The Health Impact of Grandchild Care on Grandparents in China

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Abstract   This study explores the health implications of grandparental child care in China. Using data from the China Health and Retirement Longitudinal Study (CHARLS, 2011 and 2013), it examines the effect of caregiving intensity and transitions on grandparents' health and the relevance of gender and multiple roles. Results of lagged dependent variable models show general health benefits of grandparenting, but intensive caregiving is detrimental. Moreover, transition in caregiving matters: while gradual change is beneficial, dramatic change or stagnation often suggests otherwise. The relationship between caregiver and other social roles is deeply gendered: for grandfathers, it is contradictory and more social roles apart from being caregiver will undermine their health; for grandmothers, increase in other roles is at best neutral to their health. In general, the health effect of grandparenting is intricately conditioned by individual as well as cultural characteristics.

Keywords   Grandparent, Health, Caregiving intensity, Caregiving transition, Multiple roles

Introduction

With improvements in life expectancy, the structure of family relationships has been undergoing great changes (Uhlenberg 1996), and multigenerational households have become more common (Silverstein and Giarrusso 2010). In China, life expectancy at birth has increased dramatically,

from 44.6 in 1950 to 76.4 in 2016 (WHO 2018). According to the official statistics, 240.9 million people aged 60 or older accounted for 17.3 percent of the whole population in 2017 (Ministry of Civil Affairs 2018). Consequently, more people will become grandparents and experience longer periods of grandparenthood (Chen and Liu 2012), even when the delay of grandparenthood is taken into account (Leopold and Skopek 2015; Margolis 2016).

Moreover, grandparents in both rural and urban China increasingly take on important roles for their families, particularly satisfying the demand for child care as a result of expanding outflow of rural laborers and increasing female labor force participation (Chen, Liu, and Mair 2011). Due to a rigid household registration system, high living cost, and scarce educational opportunities for rural children in cities, many migrant parents have to leave them behind with their grandparents (Sun and Zhang 2013). Meanwhile, to secure a good job or a smooth promotion for their daughters, many older adults in the cities tend to share household chores and take up child care (Shen, Zhang, and Yan 2012). Among grandparents in rural and urban areas, there were about 41.4% and 35.3%, respectively, who took care of their grandchildren as early as in 2006 (Sun 2013).

While grandparenting is common in China, most studies focus on grandchildren's educational, emotional, and behavioral issues, especially those left-behind children living with grandparents (Duan et al. 2013; Zeng and Xie 2014). Only a few have clarified its basic situation (Sun 2013) or implications for caregivers (Chen and Liu 2012), and are mostly limited to rural areas and intergenerational support (Cong and Silverstein 2011; Song, Li, and Li 2013; Zhou et al. 2016). There is no clear evidence whether grandparental child care have positive or negative effects on

grandparents' health partly due to the use of cross-sectional and small-scale data (Huang, Du, and Chen 2016; Xiao 2017). And few studies have taken into account potential selection bias and complex caregiving conditions (Wu 2018).

To fill in the gap, this study will examine the health impact of child care provision on grandparents in contemporary China. Specifically, we try to answer how grandparents fare in health when grandparenting constitutes an important facet of social involvement for the elderly and how the caregiving role interacts with other social roles. In addition, we will figure out whether a gendered pattern of caregiving would produce heterogeneous outcomes for both genders. The following analysis includes four sections. We begin by reviewing theoretical perspectives and empirical research. Then, using multivariate models, we will test the effects of intensity and transition in caregiving, and multiple roles on grandparents' health. Finally, we briefly summarize our main findings and discuss their implications.

Theoretical Background and Empirical Literature

The health effect of grandparental child care is controversial. There are two contradictory theories explaining the health outcome of grandparenting. One is role strain theory, which argues that multiple roles always result in worse health, for contradictory expectations and role burdens will elicit physical and psychologic strains (Goode 1960). In this case, when their capacity is not compatible with the caring role, the demand and pressure therein would undermine their health. Some research has found a negative association between child care and grandparents' health,

especially when they become the main caregivers in the family (Hayslip, Fruhauf, and Dolbin-MacNab 2017). Social isolation and lack of social resources are widespread among grandparents who are taking care of their grandchildren. Many experience loss of freedom and social relationships (Gerard, Landry-Meyer, and Roe 2006), and some even take early retirement to meet familial responsibilities (Wiese, Burk, and Jaeckel 2016). Worse still, it is hard to handle generational relationships and get familial support for grandparents who are socio-economically disadvantaged (Hayslip, Blumenthal, and Garner 2015). This situation would be exacerbated when they tend to neglect or ignore their own physiological or psychological discomfort (Baker and Silverstein 2008).

However, according to the role enhancement theory, those with multiple productive roles are comparatively healthier than those who do not have as many, for more roles can promote personal identity and self-efficacy (Sieber 1974). Besides, more roles always mean stronger social relationships and social support, and this in turn can offset the possible health risks closely related to role pressure (Cong and Silverstein 2012; Gerard et al. 2006; Hayslip et al. 2015). Frequent interactions with adult children and grandchildren can also strengthen intergenerational ties within the family. Child care itself is psychologically rewarding for grandparents, and can even help develop good behaviors (e.g., dropping drinking and smoking) (Jendrek 1993). Much research has focused on living arrangements and family support. As the middle generation, the presence of adult children often provides practical/instrumental support (Hayslip, Blumenthal, and Garner 2014). Even absent adult children could provide financial and emotional support (Zhou et al. 2016), which

also have additional health benefit (Chen and Liu 2012; Wu 2018).

Due to a cross-sectional survey design, most research fails to take into account the potential selection bias (Ates 2017). As such, these contradictory results might be an artifact of grandparent's characteristics, and not the effects of care giving itself (Di Gessa, Glaser, and Tinker 2015, 2016). But recent research using longitudinal data and advanced methods has confirmed the positive effect of care giving on grandparents' health even when their individual characteristics have been controlled properly, or at least, there is no significantly negative effect (Chen et al. 2014; Wu 2018). Additionally, the variations of grandparental child care, such as the intensity and transition in caregiving, and the relationship between the grandparent role and other roles, are rarely considered seriously.

First, we argue that intensity or transition in caregiving matters. Apparently, health result will vary with the intensity that grandparents engage in the caring process. Most studies have focused on grandparents as guardians of their grandchildren (Hayslip et al. 2017), and some would consider grandparents who offer complementary caring (Di Gessa et al. 2015). Grandparents who play a complementary role might fare differently from their counterparts who are the main caregivers. The role expectancy and requirement associated with intensive caring would undermine their health (Chen and Liu 2012; Hughes et al. 2007), while complementary caring might promote their health condition (Tsai, Motamed, and Rougemont 2013). Moreover, transition in the caregiving role might elicit different health results as well. Grandparents are found to encounter a higher level of health risk when they begin to take up the caring role or increase its intensity (Baker and

Silverstein 2008; Hughes et al. 2007). There is also evidence suggesting that, compared with grandparents who do not take care of their grandchildren, those who do begin to and keep a low intensity often have a higher level of health: better self-reported health, fewer physically functional limitations, and lower levels of depression (Hughes et al. 2007).

Second, participation in multiple roles could be a resource as well as a stressor. On one hand, it can enhance well-being directly through stable income and accumulated social capital and indirectly through greater social integration (Adams, Leibbrandt, and Moon 2011). Grandparent who are working receive income needed to support a grandchild as well as other benefits such as health insurance. Other social activities, such as participation in leisure, learning, and voluntary activities, may also provide resources for grandparents (Wu 2018). Those grandparents caring a grandchild may be more likely to have peers who are also looking after grandchildren with whom they could exchange assistance. There is evidence that grandparents who have been raising a grandchild for long periods of time seem to benefit from their participation in multiple roles (Baker and Silverstein 2008). On the other hand, it is likely that the costs of multiple roles work simultaneously on grandparent caregivers. While few studies have explored the potential conflicts inherent in the multiple roles for grandparents, a large body of research on work-family conflicts has found that the presence of young children increases exposure to significant stressors among parental caregivers (Bianchi and Milkie 2010). It is likely that these negative influences would also be experienced by grandparent caregivers. Caring for a grandchild may aggravate prior stressors that a grandparent has already been experiencing (Doley et al. 2015). It also induce stress

when the expectations of grandparenting and parenting come into conflict by making it hard to keep a balance between being the indulgent grandparent and the disciplining parent (Hayslip et al. 2017).

Finally, the meaning and the role of grandparenthood may be shaped by several factors including individual characteristics, such as socioeconomic status, age, and gender and the cultural context (Hank et al. 2018; Hayslip et al. 2017). Higher education and income, and continual social support can help them deal with intergenerational relationships, and this in turn is conducive to their health (Hayslip and Smith 2013). Besides, caring role is always gendered, and women often have more responsibilities than men in the family, be it taking care of seniors, children or the sick. In child care provision, grandmothers are always the main actors, and grandfathers are at best complementary (Hank and Buber 2009). In China, the traditional division of labor in the family dictates that women have to do most of the household chores and caring (Chen and Liu 2012; Song et al. 2013). Therefore, it is also necessary to incorporate norms and role expectations in specific cultures to explain the gendered pattern of grandparenting and its consequences. The experiences of grandparenthood in various cultures are totally different from each other, and its health implications also vary greatly (Dolbin-MacNab and Yancura 2018). In the U.S., due to cultural traditions and norms among ethnic groups, grandparents face different role expectations and pressure, and eventually, fare divergently in health (Chen et al. 2014). It is the same with European countries (Di Gessa et al. 2015; Glaser et al. 2013). In traditional Chinese society, it is highly appreciated if grandparents could take up the caregiver role as a valuable, contributing and

authoritative family member (Burnette, Sun, and Sun 2013; Guo, Pickard, and Huang 2008). Therefore, it is no wonder that most studies on Taiwan and mainland China tend to find that Chinese caregiving grandparents experience better health than their non-caregiving counterparts (Song et al. 2013; Tsai et al. 2013; Wu 2018; Zhou et al. 2016).

Hypotheses

Both role strain theory and role enhancement theory suggest that physiological and psychological pressures increase proportionally to the number of roles and would result in worse health. In traditional Chinese families, complementary caring is normal, and it helps maintain grandparents' status in the family and promote harmonious family life. However, if grandparents become the sole caregiver, their health might suffer as a result of higher expectation and more burden and challenges, or at best, what they gain from the caregiving process, like affection feedback and social support, will be outweighed by the negative effects. Therefore, it is reasonable to expect that *low-level caring has a positive effect on grandparents' health, while high-level caring has a negative one (Hypothesis I).*

Changes in the role of caregiving might also make a difference. Role change might become a source of pressure as well as enhance life quality in later life. Taking up a caring role and adapting to new norms, grandparents' living environment, life style, social relationship and other roles will also change. In this case, its health implication will diverge: *A decrease in the caring burden can lead to a better health for grandparents, while the effect of increase in the burden will be opposite*

(Hypothesis II).

Besides, the effect of caring on grandparents' health might be moderated by other social roles they are playing simultaneously. Both role strain and role enhancement theories might be applicable when gender is taken into account. For grandmothers, it is nearly taken for granted to take care of their grandchildren, and they can thus easily get understanding and support in return; if they have other productive or social roles as well, they will get more social support and pride, and eventually a better health. This is consistent with the role enhancement theory. On the contrary, caring for grandchildren is not usual for grandfathers: it is hard to take up the burden and pressure of caring, and their social roles might suffer as well. In other words, grandfathers are very likely to experience role strain in the process: *Compared with grandmas not offering care, the number of social roles is positively associated with the health condition of grandmas who do offer care; the opposite exists for grandpas (Hypothesis III).*

Data and Methods

Data

This study uses data from the China Health and Retirement Longitudinal Study (CHARLS, 2011 and 2013). CHARLS is a longitudinal survey administered by the China Center for Economic Research at Peking University, and it draws a representative sample of Chinese 45 or older. The sample covers 28 provinces, 150 counties, and 450 villages or communities in mainland China, and the original sample sizes for 2011 (W1) and 2013 (W2) are 17,708 and 18,605, respectively.[1]

The study defines grandparents as respondents who were more than 45 years old and had at least one grandchild in either wave. Excluding cases which had no grandchild or were not followed up successfully in 2013, 9,059 cases are used in the analysis. There are 29, 267 and 1,622 cases with missing values on self-reported health, physical functional limitations and depressive symptoms, respectively, and models for each variable use 9,030, 8,792 and 7,437 cases correspondingly.

Dependent Variables

The study includes three dependent variables, i.e., the self-reported health, physical functional limitations, and depressive symptoms, trying to capture three facets regarding subjective evaluation, and physical and psychological health. While all dependent variables are drawn from the second-wave data, all health indicators used as controls are drawn from the baseline survey.[2]

Self-reported health has been widely accepted as a valid measure for general health. In the questionnaire, respondents were asked "how do you feel about your health status", and five answers are listed: very bad, bad, general, good, and very good.[3] A score from 1 to 5 is assigned to each answer, and the higher the score, the better one's self-reported health is.

Physical functional limitations include mobility activity, activities of daily living (ADL) and instrumental activities of daily living (IADL). There are 20 items in the questionnaire, and each has the same four responses: no difficulty, difficult but make it, difficult and need help, and cannot make it.[4] For each item, the study assigns a score from 0 to 3, and a total score with a range from 0 to 60 is constructed by adding each score, a higher score indicating more limitations.[5]

The Center for Epidemiologic Studies Depression Scale (CES-D) is utilized to measure

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respondents' depressive symptoms in the last week before the survey. 10 items are included in the scale, and each has the same four responses: rare or none (<1 day), not that much (1-2 days), sometimes (3-4 days), and most of the time (5-7 days). Of the 10 items, 8 are positive and a score from 0 to 3 is assigned to each, and 2 are negative and a score from 3 to 0 is assigned to each.

Independent Variables

Caring pattern is the key independent variable, including whether providing or not, the intensity, and transition. In the 2011 baseline survey, participants were asked "In the last one year, did you take care of your grandson or granddaughter (below 16)", and the answer is yes or no. Drawing on information on the weeks and hours per week distributed for each grandchild, the intensity of caregiving is operationalized into three categories: no, low level, or high level. Specifically, high level of caring denotes cases that spent at least 48 weeks and 40 hours each week in the last year, corresponding to the definition of a full-time worker. In addition, caregiving variation includes 8 categories, constructed by comparing the intensity of caring at two time points: never, stop caring, begin a low level, begin a high level, continue a low level, continue a high level, decrease intensity, or increase intensity.[6]

Moreover, the number of social roles as an indicator of social involvement is also included as a moderator. Using information on whether respondents participated in any of four types of social activities last month, including productive, communal, entertaining, and developmental activities, a continuous variable with a range from 0 to 4 has been constructed.

Control Variables

The analysis uses several variables as controls: grandparents' demographic and socio-economic characteristics, baseline health, life style, and family background Demographic characteristics include age, gender, household registration status, or *hukou*, and marital status. Socio-economic indicators include education, occupation, and living standard.[8] In addition, whether any adult child is living together is also controlled.

Analytic Strategy

The analysis takes three steps. First, descriptive statistics show how grandparents diverge in backgrounds, and health risks and results when playing different caring roles. The next step is to use multivariate models to estimate the effect of caring on grandparents' health condition, controlling for other factors. Finally, to test the robustness of the results, we conduct a series of sensitivity analyses, including applying the propensity score analysis to eliminate the threat of endogeneity, and using alternative models (e.g., bivariate or ordered logistic models) to test the effects of measurement.[10]

We explicitly incorporate time into the analysis and try to figure out the lagged effect of grandparenting. Specifically, the analysis uses health results in the second-wave data and caring behaviors in the first-wave, and also keeps the health conditions in 2011 as controls. This strategy has at least two advantages: one is to maintain a time order for the causal relationship, and controlling the baseline health conditions is also a good way to avoid the problem of endogeneity. While caring change is combining information from both waves, the change itself is temporarily

prior to the health results.

Results

Descriptive Statistics

Table 1 presents the descriptive statistics for variables used in the analysis. On the whole, grandparents are 60 years old, most have a rural *hukou* (83.30%) and are poorly-educated, with 31.35% not receiving any formal education, and the proportion of being unemployed or just engaged in farming is beyond 90%. Regarding their life style, more than 30% either drink or smoke, indicating an inadequate awareness of health risk among senior citizens. Additionally, more than half of them live with one or more adult children (58.95%), and the proportion of living with grandchildren is around 50%. On average, each grandparent participates in 1.23 social activities other than caring.

Columns 2 to 5 in Table 1 show comparisons among various caring statuses. In the follow-up sample, there are about 43% (3,899/9,059) grandparents who provide caring, of which most just provide a low-intensity caring, and the proportion of grandparents offering high-intensity caring is no more than 25% (867/3,899). Compared to grandparents who do not provide caring, those who do are relatively younger, have a better education, and are more actively engaged in farming or other jobs, and they are more likely to live with their grandchildren or adult children as well.

As shown in Table 1, there is a clear gendered pattern in grandparenting. While there is no gender difference regarding whether offering care or not, the proportion of females is much higher

Table 1 Descriptive statistics, by caregiving status and intensity, CHARLS (2011)

Variables	Total	Non-caregiving	Caregiving	Low Level	High Level
Age	60.08	61.56	58.12	58.10	58.16
	(8.95)	(10.03)	(6.82)	(6.84)	(6.74)
Female (%)	54.02	54.21	53.78	51.75	60.90
Rural (%)	83.30	83.68	82.79	81.53	87.20
Married (%)	86.46	82.44	91.77	92.35	89.73
Education (ref=illiteracy %)					
Primary school	41.48	39.96	43.50	43.96	41.87
Middle school	18.02	17.13	19.18	19.85	16.84
High school or more	9.15	9.17	9.13	9.43	8.07
Occupation (%)					
Agriculture	59.16	55.25	64.32	63.29	67.94
Non-agriculture	9.39	9.30	9.52	10.03	7.73
Living standard (ref = low %)					
Middle	53.80	53.02	54.83	55.11	53.86
High	3.00	3.64	2.15	2.37	1.38
Smoking (%)	30.25	29.57	31.14	32.32	26.99
Drinking (%)	31.92	30.33	34.03	36.35	25.95
Living with children (%)	58.95	54.07	65.40	65.34	65.63
Living with grandchildren (%)	49.01	30.17	73.94	71.04	84.08
Number of roles	1.23	1.17	1.31	1.31	1.29
	(.76)	(1.00)	(.95)	(.95)	(.95)
N	9059	5160	3899	3032	867

Note: (1) Standard deviation in parentheses; (2) Simple tests between groups suggest significant differences among variables except gender, *hukou*, and drinking.

in the case of offering a high-intensity care, which is consistent with the norm that women are the main caregiver in the family (Hank and Buber 2009). The same distinction exists between rural and urban areas: while there is no difference as to whether or not offering care, rural grandparents are more likely to offer a high-intensity care than their urban counterparts.
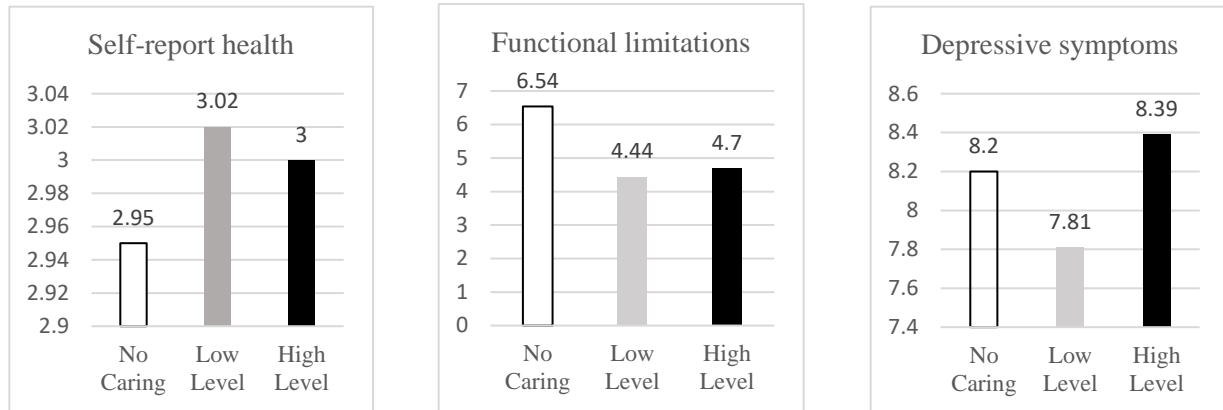
Figure 1   Caregiving intensity (W1) and grandparents' health (W2), CHARLS (2011, 2013)

Figure 1 shows grandparents' health outcomes under various caring patterns in 2013. Across all health indicators, grandparents offering care fare better than otherwise. Specifically, the health conditions of grandparents who offer a low-intensity care are the best, while grandparents who offer a high-intensity care tend to experience the most severe depression.

Caregiving Intensity and Grandparents' Health

Table 2 shows the results of regression analysis on the health impact of caring intensity.[12] Models 1, 2, and 3 are models for each dependent variable. Specifically, Model 1 is on grandparents' self-reported health. As the results show, controlling for their baseline health condition and other factors, grandparents who offer low-intensity or high-intensity care report a better health than those who don't. There is a gender difference: female seniors tend to report a lower level of health. While participation in social activities is positively related to grandparents' health conditions, living with adult children makes no difference.

Table 2 OLS regression of grandparents' health on caring intensity, CHARLS (2011, 2013)

	Self-report health (W2) Model 1	Functional limitations (W2) Model 2	Depressive symptoms (W2) Model 3
Caring intensity (ref = no)			
Low	0.03^+	-0.62**	-0.14
High	0.06^+	-0.55*	-0.22
Gender (ref=male)	-0.04^+	0.30	0.85**
Number of roles	0.02^+	-0.29**	-0.13
Constant	2.19**	3.41^+	1.64
R^2	0.20	0.43	0.27
N	9030	8792	7437

Note: (1) Robust standard error in parentheses; (2) To save space, all coefficients for control variables are not shown here; (3) $^+$ $p < .1$; * $p < .05$; ** $p < .01$.

Model 2 shows estimates for physical functional limitations. As is the same with self-reported health, holding other factors constant, whatever the intensity, grandparents who offer care have a lower level of physical functional limitations than those who don't. While there is no difference between genders, participation in social activities significantly decrease the level of limitations.

Model 3 shows the results for depressive symptoms. With other factors being controlled, the health impact of grandparenting is no longer significant. While there is a clear gender difference, for females are still more depressive than males, the protective function of social activities disappears. In sum, these three models confirm that grandparenting does have a positive effect on grandparents' health.

Caregiving Transition and Grandparents' Health

Health outcome might vary as a result of the entry or exit of a role, or an increase or decrease in the level of responsibility. Table 3 presents a further analysis on health implications of caring

change. Models 4, 5, and 6 are results for self-reported health, physically functional limitations, and depressive symptoms respectively.

As shown in Model 4, holding other factors constant, compared with not assuming any role, taking up high-intensity care, continual low- or high-intensity care, or giving up the caring role makes no difference in terms of self-reported health, while taking up a low-intensity role, decreasing or increasing the intensity does have a positive effect. In Model 5, with taking up a high-intensity caring role as an exception, other coefficients for caring change are negative, indicating a protective role in ameliorating grandparents' physical functional limitations. In Model 6, only decreasing the intensity of care lowers the level of depressive symptom, after controlling for several relevant variables.

On the whole, there is no consistency regarding the health impact of various role changes, but two scenarios deserve further analysis. One is taking up a high-intensity caring role: it is no different than the case of not taking up any role. A possible explanation is that, when grandparents who assume this role have not adjusted to the new requirement, its health implication will not appear. The other case is that decreasing the intensity of care can significantly benefit grandparents' health.

In addition, while offering high-intensity care does not have any health implication, taking up a low-intensity caring role does have a positive effect in terms of either increasing grandparents' self-reported health or decreasing their functional limitation. The reason might be that a low-

Table 3 OLS regression of grandparents' health on caring change, CHARLS (2011, 2013)

	Self-report health (W2)	Functional limitations (W2)	Depressive symptoms (W2)
	Model 4	Model 5	Model 6
Caring change (ref = no)			
Stop caring (low/high → no)	0.05	-0.73**	-0.36
Begin a low level (no → low)	0.06*	-0.47*	-0.05
Begin a high level (no → high)	0.03	0.06	-0.27
Continue a low level (low → low)	0.04	-0.61**	-0.05
Continue a high level (high → high)	0.05	-0.60^{+}	-0.26
Decrease intensity (high → low)	0.10*	-0.76*	-0.63*
Increase intensity (low → high)	0.11**	-1.03**	-0.14
Gender (ref = male)	-0.04	0.27	0.86**
Constant	2.16**	3.54^{+}	1.31
R^2	0.20	0.43	0.28
N	9030	8792	7437

Note: (1) Robust standard error in parentheses; (2) To save space, all coefficients for control variables are not shown here; (3) $^{+}$ p < .1; * p < .05; ** p < .01.

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intensity caring role can help grandparents get involved in family life and realize their value without imposing too much obligation upon them. Besides, transition from offering care to not does not bring about any health benefit (physical function excluded): exit from the caring role will inevitably lower one's satisfaction and value in the family.

Similar to the case of decreasing the intensity of care, increasing the intensity of care can also be beneficial to grandparents (depressive symptoms excluded). A gradual increase does not constitute a threat and the health impact of grandparenting persists. However, when grandparents keep staying in some caring role, they tend to feel exhausted, and the satisfaction or value along with grandparenting might decline gradually. Consequently, the health gain of grandparenting will no longer be guaranteed.

Multiple Roles, Gender, and Grandparents' Health

Another way to think about the health implications of grandparenting is to explore the interactions between the caring role and other social roles that grandparents might assume simultaneously. Table 4 presents relevant results. Models 7, 9 and 11 are baseline models for three health indicators. Correspondingly, Models 8, 10, and 12 include the interaction term: Models 8a, 10a and 12a are separate analyses for males, and Models 8b, 10b and 12b are for females.

Comparing Model 7 across Model 8b, there is no significant effect for these interaction terms, suggesting that there is neither enhancement nor strain between grandparents' caring role and other social roles. According to Model 7, the positive effect of social roles on grandparents' health, be it caring role or other roles, is additive.

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Table 4 OLS regression of grandparents' health on the interaction of caring role and other social roles, CHARLS (2011, 2013)

	Self-report health (W2)				Functional limitations (W2)				Depressive symptoms (W2)			
	M7 (full)	M8 (full)	M8a (male)	M8b (female)	M9 (full)	M10 (full)	M10a (male)	M10b (female)	M11 (full)	M12 (full)	M12a (male)	M12b (female)
Gender (ref = male)	-0.04$^+$	-0.04$^+$			0.30	0.30			0.85**	0.86**		
Caregiver (ref=no)	0.04*	0.05	0.08	0.03	-0.61**	-0.93*	-1.29*	-0.62$^+$	-0.16	-0.45$^+$	-0.79*	-0.19
No. of social roles	0.02$^+$	0.03	0.04	0.02	-0.29**	-	-	-0.21	-0.13	-0.24$^+$	-0.30$^+$	-0.20
Caring role × no of social roles		-0.01	-0.03	0.01		0.41**	0.63**	-0.01		0.22	0.41$^+$	0.07
Constant	2.19**	2.19**	2.40**	1.96**	3.41$^+$	3.49$^+$	1.56	5.28*	1.64	1.70	-0.63	4.32$^+$
R^2	0.20	0.20	0.21	0.19	0.43	0.43	0.46	0.39	0.28	0.28	0.25	0.27
N	9030	9030	4153	4877	8792	8792	4080	4712	7437	7437	3509	3928

Note: (1) Robust standard error in parentheses; (2) To save space, all coefficients for control variables are not shown here; (3) $^+$ p < .1; * p < .05; ** p < .01.

Results from Models 9, 10, 10a and 10b show a clear gendered pattern in multiple roles' effects on seniors' functional limitations. The interaction effect is significantly negative in the male sample: holding other factors constant, one more social role will result in a 0.53 score increase in grandfathers' functional limitations, suggesting a strain between grandfathers' caring role and other social roles. However, for grandmothers, the positive coefficient is not significant, and the enhancement hypothesis is not applicable here. Likewise, as shown in Models 11, 12, 12a and 12b, a gendered pattern exists in the case of grandparents' depressive symptoms.
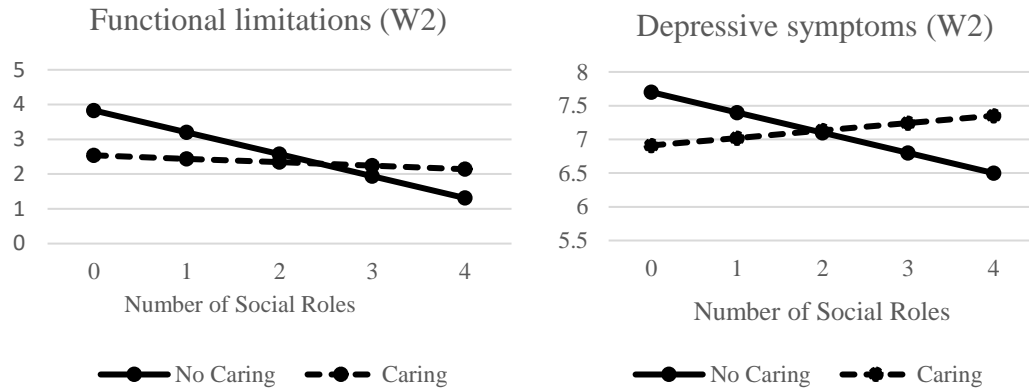
Figure 2   Predictions for grandfathers' functional limitations and depressive symptoms
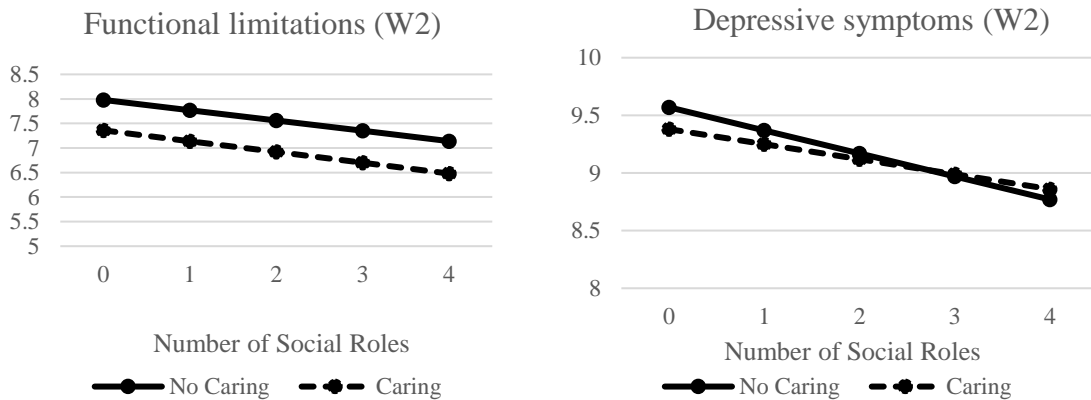
Figure 3   Predictions for grandmothers' functional limitations and depressive symptoms

Based on predictions from Models 10a, 10b, 12a and 12b, the complex relationships between caring role, other social roles and gender on one side, and grandparents' health on the other, are illustrated via Figures 2 and 3.

Conclusion and Discussion

Using data from the first two waves of the China Health and Retirement Longitudinal Study (CHARLS), this study analyzes the health impact of child caring on grandparents. On the whole, taking care of grandchildren can significantly enhance grandparents' health. However, heterogeneities prevail: caring pattern and social involvement indicate different role expectations and health outcomes; both caring role and its impact are deeply gendered.

First, taking care of grandchildren can be beneficial to seniors' health. Both low- and high-intensity care would improve their health conditions except for depressive symptoms. For Chinese grandparents, taking care of grandchildren is integrative to the continuity of a specific lineage, and is more or less a "calling": rather than being a burden for a later life, which is prevalent in most European countries and America, it is a blessing and also consistent with the idea of positive aging.

Second, change in caring roles also has complex effects on grandparents' health. Moderate change, like beginning to offer low-intensity, gradual increase and decrease in intensity, can improve health, but dramatic change, either stopping care or beginning high-intensity care, do not have health benefits. The burden of moderate increase would pale when personal value and social relationship have been strengthened. When dramatic change occurs, however, grandparents' health

might suffer, for they are slow in adjusting their behaviors and life style. Additionally, a continual caring role could exhaust one's value and satisfaction, and the health benefit will dilute with time.

Finally, the relationship between caring role and other social roles is not straightforward. While caring and participation in social activities can enhance grandparents' health, there is also contradiction between them. Gender matters here. In general, females play more caring roles than males, and this in turn configures health implications of grandparenting. Grandmothers have been playing the caring role, and they are experienced in dealing with multiple roles. However, imbalance can easily occur when grandfathers have to take up the caring role: taking care of grandchildren can better their health, but social isolation and health risk will follow suit when the caring role begins to squeeze the time for personal entertainment and development (Baker and Silverstein 2008).

Our study has several limitations and with the availability of new data sets, we hope to solve some of them and provide valid evidence for the health implication of grandparenting. First, with a focus on the interaction between grandparents' social involvement and caring role, we fail to integrate more family roles they may undertake, such as providing care for their spouse or parents. Therefore, the next step of our project is to go beyond social involvement and take into account all family roles that grandparents usually assume in contemporary China.

Second, we only use data from the first two waves of the survey and our conclusions might not stand due to the short time frame and limited choices of model specifications. Using the new data from the third and fourth waves of the longitudinal survey (CHARLS 2014, 2015), we could extend

the horizon of our study and test the health effects of grandparenting in a longer term.

Notes

1. Details about the survey design can be found at http://www.charls.ccer.edu.cn/.

2. Definition and operationalization for each variable are presented in Table A1 in the Appendix.

3. Specific items appear randomly at the beginning or end of the health section in the questionnaire, and no significant difference exists between responses to the two parts, indicating that answers to these items are not affected by the order of questions.

4. Factor analysis other than the approach used here is also utilized to operationalize respondents' depressive symptoms. Since estimates based on either are very similar, and to make the explanation more intuitive, this study only presents results from the latter approach.

5. Apart from the 20 items in the 2011 questionnaire, two more are included in the 2013 questionnaire, and to keep consistency, these two added items are not used in the analysis.

6. Details about the operationalization (caring change) are shown in Table A2 in the Appendix.

7. All three health indicators are operationalized in the same way as the dependent variables.

8. The survey asked respondents' income in the last month, but there are too many missing or extreme values among the responses. Therefore, a subjective indicator standing for their families' socio-economic status at the local place is used instead.

9. Results from these models are similar, and to facilitate explanation and comparison, this study only presents estimates of OLS regression models.

10. More details can be found in Table A3 in the Appendix.

11. All models in Table 2, as well as Table 3 and Table 4 control for respondents' age, age squared, *hukou*, marital status, education, occupation, living standard, drinking, smoking, and corresponding baseline health condition. To save space, standard error for each coefficient is not shown in each table.

Appendix

Table A1   Definition and operationalization for each variable, CHARLS (2011, 2013)

Conceptions	Variables	Operationalization
Health outcome	Self-report health (W2)	1 = very bad, 2 = not good, 3 = general, 4 = good, 5 = very good
	Functional limitations (W2)	Ranging from 0 to 60
	Depressive symptoms (W2)	Ranging from 0 to 30
Caregiving	Caregiving	0 = no, 1 = yes
	Caring intensity	0 = no, 1 = low level, 2 = high level
	Caring change	0 = never, 1 = stop caring, 2 = begin a low level, 3 = begin a high level, 4 = continue a low level, 5 = continue a high level, 6 = decrease intensity, 7 = increase intensity
Demographic characteristics	Age	Age, ≥ 45 years
	Gender	0 = male, 1 = female
	Hukou	0 = city, 1 = rural
	Married	0 = no (being single, divorced or widowed), 1 = yes
Socio-economic characteristics	Education	0 = illiteracy, 1 = primary school, 2 = middle school, 3 = high school or beyond
	Occupation	0 = no job, 2 = farmer, 3 = non-farmer
	Living standard	0 = low, 1 = middle, 3 = high
Life style	Smoking	0 = no, 1 = yes
	Drinking	0 = no, 1 = yes
Health risk	Self-report health (W1)	1 = very bad, 2 = not good, 3 = general, 4 = good, 5 = very good
	Functional limitations (W1)	Ranging from 0 to 60
	Depressive symptoms (W1)	Ranging from 0 to 30

| Living arrangement | Living with adult child(ren) | 0 = no, 1 = yes |
| Social involvement | Number of social roles | Counts of being a worker, volunteer, entertainer, or learner, ranging from 0 to 4 |

Table A2 The operationalization of caring change, CHARLS (2011, 2013)

Intensity（W1）	Intensity（W2）	Caring Change
no	no	never (0)
low/high level	no	stop caring (1)
no	low level	begin a low level (2)
no	high level	begin a high level (3)
low level	low level	continue a low level (4)
high level	high level	continue a high level (5)
high level	low level	decrease intensity (6)
low level	high level	increase intensity (7)

Table A3 Descriptive statistics for grandparents' health condition, by caregiving status and caring intensity, CHARLS (2011, 2013)

Variables	Full Sample	Non-caregiving	Caregiving	Low Level	High Level
Self-report health (W1)	2.96 (.90)	2.94 (.90)	2.98 (.89)	2.99 (.90)	2.94 (.89)
Self-report health (W2)	2.97 (.92)	2.95 (.93)	3.01 (.90)	3.02 (.90)	3.00 (.90)
N	9030	5142	3888	3026	862
Functional limitations (W1)	5.02 (7.00)	5.65 (7.72)	4.20 (5.82)	4.18 (5.92)	4.28 (5.45)
Functional limitations (W2)	5.66 (7.82)	6.54 (8.64)	4.50 (6.42)	4.44 (6.48)	4.70 (6.19)

N	8792	4999	3793	2947	846
Depressive symptoms (W1)	8.51 (6.33)	8.62 (6.39)	8.37 (6.25)	8.13 (6.15)	9.22 (6.53)
Depressive symptoms (W2)	8.08 (5.84)	8.20 (5.88)	7.93 (5.78)	7.81 (5.76)	8.39 (5.85)
N	7437	4147	3290	2565	725

Note: (1) Standard deviation in parentheses; (2) Caregiving status and caring intensity are drawn from survey data in 2011; (3) Statistic tests show significant differences between groups.

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