physical and psychological capacity, then it could be the source of a "chronic stressor" that is harmful to health (Pearlin, 1989). For some older adults, the "grandparent" role may include occasional babysitting with limited responsibilities and thus may not render any negative effects. For grandparents who coreside with grandchildren or provide full-time care of grandchildren, the expectations and responsibilities associated with that role could be considerably higher and could interfere with their work, self-care, or relationship with spouse or others. Consequently, the elevated level of time pressure, physical demand, and stress could be detrimental to health.

Role enhancement theory argues that an accumulation of multiple roles can lead to improved well-being, as individuals gain social integration and gratification from their various social roles (Moen, Robison, & Dempster-McClain, 1995). The demand of the multiple roles could be linked to increased level of social support and can offset the risk of role strain (Szinovacz & Davey, 2006). For grandparents who help to take care of grandchildren, they could benefit from the emotional reward and may even lead a healthier lifestyle (e.g., quit smoking or drinking). The heightened level of exchange between the grandparents and their children and grandchildren could also mean a strengthened social network. In the stress process model, social support inevitably acts as a moderator and buffer to stress outcomes (Pearlin, 1989).

Empirical research on the consequences of grandparents' caregiving on the well-being of grandparents in the United States has been inconclusive, with some studies reporting deteriorating health conditions and elevated depressive symptoms (Blustein, Chan, & Guanais, 2004; Leder, Grinstead, & Torres, 2007; M. K. Minkler, Fuller-Thomson, Miller, & Driver, 2000); and others reporting positive effects including higher levels of life satisfaction (Forsyth, 1994; Forsyth, Roberts, & Robin, 1992; Goodman & Silverstein, 2001; Kivnick, 1981; Peterson, 1999); or no dramatic and widespread negative effects (Bachman & Chase-Lansdale, 2005; Hughes, Waite, LaPierre, & Luo, 2007; Szinovacz & Davey, 2006; Szinovacz, DeViney, & Atkinson, 1999). In the United States, grandparents often do not "choose" to take care of their grandchildren full time but step in under troubled circumstances (Cherlin & Furstenberg, 1986; Hayslip, Shore, Henderson, & Lambert, 1998; Jendrek, 1994). "Off-time" parenting responsibility can create a great deal of stress or psychological anxiety, in addition to the added financial burden and lack of time to attend to their own needs (Bachman & Chase-Lansdale, 2005; Bowers & Myers, 1999; Burton & deVries, 1992; Kelley, 1993; Sands & Goldberg-Glen, 2000). Further, because full-time care by grandparents is often preceded by some traumatic event, for example, drug abuse or divorce, the stress from that event makes the adjustments to the parenting role even more difficult (M. E. Minkler, Roe, & Price, 1992). As a result, the burden and stress often lead to deteriorating health conditions, in support of the role strain theory (Burton, 1992; M. E. Minkler & Roe, 1993; Solomon & Marx, 2000).

At the same time, it is noteworthy that some studies support role enhancement theory and report positive consequences on the well-being of many grandparents. The grandparent and grandchild relationship constitutes an important element of the social support network of the elderly. The role of grandparenthood is an indication of social bonds, which act as a buffer against the negative social and psychological consequences of aging. The linkage between the social relationships of older adults and health has been well documented (Berkman & Glass, 2000; Rogers, 1996; Ross, Mirowsky, & Goldsteen, 1990; Seeman, 1996). Low levels of social support translate into higher mortality rates, whereas close social relationships can extend human life. Frequent contact with grandchildren has been found to be associated with high levels of life satisfaction (Forsyth, 1994; Forsyth et al., 1992; Goodman & Silverstein, 2001; Kivnick, 1981; Peterson, 1999). Even those who experienced negative outcomes also reported feelings of satisfaction, accomplishment, and pride from the nurturing role (Goodman & Silverstein, 2001; M. E. Minkler & Roe, 1993; Rozario, Morrow-Howell, & Hinterlong, 2004).

Both role strain and role enhancement theories and their empirical tests in the United States provide us helpful guidance in understanding the health implications of grandparental caregiving for older adults in China. However, any test of theoretical hypotheses would not be adequate without a proper comprehension of the role of grandparenthood in the specific cultural context and family systems of norms and exchange in China. Scholars on grandparenthood

research often note the "normative ambiguity" of the role of grandparent. Unlike parenthood, the duties, rights, and types of involvement of grandparents are often vaguely specified, and there is tremendous cross-cultural variation. For example, in the United States, the majority of grandparents do not provide routine care for grandchildren, conforming to a norm of noninterference in intergenerational relationships (Cherlin & Furstenburg, 1986). In contrast, in China, it is common for grandparents to live with children and grandchildren and to provide care for their grandchildren on a regular basis (Chen, Short, & Entwisle, 2000; Hermalin, Roan, & Perez, 1998; Olson, 1990; Unger, 1993). It reflects a strong cultural continuity, with Confucianism prescribing a strong parent–child relationship throughout the lifetime. It can also be simultaneously perceived as a strategic adaptation to family circumstances. By providing child care for grandchildren, mothers are often alleviated from the burden and can devote more time to economic opportunities, which in turn benefit the entire extended family (Chen et al., forthcoming).

Further, although some grandparents may perform child care duties altruistically, others may do so as an exchange to ensure old age support. Croll (2006) refers to such a type of intergenerational exchange as a renegotiated and reinterpreted "intergenerational contract." In rural China, parents can be particularly dependent on their children for financial security in old age. The difference between the population living in the urban and rural sector is a well-known feature of Chinese society. As a result of a strictly enforced household registration system, urban residents are more likely to have a higher living standard, to receive retirement income, and to have better access to health insurance programs and health care facilities than rural residents (F. Wang & Mason, 2007; Zimmer & Kwong, 2003). In addition, with an estimated 144.4 million temporary migrants (the so-called "floating population") from rural to urban China (National Bureau of Statistics in China, 2002), many parents choose to leave the children behind under their grandparents' care in order to seek better job opportunities. Although it could be potentially burdensome for grandparents, remittances from their adult children often help to compensate for the effort and to strengthen the intergenerational bond (Cong & Silverstein, 2008).

RESEARCH HYPOTHESES AND DESIGN

Whether caring for grandchildren elevates the risk of role strain or enhances one's social support network, any test of the role strain or role enhancement theory needs to begin with the premise that grandparenthood is a kinship status that is embedded in the family system. Therefore, we hypothesize that the health consequence of grandparental caregiving depends on how the role of grandparenthood is enacted and is simultaneously shaped by the norm and structure of the kinship system in China.

First, we begin with an examination of the family structure, or coresidence with grandchildren, with further differentiation between those who live in three-generation households and those in skipped-generation households. Coresidence is a key measure of the structural dimension of intergenerational solidarity, reflecting the opportunity structure that facilitates interactions between grandparents and grandchildren (Silverstein, Giarrusso, & Bengtson, 1998). Extended family is the culturally preferred family form, and the majority of older adults (age 65+) coreside with their children in China (Zeng & Wang, 2003). On the one hand, those who live with grandchildren and assume a major caregiving responsibility (particularly those without the help of adult children) may experience increased levels of stress and physical challenges and are consequently disadvantaged in health. On the other hand, in a context where living with adult children is the traditional family pattern, coresidence may reflect a source of social support and thus be beneficial to health. Given the strong cultural imperative to live with the sons, we further explore whether a patrilineal family structure holds any advantage compared with other types of living arrangement. A recent study in China found that older adults living in three-generation households or with grandchildren in skipped-generation households have better psychological well-being than those in single-generation households (Silverstein, Cong, & Li, 2006). The study suggests that the remittance coming from the migrant children may help to improve family financial well-being and ultimately benefit grandparents' health. Thus, we test whether the effect of family structure could be moderated by economic resources.

Next, we extend beyond previous research and examine the health effects of caregiving intensity of coresiding grandparents, particularly those who care for younger grandchildren (aged 0–6) and are engaged in most physically demanding child care tasks. It is often assumed that those who live with grandchildren share caregiving responsibility, but the extent of the care they provide could range widely from one person to another. Most research on grandparenting in the United States focuses on custodial grandparenting, and yet, evidence suggests that custodial and noncustodial grandparents differ greatly in health outcomes (Emick & Hayslip, 1999; Fuller-Thompson & Minkler, 2001; Kelley, 1993; Solomon & Marx, 2000). Instead of treating role enhancement and role strain theory as competing hypotheses, we consider them complementary to each other. We hypothesize that the effect of grandparental caregiving depends by the level of care involvement. When care load is light, the benefit of grandparenthood (e.g., emotional rewards and social support) outweighs its negative effects (e.g., stress and competing demands). Conversely, a heavy or intense load of caregiving can take a toll on their health.

Furthermore, we hypothesize that the effect of caregiving intensity could be further conditioned by the normative and cultural contexts. For example, it is much more common for

grandmothers to assume child care duties than grandfathers. Given the gendered nature of child care, heavy child care involvement may be more likely to increase role strain for grandfathers than grandmothers, and therefore could translate into a deeper health deficit for grandfathers, who are not culturally expected to fulfill such roles. Another important contextual factor to consider is the urban and rural divide. As mentioned earlier, rural elders are much more likely to face financial challenges and are much more likely to depend on their children for assistance and care for old age. The lack of alternative child care facilities and other community-based support programs could add the burden to rural grandparents who are socioeconomically disadvantaged to begin with.

Finally, we use a longitudinal design and examine the influence of grandparenting on health trajectories over a 15-year time span. One of the major limitations of prior studies on the effect of caregiving on grandparents' health is the use of cross-sectional health indicators (Fuller-Thomson, Minkler, & Driver, 1997; Goodman & Silverstein, 2002; Pruchno & McKenney, 2002; Sands & Goldberg-Glen, 2000; Szinovacz & Davey, 2006) or health change between two time points at best (Bachman & Chase-Lansdale, 2005; Blustein et al., 2004; Hughes et al., 2007; Szinovacz et al., 1999). Nonetheless, health change usually does not take place suddenly but is likely a gradual, interactive, and cumulative process. Our paper is the first to examine the influence of grandparents' caregiving from a life course perspective by focusing on health trajectories rather than health status. For example, the amount of caregiving that grandparents provide may vary from time to time, depending on the needs of their children. Grandparents' own life circumstances may change, including transitions in employment and marital status. The synchronization of transitions in multiple roles and the timing of caregiving experience could have strong influences on grandparents' health.

Finally, U.S. studies on grandparents' caregiving are mostly concerned with the process of negative selection, that is, grandparents who are primary child caretakers could be socioeconomically disadvantaged or the caregiving could be preceded by traumatic events. Therefore, some of the negative effects could be due to these prior characteristics. Indeed, a recent comprehensive study using a longitudinal and nationally representative data set in the United States (the Health and Retirement Study) finds that caring for grandchildren has no dramatic and widespread negative effects on a range of health and health behavior indicators when controlling for grandparents' characteristic and prior health rather than the consequences of caregiving (Hughes et al., 2007). The context of China is different in that grandparents' caregiving is normative and common. Thus, the process of negative selection is much less of a concern. However, the potential of positive selection cannot be ruled out, in that they could be healthier to begin with. In addition, coresidence

with children and grandchildren does not happen at random. Thus, in the analysis, we use propensity score weighting method to control for such selectivity. Compared with a cross-sectional data design, a longitudinal design is much more effective in sorting out the causal relationship and selection.

Data and Sample

We use data from the China Health and Nutrition Survey (CHNS), an ongoing collaborative project of the Carolina Population Center at the University of North Carolina, the Institute of Nutrition and Food Hygiene, and the Chinese Academy of Preventive Medicine (now renamed as the Center for Disease Control) in Beijing. The survey covers nine provinces and autonomous regions in China, Liaoning, Heilongjian, Shandong, Jiangsu, Henan, Hubei, Hunan, Guangxi, and Guizhou, which vary substantially in their level of economic development and geographically extend from the coastal to the inland provinces and from the northeast to the southern mountainous region. The CHNS uses a stratified multistage cluster design. A detailed description of the design can be found at the following website: www.cpc.unc.edu/projects/china. Although the CHNS data are not a representative sample of China, previous studies using the CHNS data have suggested that the characteristics of the households and individuals well reflected the national averages (e.g., see Du, Lu, Zhai, & Popkin, 2002; Entwisle & Chen, 2002; Short, Ma, & Yu, 2000).

We use six waves of CHNS data (1991, 1993, 1997, 2000, 2004, and 2006) and select a sample of older adults aged 55 and above across all waves. Our working sample consists of 1,990 individuals in 1991, 1,966 in 1993, 2,193 in 1997, 2,253 in 2000, 3,109 in 2004, and 3,443 in 2006. Among them, 753 individuals died by the end of 2006. The overall working sample also excludes missing values (less than 6%) on any variable included in the analysis. The loss to follow-up rate ranges from 8 to 14% from one wave of the survey to next. All together, this yields 14,954 person–year records. Because individuals remaining in the sample are likely to be healthier, we will address this potential selection bias in the method section.

Key Variables

Self-reported health is the dependent/outcome variable for the analyses described subsequently. The following question has been asked of each household member regarding their health in all waves of the CHNS data: "How would you describe your health compared to that of other people your age?" The responses range from 1 to 4, indicating *excellent* to *poor* health. Those who answered "refuse to answer" and "do not know" were coded as missing and dropped from our analysis. We have reverse-coded self-rated health so that higher values indicate better health. We use this measure of self-reported health (SRH) as our main

Table 1. Descriptive Statistics of All Variables, CHNS Pooled Sample, 1991–2006 ($N = 14,954$)

Variable	Mean	SD
Self-rated health (range 1–4)	2.40	0.77
Age	65.17	7.73
Living arrangement		
Skipped generation	0.07	0.26
Three generation (ref. category: noncoresiding)	0.44	0.50
Paternal (paternal = 1, else = 0)	0.40	0.41
Caregiving intensity (Grandparents coresiding with grandchildren aged 0–6, $N = 7,712$)		
High intensity (more than 15 hr per week)	0.04	0.21
Low intensity (less than 15 hr per week; ref. category: no-care)	0.04	0.21
Sex (male = 1, female = 0)	0.47	0.50
Died (dead = 1, not dead = 0)	0.12	0.32
Marital status (married = 1, not married = 0)	0.76	0.43
Urban (urban = 1, rural = 0)	0.39	0.49
Education (more than primary school = 1, else = 0)	0.49	0.50
Family Income (lowest quintile = 0, else = 1)	0.80	0.40
Working (working = 1, else = 0)	0.37	0.48
Medically Insured (yes = 1, else = 0)	0.36	0.48
Number of children in the household (age 0–16)	0.56	0.81
One parent present (both parents present = 0)	0.03	0.17
Smoking (smoking = 1, not smoking = 0)	0.31	0.46
Drinking (drinking = 1, not drinking = 0)	0.28	0.45

dependent variable, as it has been consistently documented to be a valid measure of health and a robust predictor of mortality and survival (Farmer & Ferraro, 1997; Hays, Schoenfeld, & Blazer, 1996; Idler & Angel, 1990; Idler & Benyamini, 1997; Johnson & Wolinsky, 1993). A previous study using the SRH measure from the CHNS also demonstrated that it well captures the health trajectory of individuals over the life course (Chen, Yang, & Liu, 2010).

We use two key independent variables to measure older adults' involvement with grandchildren. They are both time varying, measured in each wave of the study. We begin with a three-category measure of living arrangement (see Table 1 for the distribution of the variable, based on the pooled sample 1991–2006). We distinguish those who coreside from those who do not coreside with grandchildren (51% vs. 49%). Among the 51% coresidential grandparents, 40% are paternal grandparents (vs. 11% maternal), reflecting a lingering patrilineal tradition in China. Further, we differentiate those who live with grandchildren in the absence of adult children (skipped-generation, 7%) from those whose children are present (three-generation, 44%). Our second part of the analysis is based on the sample with coresiding grandchildren, which consists of 51% of the overall pooled sample. Because child care activities are more intense for younger children, the CHNS only asks child care questions in households with the presence of children aged 0–6. About 19% of older adults live with grandchildren aged 0–6.

Next, we characterize the child care load of those grandparents who coreside with younger grandchildren. The CHNS asks all household members over the age of six whether they spend any time feeding, bathing, dressing,

holding, or watching children aged six or younger who live in the household, and if so, how many hours of child care they provided in the last week. In preliminary analyses, we experimented with different specifications of this variable and chose to use a categorical variable in the final analysis for its simplicity of presentation. We operationalize caregiving load as "high intensity" (i.e., 15 or more caregiving hours per week), "low intensity" (i.e., 1–14 caregiving hours per week), and "no-care" (reference group).

METHOD

We employ growth curve specifications of hierarchical linear models to simultaneously estimate intraindividual as well as interindividual health trajectories, with particular attention paid to the effects of grandparents' caregiving. Given that self-reported health is an ordinal variable, we estimated Generalized Linear Mixed Models (GLMM) with ordinal logit link using SAS PROC GLIMMIX in our preliminary analysis but did not present these results because the fixed and random effect coefficients and variance estimates are qualitatively similar from these two sets of analyses.

The panel data have two levels, with repeated measurements of individuals at Level 1 being nested across individuals at Level 2. We begin with a linear change trajectory model of self-reported health of individual i at time t (SRH_{ti}), as a function of age (Age_{ti}). We then add a quadratic term due to its better empirical fit and a theoretical expectation of a nonlinear pattern of health decline. We further add our key independent variables—measures of grandparenting. Grandparenting is measured in two ways sequentially. We first model the effect of living arrangements (noncoresidence, coresidence with grandchildren in skipped-generation households, three-generation households, and whether the coresiding grandparent is paternal or maternal). In the second step of the analysis, we narrow the analytical sample to grandparents who coreside with grandchildren aged 0–6 and focus on the effect of child care intensity (e.g., high, low, and no caregiving) on health trajectories. Because we hypothesize that the effect of grandparenting on health is age dependent, we also add the interaction terms between age and the grandparenting measures at Level 1. We did not include the interaction term between age-squared and grandparenting variables because they were not significant. Equation 1 shows the basic parameterization of the Level 1 model:

$$\mathrm{SRH}_{ti} = \beta_{0i} + \beta_{1i}\mathrm{Age}_{ti} + \beta_{2i}\mathrm{Age}_{ti}^2 + \beta_{3i}\,\mathrm{Grandparenting}_{ti} + \beta_{4i}\,\mathrm{Age}_{ti} \times \mathrm{Grandparenting}_{ti} + e_{ti} \quad (1)$$

We then posit a Level 2 submodel for interindividual difference in change, where the coefficients βs in the Level 1 model are further modeled as dependent variables. Although technically it is possible to model all of the βs, we choose our models based on our theoretical hypotheses. We begin

with two "unconditional" models of the intercept model β_{0i} and linear rate of change β_{1i} at Level 2:

$$\beta_{0i} = \gamma_{00} + u_{0i} \tag{2}$$

$$\beta_{1i} = \gamma_{10} + u_{1i} \tag{3}$$

We modeled the quadratic rate of β_{2i} but did not present it due to insignificant results. In other words, the quadratic age term is included in the model, but it is not interacted with independent variables. Combining the Level 1 and Level-2 models together, the composite model is presented in Equation 4:

$$
\begin{aligned}
SRH_{ti} = {} & \gamma_{00} + \gamma_{10}Age_{ti} + \beta_{2i}Age_{ti}^2 \\
& + \beta_{3i}Grandparenting_{ti} \\
& + \beta_{4i}Age_{ti} \times Grandparenting_{ti} \\
& + \left(e_{ti} + u_{0i} + u_{1i}Age_{ti}\right)
\end{aligned}
\tag{4}
$$

The composite residual combines the original Level 1 and Level 2 error terms, with e_{ti} assumed to be independently and normally distributed with a mean of 0 and a constant variance of σ^2, and with both u_{0i} and u_{2i} assumed to have multivariate normal distribution. We center age so that the interpretation for the intercept is meaningful (i.e., the predicted value of health status at the mean age of 65 rather than age 0). Other predictor variables are entered at Level 1 for time-varying covariates (marital status, socioeconomic status [SES], access to health care, and health behavior) and at Level 2 for time-constant covariates (sex and urban/rural residence). We measure SES by education (primary school education or less = 0), income (the lowest quintile of the income distribution = 0), and working status (not working = 0). Access to health care is defined as whether one has insurance or not (not insured = 0). We also adjust for health behaviors including smoking (smoking = 1) and drinking (drinking = 1) in our analytical models. We also add the presence of single parent and the number of children aged 0–16 to capture the household characteristics of coresiding grandparents in the second step of analysis. Finally, we address potential bias introduced by attrition and death by using a simple but effective strategy, namely, by entering dummy variables indicating the deceased and nonrespondent identities (later dropped due to nonsignificant selectivity; Raudenbush & Bryk, 2002). Table 1 shows the summary statistics of all variables used in the analyses for all waves combined.

In addition, to capture the unique cultural and normative aspects of grandparenting in China, we test a number of interaction terms by examining how the effects of living arrangement and caregiving intensity on health may vary by family income, urban/rural residence, and gender. We tested the interactions between these variables and grandparenting (two-way interaction) as well as between them and Grandparenting $\times$ Age (three-way interaction). Because all the three-way interaction terms were not significant, they were dropped from the analyses. A detailed description of these tests is presented in the *results* section.

In addition to the foregoing growth curve analyses, we assess the possibility and implications of nonrandom selection in the data by using propensity score weighting (Guo & Fraser, 2010). Coresidence with grandchildren and intensive child care provision are most likely to be selective in nature (as compared with occasional babysitting). Therefore, the estimates for the effects of living arrangements and caregiving status could be biased if selectivity is not taken into account. We first estimate logistic regressions to estimate the conditional probability of coresidence with grandchildren (for the first part of the analysis) and then providing care versus not (for the second part of the analysis), using covariates measuring household structure and composition, demographic characteristics, and SES measures, as well as measures capturing the potential needs for child care by adult children (e.g., having a day care or not in the community and whether the household has experienced the birth of a child in the last survey interval). The last two measures are particularly important because we consider them important predictors of whether grandparents are engaged in child care or not, while at the same time, the measures should not have direct effects on grandparents' health. We then calculate a weight measure based on the predicted probabilities generated from the models (the propensity scores) using the following formula (Hirano & Imbens, 2002):

$$w(t, x) = \frac{t}{\hat{e}(x)} + \frac{1-t}{1-\hat{e}(x)}$$

where $\hat{e}(x)$ represents the estimated propensity scores and t stands for treatment (coresidence or providing care or not). The propensity score weight is then included in the growth curve models as sampling weights. Comparison of models using the weight versus not shows that the magnitude of the grandparenting variables (e.g., high intensity of care) is slightly larger than those without the adjustment, suggesting potential positive selection effects (i.e., healthier grandparents may be more likely to care for grandchildren) were captured by using propensity score weighting (results available upon request).

Results

Do living arrangements with grandchildren affect the health trajectories of older adults? Results presented in Table 2 address this question. We begin with a reduced model that is depicted in Equation 4 (Model 1). The control variables on sociodemographic and socioeconomic characteristics and health behaviors are then added one group after the other (Models 2 and 3). The results across the models consistently show that both coresidence and family lineage matter, although the effects are different for the intercept and linear growth rate model. We caution that these two sets of variables have to be interpreted together because

Table 2. Growth Curve Models of Living Arrangement Effects on Health in China (*N* = 14,954)

	Model 1	Model 2	Model 3	Model 4
	Coef. (*SE*)	Coef. (*SE*)	Coef. (*SE*)	Coef. (*SE*)
Fixed effects				
Intercept	2.41*** (0.01)	2.23*** (0.03)	2.21*** (0.03)	2.23*** (0.03)
Age	−0.23*** (0.02)	−0.22*** (0.02)	−0.20*** (0.02)	−0.20*** (0.02)
Age square	−0.03 (0.02)	−0.02 (0.02)	−0.02 (0.02)	−0.02 (0.02)
Skipped generation	−0.03 (0.03)	−0.03 (0.03)	−0.03 (0.03)	−0.14** (0.05)
Three generation (ref. category: noncoresiding)	−0.03 (0.02)	−0.02 (0.02)	−0.02 (0.02)	−0.02 (0.03)
Paternal	0.03 (0.02)	0.07** (0.02)	0.07** (0.02)	0.07** (0.02)
Age × Skipped Generation	0.04 (0.05)	0.04 (0.05)	0.04 (0.05)	0.04 (0.05)
Age × Three Generation (ref. category: noncoresiding)	−0.16*** (0.04)	−0.15*** (0.04)	−0.15*** (0.04)	−0.15*** (0.04)
Age × Paternal	0.11* (0.04)	0.09* (0.04)	0.09* (0.04)	0.09* (0.04)
Sex (female = 0)	0.09*** (0.02)	0.01 (0.02)	0.01 (0.02)	
Died	−0.23*** (0.02)	−0.22*** (0.02)	−0.22*** (0.02)	
Married	−0.02 (0.02)	−0.02 (0.02)	−0.02 (0.02)	
Urban	0.06*** (0.02)	0.06*** (0.02)	0.06*** (0.02)	
Education (primary or less = 0)	0.09*** (0.02)	0.09*** (0.02)	0.09*** (0.02)	
Income (lowest 20% = 0)	0.08*** (0.02)	0.08*** (0.02)	0.07** (0.02)	
Working (not working = 0)	0.14*** (0.02)	0.13*** (0.02)	0.13*** (0.02)	
Medically insured (not insured = 0)	0.01 (0.02)	0.02 (0.02)	0.02 (0.02)	
Drinking	0.12*** (0.02)	0.12*** (0.02)		
Smoking	0.05** (0.02)	0.05** (0.02)		
Skipped Generation × Income	0.14** (0.06)			
Three Generation × Income	0.00 (0.03)			
Random effects–variance components				
Level 1: within-person	0.15***	0.14***	0.13***	0.13***
Level 2: in intercept	0.02*	0.02*	0.01	0.01
Level 2: in linear growth rate	0.21***	0.20***	0.20***	0.20***
Goodness-of-fit				
BIC (smaller is better)	34,501.60	34,241.70	34,177.00	34,178.70
−2 Log likelihood	34,467.00	34,207.10	34,142.50	34,144.10

Notes. *p < .05; **p < .01; ***p < .001 (two-tailed test); BIC = Bayesian Information Criterion.

for a grandparent to be identified as "paternal," he or she has to coreside with the grandchildren, either in a skipped-generation or three-generation household. To illustrate the effects of these variables more effectively, we present the predicted health trajectories of older adults by living arrangements in Figure 1, based upon the estimates from Model 3 in Table 2, with all the other control variables set to

their sample means (for continuous variables) or modes (for categorical variables). First, grandparents who live in skipped-generation households (either maternal or paternal) do not seem to suffer from a health disadvantage compared with those who do not live with grandchildren. Second, compared with older adults who do not live with their grandchildren, grandparents living in three-generation house-
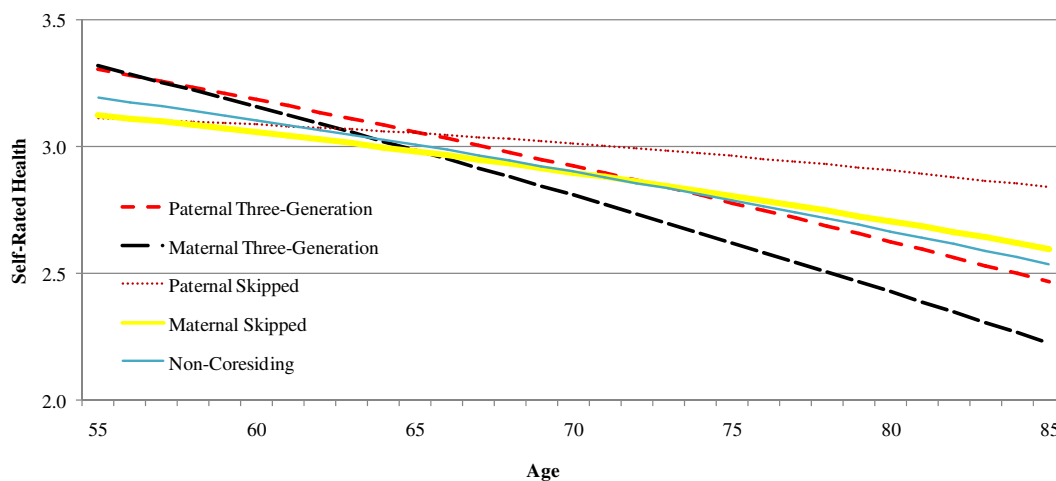

Figure 1. Predicted age trajectories of self-rated health by living arrangement among older adults in China.

holds experience a steeper decline in health with age, despite their initial health advantage. However, for the paternal grandparents who coreside with their son and grandson, they have a better mean level of health and slower rate of health decline than maternal grandparents in three-generation households, suggesting a protective effect that is associated with the culturally preferred type of living arrangement. Overall, among the five groups of older adults, maternal grandparents living in three-generation households experience the steepest health decline and paternal grandparents in skipped-generation settings have the slowest rate of health decline.

Thus, the hypothesis that grandparents in skipped-generation household could be burdened with heavy child care demands without the support of parents and their health may be compromised is not supported in our analysis. As Silverstein and colleagues (2006) suggested, this type of living arrangement is quite different from the U.S. setting. Instead of being "associated with a breakdown in parenting by middle generation" (S263), it could reflect "optimal family functioning," where grandparents fill the parental role while migrant children are away. In exchange, remittances sent back to the grandparents by the adult children could help improve overall family well-being and strengthen the intergenerational tie. Could the parents in skipped-generation households benefit from the improved economic well-being of the household? We find some evidence by testing for an added interaction term between living arrangements and family income (see Model 4). The positive interaction effect between skipped-generation household and high income (0.14) results suggest that additional economic resources do provide a buffer effect for those grandparents living with grandchildren without the presence of adult children.

As indicated earlier in the paper, coresidence with grandchildren cannot be simply equated with care for grandchildren. Grandparents who live with their children and grandchildren are a heterogeneous group, including not only those who are caregivers but also those who may need care themselves. Nonetheless, living with grandchildren certainly means a higher possibility of getting involved with child care. Thus, we restrict the next part of the analysis to those who are living with grandchildren at each survey year and examine the effect of caregiving intensity. The analytical results shown in Table 3 suggest that care intensity affects grandparents' health trajectories, however, as hypothesized, the effect is not linear and differs in its effect on the mean level and the rate of health decline (see Model 1 in Table 3 and predicted health trajectories in Figure 2): those who are heavily involved with child care are more likely to have a lower mean level of health than those who do not care for grandchildren. At the same time, those who are involved with a light load of child care have a less accelerated path of health decline. This supports our hypothesis that the lighter care involvement may indeed provide a beneficial effect on health, whereas intense grandchild care may be physically and psychologically draining. The finding is consistent with

an earlier U.S. study in which light babysitting was found to be beneficial to health (Hughes et al., 2007).

Finally, Model 2 and in Table 3 added the interaction between gender, urban/rural residence, and caregiving intensity, respectively. They clearly support our hypothesis that the effect of grandparents' caregiving is not only conditioned by the level of intensity but also shaped by the characteristics of the caregiver and the context of caregiving. Heavy involvement in child care does not have a universally adverse effect on health; instead, caregiving has varied effects by gender and urban/rural residence. This is consistent with a longitudinal study in the United States that found "the effect of grandchild care on grandparents' health are contingent on the context and circumstance of that care" (Hughes et al., 2007, S115). First, grandfathers who are involved in intensive child care have worse health on average than the grandmothers who are engaged in the same level of care (see Figure 3). Grandfathers' child care involvement in China is very limited. An earlier study by the research team suggests that grandfathers' involvement was much lower than that of the grandmothers and that their heavy involvement is often preceded by the unavailability of grandmothers (Chen et al., forthcoming). For example, grandfathers only spend 7 hr per week in caring for grandchildren compared with 21 hr per week for grandmothers. Thus, their worsened health condition could be due to a combination of the lack of support from grandmothers, the stress associated with widowhood, and perhaps equally important traditional gender role expectations. In Chinese culture (as in many other cultures), child care provision is viewed as a feminine role. For those grandfathers who are engaged in heavy child care duties, the lack of normative support or even associated "stigma" may add to the stress and in turn lead to a worsened health condition. This finding is consistent with a recent U.S. study that found that the adverse health effect of having a grandchild in the home is more pronounced for men than women (Blustein et al., 2004).

Interestingly, the level of child care intensity also has different health implications for urban and rural grandparents. The negative effect that is associated with intensive care (0.09) is wiped out for urban grandparents when adding the interaction term (−0.11) in the intercept model (Model 3 in Table 3). As Figure 4 shows, urban grandparents who are providing intensive care do not suffer from a clear health disadvantage, whereas it is obvious that rural grandparents engaged in high intensity care have worse health compared with all other groups of grandparents. Although we control for SES and health insurance in the model, the measures we have do not entirely capture the wide extent of differences in living standards, support systems and access to health care for rural and urban older adults. Given the substantial differences in social systems for these two segments of the population, it is expected that the rural grandparents' disadvantage was further magnified with added stress associated with intense caregiving.

Table 3. Growth Curve Models of Caregiving Intensity Effects on Health in China, Coresiding Grandparents (*N* = 7,712)

	Model 1	Model 2	Model 3
	Coef. (*SE*)	Coef. (*SE*)	Coef. (*SE*)
Fixed effects			
Intercept	2.22*** (0.04)	2.21*** (0.04)	2.23*** (0.04)
Age	−0.30*** (0.02)	−0.30*** (0.02)	−0.30*** (0.02)
Age square	−0.07 (0.03)	−0.07 (0.03)	−0.06 (0.03)
High intensity	−0.05* (0.03)	0.02 (0.03)	−0.09** (0.03)
Low intensity (Ref. category: no-care)	−0.01 (0.03)	−0.01 (0.04)	−0.04 (0.03)
Age × High Intensity	−0.07 (0.06)	−0.06 (0.06)	−0.06 (0.06)
Age × Low Intensity (Ref. category: no-care)	0.16** (0.06)	0.16** (0.06)	0.16** (0.06)
Sex (female = 0)	0.00 (0.03)	0.03 (0.03)	0.00 (0.03)
Died	−0.18*** (0.03)	−0.18*** (0.03)	−0.18*** (0.03)
Married	0.00 (0.03)	0.00 (0.03)	0.00 (0.03)
Urban	0.10*** (0.03)	0.10*** (0.03)	0.07** (0.03)
Education (primary or less = 0)	0.12*** (0.03)	0.12*** (0.03)	0.12*** (0.03)
Income (lowest 20% = 0)	0.00 (0.02)	0.01 (0.02)	0.01 (0.02)
Working (not working = 0)	0.17*** (0.02)	0.17*** (0.02)	0.17*** (0.02)
Insured (not insured = 0)	0.04* (0.02)	0.04* (0.02)	0.04* (0.02)
Skipped	−0.04 (0.03)	−0.04 (0.03)	−0.04 (0.03)
Paternal	0.06* (0.02)	0.06* (0.02)	0.06* (0.02)
Number of children	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
One parent present	−0.10* (0.05)	−0.10* (0.05)	−0.10* (0.05)
Drinking	0.09*** (0.02)	0.08*** (0.02)	0.09*** (0.02)
Smoking	0.08** (0.02)	0.08** (0.02)	0.08** (0.02)
High Intensity × Male	−0.23*** (0.05)		
Low Intensity × Male	0.02 (0.05)		
High Intensity × Urban	0.11* (0.05)		
Low Intensity × Urban	0.11 (0.06)		
Random effects–variance components			
Level 1: within-person	0.16***	0.16***	0.16***
Level 2: in intercept	0.01	0.01	0.01
Level 2: in linear growth rate	0.25***	0.24***	0.25***
Goodness-of-fit			
BIC (smaller is better)	17,784.90	17,772.40	17,786.40
−2 Log likelihood	17,753.30	17,740.80	17,754.80

Notes. *p* < .05; **p* < .01; ***p* < .001 (two-tailed test); BIC = Bayesian Information Criterion.

DISCUSSION AND CONCLUSION

Grandparents' caring for grandchildren illustrates an important dimension of intergenerational exchange in China, one that is simultaneously normative and pragmatic in the milieu of rapid socioeconomic changes. At the same time, the grandparenting experience is vastly heterogeneous. With such diversity in living arrangements, intensity of care, and differences in individual and contextual characteristics, how does caregiving for grandchildren affect older adults' well-being in China? Using longitudinal data that
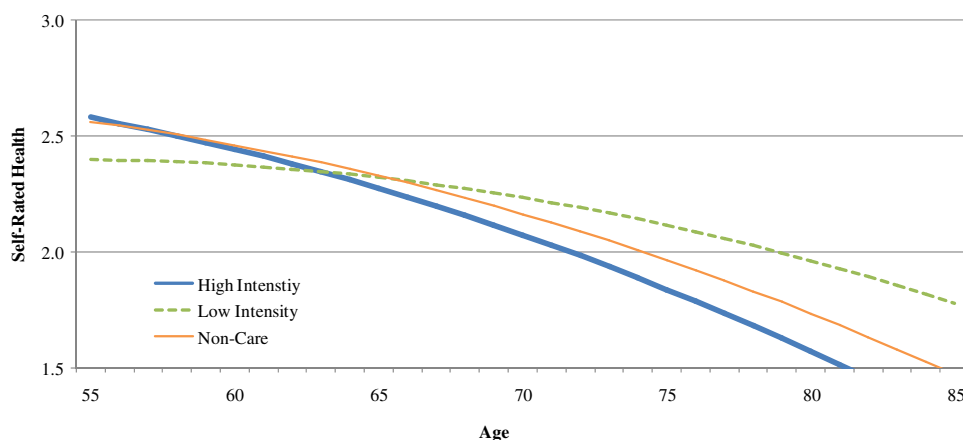

Figure 2. Predicted age trajectories of self-rated health by caregiving intensity among coresiding grandparents in China.
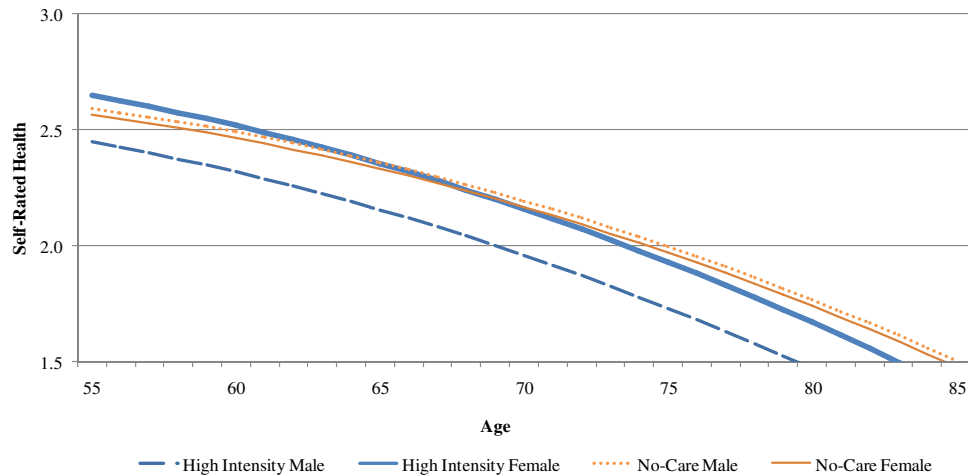
Figure 3. Predicted age trajectories of self-rated health by caregiving intensity and gender among coresiding grandparents in China.

span a 15-year interval, our analysis gives a nuanced answer to the question.

First, the analysis of the influence of living arrangements provides us with an initial understanding of the structural context of caregiving, as coresidence facilitates easy access of grandparents to grandchildren. Paternal grandparents living with their sons' families evidently enjoy a higher mean level of self-reported health and less rapid health decline than coresiding maternal grandparents, suggesting the benefit of a culturally preferred living arrangement. Grandparents who live in skipped-generation household, however, do not appear to be disadvantaged either in their average level of health or rate of health decline, particularly when their family income is high. For those who are financially worse off, however, they appear to have a health deficit. Abundant economic resources thus appear to provide a buffering effect. This is also consistent with an earlier study by Cong and Silverstein (2008), which shows that grandparents

providing care for grandchildren takes the form of "time-for-money" exchanges, with the psychological benefits for older adults being more pronounced when full time child care is accompanied by financial support from adult migrant children.

Although there is evidence suggesting that the normative and cultural context could provide benefits for grandparents, our findings also indicate that grandparents living in three-generation households experience an accelerated rate of health decline. Although the household is a crucial context for social support, relations among its members can create tensions and conflicts and thus be harmful to health, particularly in a cultural context that emphasizes harmony (Lai, 1995; Rook, 1984). In addition, although some grandparents provide care to coresiding grandchildren, other grandparents may require care themselves. An examination of the coresidence structure provides the context for caregiving, but a full assessment of the health implications has
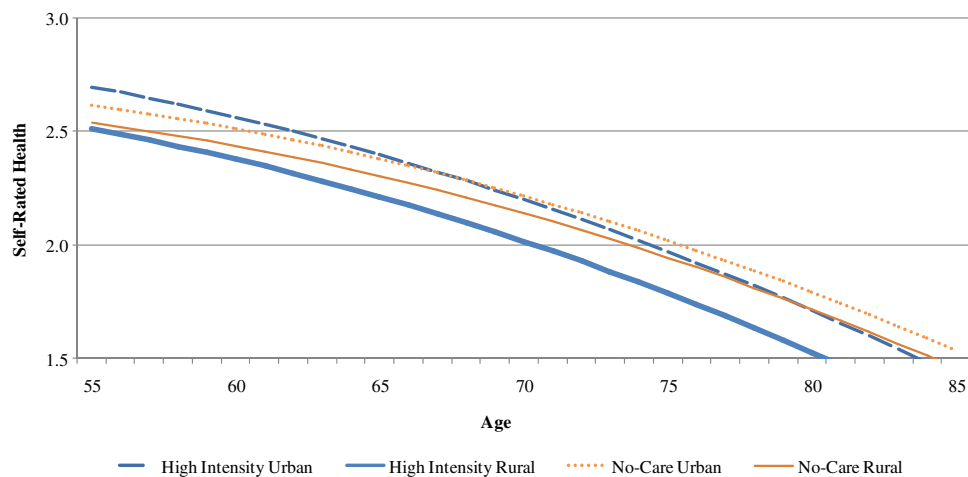

Figure 4. Predicted age trajectories of self-rated health by caregiving intensity and rural/urban residence among coresiding grandparents in China.

to take into account care intensity. Our subsequent finding shows that whereas heavy involvement in child care accelerates health decline, grandparents with a light child care load enjoy a better health level on average. On the one hand, the findings provide some support with the role enhancement theory, in which a low level of child care involvement is beneficial to health. Previous research suggests that grandparents' caregiving for grandchildren could inject a sense of meaning and purpose in life, induce a more active lifestyle, and facilitate family bonding (Pruchno & McKenney, 2002; Silverstein et al., 2006; Waldrop & Weber, 2001). On the other hand, our findings are in line with the role strain theory, in which intensive caregiving can be physically taxing and takes away resources from aging adults, leading to more rapid health decline (Jendrek, 1993; M. Minkler, 1999). Interestingly, in some additional analyses of the interaction between work status and caregiving intensity, we find that even a low level of child care involvement has a negative effect on health level when one is combining work and care, suggesting the risk of double burden or role conflict (results observed in a subsample of married grandparents, not shown).

Our analysis of the conditional effect of care intensity by grandparents also highlights the importance of normative family context in influencing the relationship between care and health. The finding that grandfathers who are engaged in intensive care of younger children are more susceptible to a more rapid health decline illustrates the centrality of gender variation in shaping family ties and the meanings of family roles. Given that grandfathers are not culturally expected to be in nurturing roles and often do not do so when the grandmothers are present, the lack of normative support could make daily caregiving more difficult and stressful. In addition, many of them could be in "double jeopardy," fulfilling caregiving roles while dealing with role deprivations related to retirement or widowhood.

The finding that the influence of heavy involvement with child care on health differs for urban and rural grandparents provides another piece of evidence that the consequence of grandchild care is not universal and contingent on the context and circumstances of the care. With wide discrepancies in socioeconomic and health care resources between urban and rural residents, rural grandparents are clearly at a disadvantage with regard to health capitals. With an absence of pension programs, they are much more likely to be dependent on their children. Caring for grandchildren could be considered a reciprocal form of intergenerational exchange that ensures old age support in later life (Cong & Silverstein, 2008; Croll, 2006). In comparison, urban grandparents are much more financially independent and have more resources at their disposal (e.g., larger social network and easier access to transportation). Taking care of grandchildren could be even more emotionally rewarding when it is altruistically motivated and not compelled by economic necessity. On the one hand, the cultural imperative of filial

piety, the need, and the expectation of adult children providing support for parents are stronger for rural than urban older adults. On the other hand, scholars and policy makers have long been concerned about undermining traditional family values and weakened filial practices in rural China during the collectivization of agriculture in the 1950s and a further erosion of parental authority and power shift to the better educated and more resourceful young generation since the economic reforms beginning in the late 1970s (Davis & Harrell, 1993; Parish & Whyte, 1978; D. Wang, 2004; Zhang, 2004). The added burden of intensive care for grandchildren could further exacerbate the vulnerable situation of the rural older adults coupled with a lack of institutional recognition and support.

We acknowledge that our study is not without limitations. First, although our study is one step forward for studying grandparenting in that we go beyond coresidence and examine care intensity, our measurement of child care is limited to the care for very young grandchildren. Although caring for school-aged children may not be as physically draining, grandparents' interaction with grandchildren may take on other forms and could have health implications as well. Second, our examination of care is limited to coresiding grandparents. Grandparents who do not live with grandchildren could also play a significant role in taking care of their grandchildren. Indeed, noncoresiding family members are increasingly likely to be involved in each others' lives (Whyte, 2003). In addition, we do not examine the care of grandparents for nonfamily members due to data limitation. Third, we use self-reported health because it is the only measure of health that is consistently available across all waves of the data. In addition, we examined active daily living (ADL) as the outcome variable for available waves of the data, and the findings are not as robust as those for self-rated health. Because caregiving must require older adults to have basic functional ability, the less robust findings on ADL may not be surprising because the selection effect may be stronger. Fourth, the issue of endogeneity and selectivity are not easily addressed. We treat health as an outcome in the analysis, but living arrangements and caregiving could be endogenous to health. In our analysis, we address this issue by using propensity score weighting in our growth curve analysis. In addition, we lagged the care intensity and coresidence in the analysis, but the results were not different. We also tested the cumulative effect of providing care in more than two waves and providing care continuously across waves but did not find any significant effects.

Despite these limitations, our analysis makes an important contribution to the literature of health implications of grandparents' child care provision in China. In a context where strong intergenerational bonds define its tradition, caring for grandchildren is often not perceived as a privilege or burden but a normative way of life for many grandparents. It is not an isolated event but an essential part of a dynamic system of family exchange. Understanding of how

intergenerational support may affect their well-being in the short and long run is critical in China, a society with the largest aging population in the world. Our analysis shows that grandchild care is neither universally detrimental nor beneficial to health, but rather its effect is shaped by the level of care and its structural and normative context. Further, our study helps to identify grandparent caregivers who are at greater risks and grandfathers and rural grandparents engaged in intensive care.

Demographic reality, shifting norms, and swiftly changing socioeconomic environment make it difficult to predict trends in grandparenting behavior as well as its implications in the near future. Many questions remain unanswered. For example, we have not identified the mechanisms of how grandparents' caregiving could potentially affect their stress level, life satisfaction, health behavior, and social support network. We also understand little of the relationship between caregiving and other types of intergenerational exchange, for example, emotional or financial support, and whether the well-being of grandparents could be moderated through complex network of interaction. Future research should further examine the complex intergenerational exchange patterns in various social and cultural contexts.

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