
Introduction

Having a new grandchild has long been believed to bring emotional gratification and psychological benefits to older people (Chen and Liu, 2011). The arrival of a grandchild contributes to the expansion of older adults' family roles (Krause, 1988). It fulfills older persons' wish to express generativity towards future generation and helps complete a key developmental stage (Erikson, 1985). However, statistical evidence has been scarce in establishing the association between grandparenthood and grandparents' wellbeing.

Researches so far have produced inconclusive results. Studies conducted in the United States, Australia and Europe indicated that becoming a grandparent improved life satisfaction (Somary and Stricker, 1998; Thiele and Whelan, 2008; Powdthavee, 2011), reduced depressive symptoms (Krause, 1988) and increased meaning of life scores (Tanskanen et al., 2017). However, in the meantime, there were findings showing that the association between grandparenthood and happiness did not hold after controlling for confounders (Danielsbacka and Tanskanen, 2016). In China, researchers mainly used cultural analysis, first-hand observation and small-sample in-depth interviews. They reported an increase in happiness and a sense of fulfilment experienced by grandparents after a new grandchild, though mixed with frustration and ambiguity (Thang, 2012).

Some studies have also documented gender difference on the health outcomes after having a grandchild. They suggested that grandmothers experienced greater life satisfaction (Somary and Stricker, 1998; Thiele and Whelan, 2008) and fewer depressive symptoms (Sheppard et al., 2019; Bordone and Arpino, 2019). Bordone and colleagues (2019) found that this positive effect was only for women who became grandparents for the first time and via their daughters.

Current literature has its limitations in establishing solid association between grandparenthood and grandparents' wellbeing. Cross-sectional researches on small samples (Somary and Stricker, 1998; Thiele and Whelan, 2008) or nationally representative data (Powdthavee, 2011; Danielsbacka and Tanskanen, 2016) suffered from reverse causation. The longitudinal analysis by Tanskanen and colleagues (2017) did not find significant results when the measure for subjective well-being was switched from meaning of life scores to life satisfaction. The majority of current literature comes from the United States, Australia and Europe. Although there are claims that having a new grandchild can bring emotional benefits to the older adults in the social context of China (Thang, 2012; Chen and Liu, 2012), they are not substantiated by empirical evidence. Due to traditional social norms, women assume the role as caregivers and family relation maintainers. It is unknown whether in China the gender difference in response to the arrival of a grandchild exists and is still biased in favor of grandmother, as observed in other countries. The intergenerational contact between grandparents and the new born naturally follows the arrival of the new grandchild, but few studies have addressed this aspect (Sheppard et al., 2019). Although the purpose of this study is not to explore the impact of coresidence and grandchild care, we still take them into consideration. Last but not the least, the current literature has disproportionally looked at mental health outcomes. We aim to include physical health measures because coresidence and grandchild care is shown to have an impact on grandparents' physical

health (Minkler et al., 1999).

In summary, our objective is to understand the effect of having a new grandchild on older persons' well-being in China. Given the aforementioned discussion, we hypothesise that having a grandchild can bring positive influence on grandparents' mental health in China. Then we will examine how intergenerational contact (coresidence and care provision) might impact the relationship, and how it affects grandparents' physical health. Finally, we will have a closer look at whether there is gender difference on health outcomes in response to the arrival of the new grandchild.

Method

Sample: China Health and Retirement Longitudinal Study (CHARLS) is a nationally representative study whose baseline survey was conducted in 2011. It covers 150 counties and 450 villages with a sample of approximately 10,000 households and 17,500 individuals aged 45 and above (Zhao et al., 2012). In this study, we used 2011 baseline national wave, together with 2013 and 2015 follow-up waves.

Having a new grandchild: We first calculated the total number of grandchildren each respondent had at each wave. Then by comparing this number across waves, we could find out whether at least one new grandchild was born into the family by 2015. At baseline, all respondents were assigned a value of 0. For those who did not have a new grandchild, neither between 2011 and 2013 nor between 2013 and 2015, this value remained 0. Otherwise, they would be assigned a value of 1. If the respondent had a new grandchild between 2011 and 2013, but not between 2013 and 2015, this value remained 1. We did not restrict our sample to first-time grandparents, as it would substantially reduce the sample size (2,565 respondents did not have any grandchild in 2011). Instead, we focused on the event of experiencing having a new grandchild.

Intergenerational contact: First we constructed two variables, i.e. 'coresidence' and 'grandchild care'. Respondents were not asked directly whether they lived with and provided care for the new born grandchild(ren). Within the same household, by comparing the birth year and birth month of very young household members at this wave with the interview year and month information at previous wave, we were able to tell whether they were new born grandchildren. By looking at for which adult child's child(ren) the respondent provided care at this wave, and whether this adult child had more children than previous wave, we could infer if the respondent provided care assistance for the adult child who had a new child. Then we were able to create a new variable, i.e. 'intergenerational contact'. We divided the sample into three subgroups, i.e. 'no new grandchild', 'had new grandchild(ren), neither coresided nor provided care', 'had new grandchild(ren), coresided and/or provided care'.

Life satisfaction: We recoded this variable as a continuous one while 1 = 'not at all satisfied' and 5 = 'completely satisfied'.

Depressive symptoms: CHARLS uses the 10-item version of Center for Epidemiologic Studies-Depression (CES-D) scale to assess depressive symptoms. This CES-D 10 scale has been proved to have high validity in China (Chen and Mui, 2014). Respondents were asked questions about their feeling during the previous week and for each question they had to select only one answer from four choices: (1) Rarely or none

of the time (<1 day); (2) Some or a little of the time (1-2 days); (3) Occasionally or a moderate amount of the time (3-4 days); (4) Most or all of the time (5-7 days). In line with previous study (Andersen et al., 1994), a total score ranging from 0 to 30 is used, with higher score indicating worse performance. In this way, a binary variable will be created and included in the models.

Activities of Daily Living: Respondents were asked whether they had difficulty dressing, bathing/showering, eating, getting into or out of bed, using the toilet, controlling urination and defecation. If respondents had no difficulty in any of these six items, then a value of 0 was assigned; otherwise they would get a value of 1. We used this variable to assess the physical health which might be subject to change following actual coresidence and grandchild care provision (Minkler et al., 1999).

Covariates: Socio-demographic factors have been shown to confound the association between grandparenthood/grandparental childcare and health outcomes (Di Gessa et al., 2015; Liu and Lou, 2017; Sheppard et al., 2019). Therefore, we adjusted for age, gender, marital status, ‘hukou (household registration system)’ status, educational level, retirement and individual annual income.

We used fixed effects models to address confounding caused by unobserved permanent characteristics.

Table 1 Descriptive statistics of analytical sample (n = 12,855)

	2011		2013		2015	
Whether had a new gkid until this wave						
No (ref)	12,797		8,684		6,376	
yes	0		4,108		6,452	
missing	58		63		27	
Intergenerational contact						
neither coresided nor took care	0		2,483		3,683	
coresided and/or provided care	0		1,625		2,769	
missing	58		63		27	
Age	59.00	9.33(SD)	60.99	9.33(SD)	62.99	9.33(SD)
missing	2	0.02%	2	0.02%	2	0.02%
Gender						
Male (ref)	6,101	47.46%	6,101	47.46%	6,101	47.46%
Female	6,754	52.54%	6,754	52.54%	6,754	52.54%
Hukou						
Agricultural (ref)	10,436	81.18%	9,761	75.93%	9,710	75.53%
Non-agri	2,300	17.89%	2,213	17.22%	2,246	17.47%
Unified hukou	102	0.79%	142	1.10%	173	1.35%
No hukou	4	0.03%	6	0.05%	6	0.05%
missing	13	0.11%	733	5.70%	720	5.60%
Education						
Elementary and below (ref)	5,733	44.60%	5,733	44.60%	5,733	44.60%
Elementary	2,879	22.40%	2,879	22.40%	2,879	22.40%
Middle/high	3,978	30.95%	3,978	30.95%	3,978	30.95%

College and above	242	1.88%	242	1.88%	242	1.88%
missing	23	0.18%	23	0.18%	23	0.18%
Marital Status						
Married/cohabit (ref)	10,639	82.76%	10,592	82.40%	10,353	80.54%
Married but not living together	782	6.08%	634	4.93%	614	4.78%
Separated/Divorced	137	1.07%	108	0.84%	99	0.77%
Widowed	1,273	9.90%	1,504	11.70%	1,766	13.74%
Never married	13	0.10%	14	0.11%	15	0.12%
missing	11	0.09%	3	0.02%	8	0.06%
Retirement						
No (ref)	11,117	86.48%	10,963	85.28%	10,664	82.96%
yes	1,336	10.39%	1,671	13.00%	1,900	14.78%
missing	402	3.13%	221	1.72%	291	2.26%
Ln individual annual income	4.14	4.47(SD)	4.48	3.72(SD)	4.79	4.40(SD)
missing	198	1.54%	267	2.08%	168	1.31%
ADL						
no difficulty (ref)	10,772	83.80%	10,581	82.31%	9,934	77.28%
had difficulty	2,039	15.86%	2,231	17.36%	2,893	22.50%
missing	44	0.34%	43	0.33%	28	0.22%
Depression score (0-30)	8.42	6.31(SD)	7.88	5.76(SD)	8.19	6.46(SD)
missing	940	7.31%	1,061	8.25%	794	6.18%
Life satisfaction (0-5)	3.06	0.70(SD)	3.12	0.74(SD)	3.39	0.77(SD)
missing	2,097	16.31%	1,138	8.85%	884	6.88%

Table 2 Association of having a new grandchild and health outcomes(n=12,855)

	life satisfaction		depressive symptoms		ADL	
	coef	SE	coef	SE	coef	SE
whether had a new grandchild (no=ref)	0.03 ⁺	0.02	-0.00	0.12	-0.00	0.01
gender x whether had a new gkid (male = ref)	-0.02	0.02	-0.01	0.15	0.03**	0.01

Table 3 Association of having a new grandchild and health outcomes (intergenerational contact) (n=12,855)

	life satisfaction		depressive symptoms		ADL	
	coef	SE	coef	SE	coef	SE
Intergenerational contact (no new grandchild = ref)						
neither coresided nor took care	0.01	0.02	0.06	0.11	0.01	0.01
coresided and/or provided care	0.03	0.02	-0.12	0.13	0.02 ⁺	0.01

notes: for table2 and 3, ⁺p< 0.1, **p< 0.01; Only FE results were presented. All RE estimates rejected by Hausman tests; In all models, socio-demographic covariates were controlled for; Unadjusted for weight

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Authors: Jiawei Wu, Karen Glaser, Mauricio Avendano

Corresponding author: Jiawei Wu jiawei.wu@kcl.ac.uk