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Family caregiving and caregivers' health among middle-aged and older adults in China

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이 논문을 보건학 석사 학위논문으로 제출함

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LIANG YULING의 석사 학위논문을 인준함

2021 년 2월

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Abstract

China's population aged rapidly from 2010 to 2019, with life expectancy at birth increasing from 71.4 years to 77.3 years and the proportion of the population over 60 rising from 13.26% to 18.1% (NHCC, 2011-2020; NBSC, 2011-2020). Family care plays a vital role in taking the pressure of aging-related care issues. However, the maintenance of such family responsibilities can lead to negative physical and mental health consequences. Most research on the effects of caregiving focuses on Western countries. It is questionable whether Western caregivers' findings apply to Chinese society with family structures and family relationships differ from Western countries. Therefore, this study aims to investigate the relationship between family caregiving and caregivers' health among middle-aged and older adults in China by analyzing a representative sample. We compare the relationships overall and between three care-type groups: parent caregiving only, grandchild caregiving only, and both.

This study conducted a secondary analysis of the China Health and Retirement Longitudinal Study (CHARLS) wave 4 data. The CHARLS data is a national longitudinal survey of adults aged over 45 in China. A conceptual framework was drawn through a comprehensive review of the literature applied to create an analytic model, including individual characteristics, family structures, social participation status, family caregiving provision, and health outcomes. Family caregiving provision includes care type, care intensity, and care duration. Based on the review,

care type includes parent caregiving only, grandchild caregiving only, and both. Health outcome is divided into self-rated health and depression. A five-point scale question measured self-rated health. Depression was measured using the CES-D-10, a 30-point scale.

This study compared the differences between non-caregivers and caregivers overall in individual characteristics, family characteristics, and social activity status using chi-square test and t-test. Next, this study also compared the differences between non-caregivers and caregivers classified by three-care types in individual characteristics, family characteristics, and social activity status using chi-square test, ANOVA analysis, and Tukey HSD test. Moreover, bivariate analysis and multivariate analysis were performed to identify the factors associated with family caregiving provision and the relationship between family caregiving provision and health. The results of this study are as follows.

Among the analytical sample of 6,871 caregivers, 74.36% were not in good self-rated health, and 36.24% presented with depressive symptoms as measured by CES-D-10.

Multivariate analysis of all caregivers results showed income, location, education, employment, ADL, IADL, chronic disease, household composition, and social activity status to be factors associated with caregivers' self-rated health. Study results also showed that age, sex, income, location, education, ADL, IADL, chronic diseases, the number of children, social activity, and care intensity are factors associated with caregivers’ depressive symptoms.

Multivariate analysis of the caregivers’ self-rated health by care type

revealed that poor self-rated health was most prevalent among caregivers who only provided grandchild caregiving. For caregivers who only provided parent caregiving, gender, income, IADL, and chronic disease significantly affected self-rated health. For caregivers who only provided grandchildren caregiving, income, education, employment, ADL, IADL, chronic disease, multi-generation family, and social activity largely influence self-rated health. For caregivers who provided both parent and grandchild caregiving, income, IADL, and chronic disease were significant factors of self-rated health.

Multivariate analysis of the sample's depressive symptoms by care type revealed that depressive symptoms were also most prevalent among caregivers who only provided grandchild caregiving. For caregivers who only provided parent caregiving, gender, income, employment, ADL, IADL, chronic disease, and care duration were significant factors of depressive symptoms. For caregivers who only provided grandchild caregiving, gender, income, location, education, ADL, IADL, chronic disease, child number, and social activity were significant factors of depressive symptoms. For caregivers who provided both parent and grandchild caregiving, gender, income, ADL, IADL, chronic disease, and household composition were significant factors of depressive symptoms.

This study found that poor self-rated health and depressive symptoms were most prevalent among caregivers who cared for grandchildren. This result may be due to the millions of left-behind children and older grandparents in China. Firstly, left-behind children mean that children’s

parents worked in a distant place. The children are left behind in their rural communities, cared for by their grandparents in China. The intensity was more than two times caregivers caring for grandchildren only than caring for parents only (62.67 vs 30.68 hours per week). Providing care to grandchildren was almost equivalent to a full-time job. With children absent and high intensity of care for grandchildren, grandchild caregivers commonly feel burn out. Also, caregivers who only cared for grandchildren were older than other type's caregivers (60.48 vs. 53.51 and 56.52 years old). Older individuals may experience a deterioration of their health condition in older ages, limiting their capacity for social engagement and, in turn, influencing their well-being in later life.

The results of this study could not clarify a statistically significant association between care intensity, care duration and self-rated health. Compared with previous research, the difference in the measurement of self-rated health and study type between the earlier studies and this study may have resulted in different outcomes. Factors influencing self-rated health and depressive symptoms were examined cross-sectionally. The factors influencing family caregiving provision and health (self-rated health, depression) were consistently shown in individual characteristics, family structures, and social activity status. This suggests caregiving provision and health of family caregivers were influenced not only by personal factors such as income but also by family structures and social activity status.

The multidimensional factors associated with self-rated health and

depressive symptoms indicated the need for a comprehensive approach to releasing intervention policy for family caregivers. The strong association between income and health suggests that promoting family caregivers' financial support could be an effective strategy to improve their health. The strong association between social activity and health advances that promoting social engagement within the family caregivers may improve their health. Finally, the results showed that rural caregivers had worse self-rated health and more depressive symptoms than urban caregivers. There is still an urban-rural disparity in social public infrastructure distribution (i.e., kindergartens, nursing homes) in China. The truth that the location influences health suggests reducing the rural-urban gap in public infrastructure distribution could be an effective health-equity strategy.

Keywords: middle-aged and older adults; family caregiving provision, self-rated health, depression

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Chapter 1. Introduction

1.1 Background

China's population aged rapidly from 2010 to 2019, with the proportion of the population over 60 years old rising from 13.26% to 18.1% (NHCC, 2011-2020; NBSC, 2011-2020). The population aged over 60 rose from 177 million to 254 million from 2010 to 2019(NBSC, 2011-2020). China has become an aging country. The number of beds in Chinese care facilities rose from 3.15 million to 7.75 million during the same period (MCAC, 2011-2020). Although the supply of care facility beds is increasing in China, there is still a seriously inadequate status compared with the high proportion of the elderly population.

Family caregiving plays a vital role in taking the pressure of aging-related care issues. There are two kinds of ordinary family caregiving for middle-aged and older adults: one is to provide grandchildren caregiving to reduce one or more adult children's' burden of childcare; the other is to provide parent caregiving (Grundy E et al., 2006). Family caregivers account for 94% of the care source for frail elderly parents in China, and 51.58% of the complete care was provided by adult children and children's spouses (Du P et al., 2016). Recent research points out that 33.36% of Chinese kids lived together with their grandparents (Liu Y et al., 2016). Studies also showed that grandparents helping take care of the children can free mothers from the burden of childcare, and the mothers then can pursue a career (Arpino et al., 2012; Posadas et al.,

2012). In China, 58% of grandparents provide care for their grandchildren (Ko PC et al., 2014). Based on the social exchange theory, grandchildren care might be a kind of intergenerational exchange in China (Tian Q et al., 2016). Grandparents care for their grandchildren to get financial, emotional, and care support from their children due to China's imperfect care and retirement policy.

The interplay between several social and demographic patterns(i.e., delayed family information, extended life expectancy, women's increased workforce participation, declined fertility rates, and rising healthcare costs, Etc.) has sandwiched people in between their children and parents' needs (Hammer & Neal, 2008). Some caregivers who look after their parents and grandchildren and shoulder responsibilities begin to compete for middle-aged and older adults after mid-life. In addition to taking care of their aging parents, they may have to help their mature children take care of their children. Family care is essential for the harmony and the stability of Chinese society.

However, maintaining such a family responsibility will lead to adverse health consequences physically and mentally. (Chen J et al., 2010; Ku LJ., 2013; Liu H., 2017; Xu H., 2019) such as an increased possibility of childhood obesity (Li B et al., 2015), decreased frequency of health behavior (Chassin L et al., 2010), etc. Family care will reduce the quality of care and marital relationships (Chassin L et al., 2010; Rogerson PA et al., 2005; Brody EM et al., 1992). Moreover, it also will result in loss or reduction in employment (Schmidt A. E. et al., 2016; Carbonell Á., 2019).

The current literature is predominantly based on western populations. Nevertheless, care may have different health consequences in distinctive cultural contexts (Goodman & Silverstein, 2002). It is questionable whether these findings based on western caregivers can be applied to Chinese societies where the family structure and family relationship are different from those in Western countries. Previous studies in China focused on the health impacts of care recipients (Chen J et al., 2010; Zhou J et al., 2016). Despite that looking after parents is common in China, little research has used nationally representative elderly's samples to comprehensively measure family caregivers' health utilizing family caregiving provision (i.e., intensity and duration). Fewer studies have been made to evaluate the factors associated with care providing in family structure (i.e., in what circumstance the caregiving is provided). Therefore, this study aims to investigate the relationship between family caregiving provision and caregivers' health among middle-aged and older adults in China using nationally representative samples.

1.2 Objective

This study aims to investigate the relationship between family caregiving and caregivers' health among middle-aged and older adults in China by analyzing a representative sample. We compare the relationships overall and between three care-type groups: parent caregiving only, grandchild caregiving only, and both. The specific research questions are as follows:

1) To examine caregivers' characteristics, family caregiving provision, and caregivers' health in China
2) To examine individual, family, and social activity factors associated with family caregiving provision (intensity and duration)
3) To examine the relationship between family caregiving provision and caregivers' health (depression and self-reported health)

Chapter 2. Literature review

2.1 Theoretical background

Igel and Szydlik's model for grandchild care provision (2011) identified three primary factors affecting grandchild care: opportunity and need structures, family structures, and cultural contextual structures. Schmidt, A. E. et al. (2016) adapted Igel and Szydlik's model for grandchild care (2011). They identified three primary sets of factors affecting multiple family caregiving provision: individual opportunity structures, family structures, socio-demographic characteristics, and individual health.

Chou, E (2007) proposed a model to describe the relationship between family caregiving and health-related outcomes. The proposed theoretical framework suggests that health-related outcomes of care result in interactions among informal caregivers, the caregiving relationship's nature, caregiving as a function of such relationships, and the caregivers' internal processes.

2.2 Family caregiving provision

2.2.1 Care type

Xu H (2019) and Liu H (2017) used the family relationship with care recipients to distinguish family care type, such as grandchild caregiving, parent caregiving, both, Etc. Kalmijn, M (2019) found two leading types of family caregiving involving middle-aged and older adults: caring for grandchildren and parents. Generally, a care recipient is an adult who requires assistance with personal care or household activities (Qualls, 2016).

Caregivers can be formal and informal. Formal caregivers are healthcare professionals (HCPs), including nurses, personal support workers, rehabilitation specialists, and physicians who, according to society's legislature, are paying for the care and support they provide to the patients or clients (Ku L et al., 2013). Informal caregivers are relatives, friends, or neighbors who provide unpaid practical support daily or at least twice a week to an older adult (Gupta R, 2009; Lethin C et al., 2016; Savage & Bailey, 2004; Shiba K et al., 2016).

Luna S et al (2019) indicated that the "sandwich generation" are considered those women who are potential caregivers for two generations: older relatives and grandchildren. Trends toward delayed childbearing and increased female labor force participation, for example, suggest a growing "sandwich generation," especially of women, who are caught between the demands of child-rearing and elder

care while attempting to play a more demanding role in the workforce (Spillman BC et al.,2000).

94% of the care source for frail elderly parents in China, especially adult children and children's spouses, are 51.58% of the complete care (Du P et al., 2016). 58% of Chinese grandparents provided care for their grandchildren in China (Ko P.C. et al., 2014). Moreover, research has shown that grandparents provide childcare in 35% of rural China families (Silverstein et al., 2006). Caregivers of parent caregiving only account for 17.9% of total family caregivers, while 55.5% are caring for grandchild only, 26.6% caring for both great-grandparent and grandchild in a multi-generation family (Xu H, 2019). A study in Europe indicated that, on average, over a third of the countries' populations provided informal care in European countries (Verbakel, E., 2018).

2.2.2 Care intensity

Previous studies defined care intensity as the number of caregiving hours or caregiving tasks (Gold DP et al., 1994; Garity, 1997; Tan SY., 2019). The OECD report indicated that providing care for 20 hours per week could be a risk factor for caregivers' health (OECD, 2011). Chen F (2012) classified the intensity of grandchildren's caregiving into three groups: "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). Studies also divide the intensity of informal caregiving provided by daughters or daughters-in-law into three

categories: no-caregiving (0 h/week of caregiving), low-intensity caregivers (less than 10 h/week of caregiving), and high-intensity caregivers (more than 10 h/week of caregiving) (Chen L et al., 2015; Carmichael F et al., 2003; Van Houtven CH et al. 2013).

Freedman and Spillman (2014) indicated that caregivers who assist only with household activities would spend an average care intensity of 85 hours per month. However, those who care for an older adult with three or more self-care or mobility needs spend 253 hours per month, equivalent to nearly two full-time jobs.

7.6% of Europe's population provides informal care at least 11h a week (Verbakel E et al., 2017). The data from EUROFAMCARE studies on family caregiving indicated that the average hours of caring was 46 hours per week.

Yihan Wang (2019) found that the average care intensity of elderly caregivers was 27.40 hours per week in China. The average care intensity of grandchild caregivers was 53.54 hours per week.

2.2.3 Care duration

Duration of caregiving means the number of months in the caregiver role (Pinquart, 2003). Caregiving duration also indicates the number of weeks the care provider cared for recipients (Yihan Wang, 2019).

Cook, S.K (2018) indicated that duration could be classified as the average duration. The care duration includes care time, body mass, and family time (Drobniak, S. M et al., 2015). The duration that offspring

require provisioning in the nest and after fledging ("care time") and the duration that offspring stay with their parents after nutritional independence ("family time") (Drobniak S.M et al., 2015).

The data from EUROFAMCARE studies on family caregiving indicated that the average duration was 60 months.

Yihan Wang (2019) found that the average care duration of elderly caregivers was 24.40 weeks per year in China. The average care intensity for caregivers of grandchild caregiving was 37.77 weeks per year.

2.3 Factors associated with the family caregiving provision

Family caregiving may vary in intensity, type, and duration of care provided (Broese van Groenou, M. I., 2016). Studies show that the association between family caregiving provision and the caregiver's situation depends on various factors. The quantitative evidence illustrating such impact is complex. The caregiver's demographic and socio-economic characteristics at the start and during their care are associated with caregivers' care status (Ross A et al., 2008). The family caregiving provision is widespread and varies by country, state provision of childcare infrastructure, social provision of welfare payments, and cultural expectations (DI Gessa et al., 2016; Hank K, 2009; Igel C, 2011).

2.3.1 Studies Abroad

The literature suggested that individual characteristics influence family caregiving provision. Schmidt, A. E. et al. (2016) found that those belonging to the oldest group (80+) are less likely to provide extra-residential family caregiving than younger seniors (60-69 years). Previous research has consistently shown that women are at higher risk of care provision (Arber S et al. in 1995; Glaser K et al., 2002; Schmid et al. 2011; Carbonell, Á, 2019), including elderly caregiving (Arber S et al., 1995; Glaser K et al., 2002) and grandchildren caregiving (Schmidt A. E. et al., 2016). Previous studies have shown that income and education have a more substantial overall effect on grandchild caregiving provision (Glaser et al. 2010; Igel and Szydlik 2011; Schmidt,

A. E. et al., 2016). Previous studies indicated that parent care reduced the employment rate (Muurinen J, 1986; Stone R. et al., 1990; Bolin K et al., 2008). In contrast, employment status will also influence caregiving. Stone R (1987) found that unemployed people are more likely to provided parent care. People with long working hours are less likely to provide parent care than non-workers (Josten and De Boer, 2015). Previous studies suggested that compared with male caregivers, female caregivers significantly provided more care intensity and longer care duration (Gilligan, 1982; Pinquart, 1983; Barush & Spaid, 1989; Navaie-Waliser, M. et al., 2002; Pinquart M et al., 2006; Pinquart M et al., 2007). Differentiation in the types of care has consequences for the intensity of care provisions of the family and duration (Verbakel, E., 2018). Caregivers for unemployed, and disabled individuals provided intensive care more often (Verbakel, E., 2018).

The literature on the provision of care suggests that family structures influence the provision of care. Schmidt, A. E. et al. (2016) indicated that larger household composition is positively associated with grandchild caregiving, while extra-residential care is not significant. One study reported that larger household size is positively related to grandchild caregiving; in contrast, care of the elderly found no significant correlation in foreign countries (Schmidt, A. E. et al., 2016). Bolin et al. (2008) indicated that the hypothesis could not be rejected for females that the elderly's living arrangement affects caregiving provision. Penning (2016) defines the caregiving network as the caregiving network's size. Care network size means the number of

caregivers who provide informal care to the care recipient. In a survey in Sweden, 28% of those who claimed that they had a parent in need of support stated that they could not assist because of geographic distance (Malmberg and Sandstorm, 2006). Adult children have less contact with their parents as they enter cohabitation or marriage (Bucx, Trudie and Hagendoorn 2008). However, the frequency of communication was higher in cases of the child having offspring (Bucx, Trudie, and Hagendoorn 2008). People with children in the household were more often intensive caregivers (Verbakel, E., 2018).

The literature on caregiving suggests that social participation affects care. Baydar N (1998) indicated that social organizations' participation was relatively low for grandmothers who care for their grandchildren in foreign countries. Schmidt, A. E. et al. (2016) suggested that all social participation variables positively and significantly provide family care.

2.3.2 Studies in China

The literature suggested that individual characteristics influence care. In China, women were more likely to provide eldercare than men because they have more family responsibilities and more pressure to participate in socio-economic activities (Zhang Q, 2012). Yi Wang (2020) suggested that urban residents were more likely to provide eldercare than rural residents. Employed older women, a high level of education were more likely to choose low-intensity elder care in China (Yi Wang, 2020).

Yihan Wang (2019) indicated that 80% of the grandchild caregivers lived in China's rural areas. The rural population is more likely to provide grandchild caregiving in China (Yihan Wang, 2019). The rural population is more likely to provide high care intensity(Chen F, 2012). A grandparent with only-children is more likely to provide care to grandchildren(Wu H, 2019). The grandparents' health condition and education level are the key factors in providing care to grandchildren (Li Fen, 2016). Sun Juanjuan(2013) used the 2006 "China Urban and Rural Elderly Population Status Tracking Survey" data to examine the status of the elderly caring for grandchildren and its influencing factors and found that the elderly who are young, healthy, well-educated, have moderate economic conditions, and whose children have worse economic conditions more likely to take care of grandchildren.

Urban grandmothers were more likely to provide caregiving to both parents and grandchildren in China (Xu H., 2019).

2.4 The health of caregivers

WHO defined health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. Mental health is vital to personal life, family, and interpersonal relationships.

Self-rated health (SRH) refers to an individual's subjective perception of his/her health (Tu, R., 2019). A frequently used health measure consists of a single item asking respondents to rate their overall health as very good, good, fair, or poor, very poor. Self-rated health evaluates the state of health in people, which integrates information on the biological, mental, functional, and spiritual dimensions of an individual's health (Bjorner, JB et al., 1996). Self-rated health is a robust predictor of several health outcomes, such as functional ability (Idler EL et al., 2000), depression (Chou et al., 2011). Self-rated health is often measured with a single item; it is an easily administered assessment tool in clinic settings (Cano, A. et al., 2003). One study found that 22.4% of caregivers reported poor self-rated health, 41.1% reported fair self-rated health, and 36.5% reported good self-rated health in China (Zhong, Y et al., 2020).

Depression, which is recognized as a significant chronic disease, has become a significant health problem worldwide (de Winter CF et al., 2012). Depressive symptoms are a common mental health problem worldwide. Pearlin et al. (1981) indicated that self-concepts might be damaged under conditions of enduring hardships. When this happens,

people are more likely to suffer symptoms of depression. Family caregiving fits this situation. Caregivers are more vulnerable to have depressive symptoms. More than 50% of the caregivers reported depression (Garcia-Alberca et al., 2011; Ferrara et al., 2008). Three papers using meta-analysis to examine the nationwide prevalence of depression among caregivers found that depression prevalence was between 26% and 57% (Loh AZ et al., 2016; Parker OD et al., 2013; Sallim AB et al., 2015). However, the caregivers' mental health is critical to the persons being cared for (Isaac V. et al., 2011). Liu H (2019) calculated that the average CES-D10 score was 9.54 among caregivers in CHARLS 2011, 7.44 among caregivers in CHARLS 2013. Liu S et al (2017) indicated that 5.83% of the caregivers had moderate to severe depression.

2.5 The relationship between family caregiving provision and self-rated health

2.5.1 Studies Abroad

Previous studies have shown that factors associated with elderly caregivers' self-rated health include age, sex, education, financial situation, and care type (Berglund E et al., 2015). Studies that investigated the effect of elder caregiving on self-rated health were most cross-sectional studies. Cross-sectional studies pointed out that elderly parent care leads to worse self-rated health than non-caregivers in foreign countries (Pinquart and Sörensen 2003; Amirkhanyan and Wolf, 2006; Coe and Van Houtven, 2009; Legg et al., 2013; Chan A, 2013; Do et al. 2014; Do Y.K et al., 2015; Berglund E et al., 2015). Other studies also found contradictory results (Rozario et al., 2004). Previous studies showed that a sex difference in self-rated health for caregivers. Coe N.B (2009) indicated that shown that female caregivers reported adverse health effects for parent caregiving. In contrast, male caregivers reported improved self-rated health two years later (Coe N.B, 2009). However, a study indicated that male caregivers had worse self-rated health than female caregivers (Häusler, N et al., 2018).Unemployed parent caregivers reported worse self-rated health than employed caregivers (Häusler, N et al., 2018).

The relationship between caring for grandchildren and self-rated health is mixed. Hughes M. E (2007) indicated that grandmothers who

provided grandchildren caregiving in skipped-generation households are more likely to experience negative self-rated health changes. Choi S (2018) indicated that providing long-term non-residential grandchild caregiving significantly affected grandmothers' self-rated health in South Korea. McGarrigle C. A (2014) found that providing grandchild caregiving was not associated with self-rated health among the sandwich generation.

2.5.2 Studies in China

Women who are caregivers to their parents have consistently worse self-reported health and a high intensity of elder care has a negative impact (Guangya Liu, et al., 2016). Compared to the male caregivers, the female caregivers more often reported they suffered from poor self-rated health (Chiou C. J et al.,2005).

The relationship between caring for grandchildren and self-rated health is mixed. Zhou J et al. (2016) showed that grandparent caregivers with repeated care had better self-rated health (SRH) than non-caregivers. Nevertheless, the study data of Zhou J et al. (2016) is limited evidence because this study just covered rural Chinese elderly. Ku LJ (2013) showed that compared with non-caregivers, long-term multi-generational caregivers were more likely to report better self-rated health. Xu L (2016) indicated that that grandparent caregiving level was significantly negatively associated with SRH. . Using data from the China Health and Nutrition Survey, Chen F (2012) found that low

intensity of grandchild care is positively associated with self-rated health and high intensity of grandchild care has a negative impact. In addition, rural grandmothers and grandfathers are more likely to have worse self-rated health (Chen F, 2012). Wang Hao et al. (2020) found that providing grandchild care was not significant with self-rated health. Han Baoqing (2019) found that with the caring time increasing，the probability of self-rated health deterioration of grandparents declines first and then rises.

2.6 The relationship between family caregiving provision and depressive symptom

2.6.1 Studies Abroad

Researchers have also documented that elder caregiving is strongly associated with depression (Bookwala Y et al., 2000; Maher J et al., 2002; Mausbach et al., 2010; Schreiner, Morimoto, Arai, & Zarit, 2006). Schulz & Sherwood (2008) found that elderly family caregiving is often described as a demanding role with all the chronic stress experience hallmarks. Do, Y. K (2015) found that caregiving can worsen health through increased emotional stress and physical strain. Elderly caregivers exhibit more depression symptoms than their non-caregiving peers in foreign countries (Ory MG et al., 1999; Bookwala, Y et al., 2000; Amirkhanyan & Wolf., 2003). Schulz et al. (1990) found that caring for ill family members can negatively impact caregivers' mental health. Holding a close family member, such as a spouse or an elderly parent, with dementia or some other severe disability can lead to stress or depressive symptoms regardless of whether the unaffected family member is providing care to the family member with the disability (Schulz and Beach, 1999; Ory MG et al., 1999; Amirkhanyan & Wolf., 2003). Litwin and colleagues (2014, p. 230) found that along with spousal caregivers, adult children's co-resident caregivers experienced more depressive symptoms than those who gave care to parents or others. Being an adult child caregiver increases the probability of

suffering from episodes of depression (Amikhanyan and Wolf, 2006). Women were more likely to experience higher care burdens (Boucher, A et al., 2019). Rural to urban migration makes it stressful for young couples to care for elders (parents and parents-in-law) and their children while maintaining successful careers. Butler et al(2005) indicated that multiple factors were associated with depression for rural elder caregivers. Caregivers with higher education were not significantly associated with depressive symptoms (McGarrigle, C. A., 2019). Depressive symptoms were considered persistent for non-working caregivers (Kumagai, N., 2017). Caregivers who provide co-residential elder caregiving have lowered psychological health (Kumagai, N., 2017). Care type was significantly associated with caregiver burden (Boucher, A et al., 2019). The elderly care activity characteristics can impact caregivers' health, such as the duration and nature of care (Whitehead M., 2003). Higher informal care intensity estimates higher depressive symptoms (Wolf DA, 2018). An OECD report (2011) shows that caregivers who devote over twenty hours a week to looking after their family members are 20% more likely than non-caregivers to suffer from mental disturbances. Most of the literature examined suggests 20 h a week as a threshold to designate high-intensity caregiving (Hirst, 2005; Grammenos, 2005; SPRU, 2009; OECD, 2011). Schulz et al. (1995) found inconsistent results on the association between care duration and care outcomes.

The relationship between grandchildren's caregiving and depressive symptoms is mixed. Factors, including caregiver's age, income, location,

care recipient's gender, age, total caregiving time, family support, and knowledge of tasks, were significantly associated with grandchildren caregivers' depressive symptoms (Butler et al. 2005; Ku, L. J. et al., 2013; Danielsbacka, M. et al., 2019). Relevant studies in foreign countries indicated that grandchildren's caregiving could lead to fewer depressive symptoms (Grundy E.M et al., 2012; Mehta KK., 2012; Danielsbacka M. et al., 2019). Another study suggested that grandchild caregiving relates to more depressive symptoms (Hughes, M. E., 2007). According to the life stress paradigm, the interplay of stressors and resources directly impacts psychological distress, precisely depressive symptoms (Ensel &Lin, 1991). Hughes M.E (2007) indicated that caregivers of grandchild caregiving in skipped-generation households are more likely to experience negative changes in depression. Robison et al. (2009) reported no impact of household composition on psychosocial outcomes. Caregiving outcomes have suggested that providing more care was related to more depression (Baumgarten et al., 1992; Yates et al., 1999; McGarrigle C. A, 2018). Grandparents who provided high-intensity grandchild care and did not participate in a social or leisure activity had increased depressive symptoms (McGarrigle, C. A., 2019).

Providing caregiving to both parents and grandchildren can impact depressive symptoms. Baker L. A. (2008) found that giving caregiving to both parents and grandchildren leads to worse depressive symptoms in foreign countries. Baker, L. A. (2008) found that grandparents who have been raising grandchildren for more extended periods seem to

benefit from their participation in multiple roles.

2.6.2 Studies in China

Elder caregiving is associated with depressive symptoms (Yihan Wang, 2019). Yihan Wang (2019) indicated that caregiving duration was negatively associated with caregivers' depressive symptoms. However, care intensity was not significantly associated with caregivers' depressive symptoms in China (Yihan Wang, 2019).

Being a grandparent was a predictive factor related to better well-being for men but not for women in China (Chen J et al., 2010). Factors, including caregiver's age, income, location, care recipient's gender, age, total caregiving time, family support, and knowledge of tasks, were significantly associated with caregivers' depressive symptoms (Wang et al., 2010; Ku, L. J. et al., 2013). Long care duration was related to fewer caregiver depressive symptoms in China (Yihan Wang, 2019). High care intensity was related to worse depressive symptoms in China (Yihan Wang, 2019). The relationships were based on various household characteristics, including a sizable number of household generations and a tremendous amount of childcare involvement of co-residential and non-residential grandparents (Chen F et al., 2011).

Previous studies indicated that caregivers who provided caregiving to parents and grandchildren reported fewer depressive symptoms than non-caregivers in China (Ku LJ., 2013; Xu H., 2019). Xu H (2019) focused on the population aged 45 or above in 2011 and 2013 CHARLS

data and found that rural grandmothers reported worse depression, followed by urban grandmother, rural grandfather, and urban grandfather. Using the data of CHARS 2011 and 2013, Liu H (2017) found that compared to others, seniors who provided continuing caregiving to grandchildren and those who gave up parental caregiving reported fewer depressive symptoms. Long-term multi-generational caregivers were more likely to report fewer depressive symptoms (Ku, L. J. et al., 2013).

2.7 Literature review conclusion

Firstly, previous studies have shown that factors associated with caregiving rovision include individual socio-demographic characteristics, family structures, and social participation status.

Secondly, it confirmed that family caregivers' caregiving has a significant relationship with depressive symptoms and self-rated health. Previous studies have shown that the factors associated with the health of caregivers include: socio-demographic characteristics, individual health, family structure, social participation status, family caregiving provision. We can see that caring for grandchildren and health (including self-rated health and depressive symptoms) is mixed. In contrast, the relationship between eldercare and health is negative. Besides this, the relationship between caregiving provision and health is also varied.

However, there is a lack of integration between the caregiving provision model and informal caregivers' effects on the health-related outcomes model. Xu, H (2019) researched the relationship between health and caregiving provision in China. Xu H (2019) studied the population of a four-generation family whose parents and grandchildren are alive and whose grandchildren are under the age of 16. However, this does not mean that the household generation in the research population is a multi-generational family. The family may not live together. However, those who only had a live parent or grandchild under 16 years old were not included in the research population in Xu H (2019)'s study. The relationship between these kinds of caregivers and

health is neglected. Besides this, care intensity and duration are important factors affecting a caregiver's health. Therefore, this study will expand the research population, including people with living parents or grandchildren under 16 years old. Yihan Wang (2019) researched the relationship between family caregiving provision and health. Nevertheless, Yihan Wang (2019) distinguished the care type between parent care and grandchild care, neglecting the caregivers who provided caregiving to both parents and grandchildren.

Therefore, this study did not choose the research population based on whether the respondents have living parents or grandchildren or not. This study used their care status to select and differentiate whether they care or not and whom they care for. This study will explore the relationship between family caregiving provision and health among middle-aged and older adults in China. Besides this, this study will also explore the factors associated with caregiving provision.

Chapter 3. Method

3.1 Conceptual framework

A conceptual framework was developed based on Igel (2011) and Schmidt A. E's model (2016) on factors associated with family care, Cho E's model (2007) on the relationship between family caregiving provision and health model, and previous studies on caregiving. This framework identifies three main sets of factors associated with family caregiving provision: individual characteristics, family structures, and social participation. Family caregiving provision includes caregiving type, caregiving intensity, and caregiving duration.

The details of the conceptual framework are shown in Figure 1.

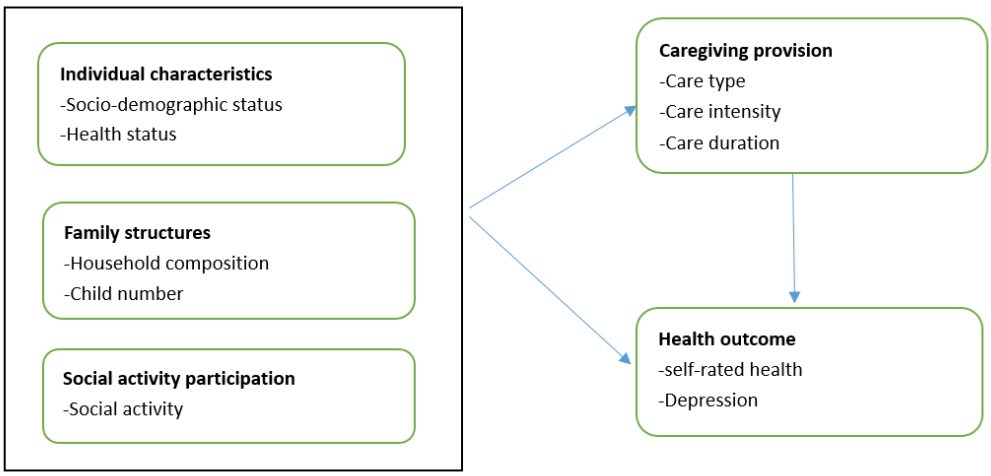

Figure 1 The conceptual framework of the study based on the theoretical models on family caregiving

3.2 Study data

This study conducted a secondary analysis on the China Health and Retirement Longitudinal Study (CHARLS) wave 4 data and was approved for deliberation exemption by the Institutional Review Board (IRB) of Seoul National University (No.E2011/003-006). The CHARLS data is a national longitudinal study of adults over 45 years of age in China. The CHARLS data cover 29 provinces and 150 counties, including 19,816 in 2018. The CHARLS aims to examine the primary health and economic adjustments of China's rapidly aging population. The CHARLS coordinated by including Peking University, the National Natural Science Foundation of China, the Behavioral and Social Research Division of the National Institute on Ageing, and the World Bank. The CHARLS had four waves: Wave 1 in 2011, Wave 2 in 2013, Wave 3 in 2015, and Wave4 in 2018.

Based on the previous studies (Liu H, 2017; Xu H, 2019; Yihan Wang, 2019), we made the sample inclusion criteria. Sample inclusion criteria must be:

1) Respondents aged over 45.

2) Respondents answered questions about family caregiving (parent caregiving and grandchildren caregiving), care duration of care, and care intensity.

3) The selected respondents, according to the above two standards, respondents should also answer questions about demographic status (education, gender, income, children status, marital status, etc.), family

information (children status, household status, Etc.), and health (ADL, IADL, depressive symptoms, self-rated health).

Following the above criteria, this study selects 15511 of the study population number in wave4, including non-caregivers(8670), caregivers that provided caregiving to parents only (934), grandchildren only (5,352), and both (585).

3.3 Measurements

Variables are selected and measured by referring to previous studies, and the details are showed in table1.

3.3.1 Independent variable: General characteristics

Individual characteristics include socio-demographic characteristics and health status. Moreover, socio-demographic characteristics include age, gender, income, location status, education status, employed status. Age referred to participants' chronological age. Gender is grouped into female and male. Income refers to the Chinese fifth-class criteria of 2018 into the low-income team, the middle and high-income team by the national bureau of China's statistics. Income is represented by two categories: less than $3,636 and above. The hukou policy represented location status in the urban region and rural region. Education is grouped into two categories from less than primary school education and more than middle school education. Employed status was represented by employed and unemployed.

Health includes physical health and chronic disease status. Physical status is represented in ADL and IADL. The Katz ADL and the Lawton IADL were used to evaluating the self-reported functional disability. ADL refer to daily self-care tasks, including taking a bath, eating, getting in and out of bed, dressing, using the toilet, and maintaining continence of urine and feces. Meanwhile, the abilities such as doing housework, cooking, taking medicine, shopping, and taking care of finances required

for living independently in the community, are used to assess the IADL. The questionnaire of CHARLS asked the respondents whether they have any difficulty in doing each of the following activities: (a) dressing, (b) bathing, (c) eating, (d) getting into or out of bed, (e) using the toilet, and (f) controlling urination and defecation for BADL. They were also asked about the level of difficulty when (a) doing household chores, (b) preparing hot meals, (c) shopping for groceries, (d) taking the right portion of medication on time, and (e) managing money for IADL. Each answer in CHARLS was divided into four responses as follows: (1) No, I do not have any difficulty, (2) I have difficulty but still can do it, (3) Yes, I have difficulty and need help, and (4) I cannot do it. For both BADL and IADL, the respondents' responses were scored as: I do not have any difficulty=0 , and I have difficulty but can still do it = 0; I have difficulty and need help=1, I cannot do it = 1. The respondents who completed all items without any help were classified as ADL- or IADL-independent. In contrast, participants who reported needing any help in any items were classified as having ADL or IADL disability. Chronic disease was classified into having no chronic disease and having one or more chronic disease.

Family structure variables include household composition and number of children. The household composition was classified as one-generation, two-generation, and multi-generation. One-generation household means the caregivers live alone or live only with a spouse. A two-generation family means that besides the spouse, the caregivers live with parents, children, or grandchildren. A multi-generation family

means that besides the spouse, the caregivers live with parents, children, and grandchildren besides the spouse, which means the family of caregivers includes three generations or more. Number of children is represented by no child or only-one child and two or more children.

Social participation status includes social activity numbers. Social activity number was grouped into no social activity and having social activity.

3.3.2 Independent variable: Care-related characteristics

Family caregiving provision includes care type, care intensity, care duration, Etc.

Care type was respondents' self-reported family caregiving provision the last year, which consists of four categories: (1) non-caregivers; (2) parent caregiving only; (3) grandchild caregiving only; (4) both.

Care intensity was classified into three groups by care type: the intensity of caregivers who provided caregiving to parents only; the intensity of caregivers who provided caregiving to grandchildren only; and the intensity of caregivers who provided caregiving to parents and grandchildren. The care intensity of caregivers who care for parents was assessed by the question: How many hours per week did you spend taking care of an older parent last year? The intensity was measured by the average hours per week of caring for a father, mother, father-in-law, or mother-in-law. If the respondent provided caregiving to more than one parent, the hours were summed up. The care intensity of caregivers

who care for grandchild was assessed by the question: How many hours per week did you spend taking care of grandchildren last year? The intensity was measured by the average hours per week of caring for grandchild. If the respondent provided caregiving to more than one grandchild, the hours were summed up. The grandchild and parent care status assessed caregivers who provided caregiving to parents and grandchildren. Suppose the respondents take care of their grandchild and parents simultaneously. In that case, we will define them as caregivers who provided caregiving to parents and grandchildren. The care hours of parent care and grandchild care were summed up as their care intensity. The log transformation was adapted to improve the normality of intensity (Yihan Wang, 2019).

Care duration was also classified into three groups by care type: the duration of caregivers who provided caregiving to parents only; the duration of caregivers who provided caregiving to grandchildren only; and the duration of caregivers who provided caregiving to parents and grandchildren. The care duration of caregivers who care for parents was assessed by the question: How many weeks per year did you spend taking care of an older parent last year? The duration was measured by the average weeks per year of caring for a father, mother, father-in-law, or mother-in-law. If the respondent provided caregiving to more than one parent, the weeks were summed up. The care duration of caregivers who care for grandchild caregivers was assessed by the question: How many weeks per year did you spend taking care of a grandchild last year? The duration was measured by the average weeks per year of caring for

the grandchild. If the respondent provided caregiving to more than one grandchild, the weeks were summed up. The grandchild and parent care status assessed caregivers who provided caregiving to parents and grandchildren. Suppose the respondents take care of their grandchild and parents simultaneously. In that case, we will define them as caregivers who provided caregiving to parents and grandchildren. The care weeks of parent care and grandchild care were summed up as care duration of caregivers who provided caregiving to parents and grandchildren. The log transformation was adapted to improve its normality (Yihan Wang, 2019).

3.3.3 Dependent variable

Self-Rated health was measured using a 1~5 ordinal scale based on the following question in the CHARLS questionnaire: would you say your health is very good, good, fair, poor, or very poor? ". SRH has been consistently documented to be a valid measure of health and a robust indicator of morbidity and survival of the elderly (Ferraro KF., 1980; Idler EL, 1990; Hays JC et al., 1996; Idler EL, 1997). Therefore it is appropriate to use it as a dependent variable.

Depressive symptoms were assessed using the 10-item version of the Center for Epidemiological Studies Depression Scale (CES-D-10) (Anderson EM et al., 1994), which has been used to measure depressive symptoms accurately (Anderson EM et al., 1994). The Chinese version of this scale has good reliability and validity among the elderly

population in China, and Cronbach's alpha was 0,813(Huang Q et al., 2015). It is believed that CES-D-10 can effectively measure the depression level of the elderly in the CHARLS data. The result of factor analysis on the scale's structural validity shows that the 10-item CES-D scale can be divided into a negative and positive two-factor structure. The correlation coefficient between the two factors is 0.56. The depression score is calculated according to the standard: the four levels are counted as 0, 1, 2, and 3 points in turn, of which the two positive emotion options are reverse scores, namely 3, 2, 1, 0 points. Thus, the total score of the CES-D-10 ranges from 0 to 30, with a lower score indicating a lower depressive symptoms level. A cutoff score ≥ of 10 was used to identify the respondents who had significant depressive symptoms.

Table 1 Study variables

Variable			Measurement
Independent Variable: General characteristics			
Individual characteristics	Socio-demographic characteristics	Age	0: 45-54 1: 55-64 2: 65-74 3: 75+
		Gender	1: Male 2: Female
		Location status	1:Rural region 2:Urban region
		Education status	0: less than primary school education 1: middle school education
		Individual income	0: less than $3,636 1: >=$3,636
		Employment	0:No 1:Yes
	Health status	ADL	0: ADL 0 1: ADL 1-6
		IADL	0: IADL 0 1: IADL 1-5
		Having chronic disease	0: No 1:Yes
Family structures		Household composition	0: One-generation 1: Two-generation 2: Multi-generation
		children number	0: <=1 1: >1
Social participation status		Forms of social participation	0: No social participation 1: one kind of social participation or above
Independent Variable: Care-related characteristics			
Family caregiving provision		Care type	0: Non-caregivers 1: Caring for parents only 2: Caring for grandchildren only 3: Both
		Care intensity	Care intensity:>=1 hour per week
			0: 1-20 hours per week

		1: >20 hours per week
	Care duration	Care duration:>= 1 week per year
		0: 1-20 weeks per year 1: >20 weeks per year
Dependent variable		
Self-Rated Health		Self-rated health scale: 1-5
		0: Not goof(Fair/Poor/very poor) 1:Good(Good/Very good)
Depressive symptoms		Depressive symptoms score: 0-30
		0: Not Depressed(CES-D 0-10) 1: Depressed(CES-D 10-30)

3.4 Statistical methods

This study is a cross-sectional study. For the analysis method, this study first carried out univariate analyses and reported caregivers' general characteristics (including individual characteristics, family structures, and social participation status), caregiving provision (intensity, duration), and health. And then, this study conducted a chi-square and T-test to compare the general characteristics, caregiving provision, and health between non-care group and all care group overall. Then this study conducted a chi-square, ANOVA analysis, Tukey HSD-test to compare the differences between non-care group and three-care group in general characteristics, caregiving provision, and health overall. This study will then carry out bivariate analysis and multivariate analysis to explore the factors associated with caregivers' caregiving provision (intensity, duration), and the relationship between family caregiving provision and health. Lastly, this study would use the R version 4.0.2 as the statistical analysis program. Moreover, the significance level was considered to be statistically significant if the p-value was less than 0.05.

Chapter 4. Results

4.1 Sample characteristics

4.1.1 Descriptive statistics of the sample

Table 2 shows the descriptive comparisons between non-caregivers and all caregivers classified by whether they provided care for their grandchildren or parents. The non-caregiving group was the reference group.

The characteristics of the 8640 non-caregivers are as follows. The average age of them was 62.27. Slightly less than half (48.56%) were female. The average annual income was $2,091. 77.09% of them lived in rural areas. The majority (65.76%) of them had an education level of middle school and above. Over half of them (67.29%) were currently working. The population's functional status was relatively good, with 94.21% of the population ADL functionally independent and 86.18% of the population IADL functionally independent. However, over half (79.35%) of the population having at least one chronic disease. 64.09% of the population lived in a one-generation family. Furthermore, the average number of children in the population was 2.78. Over half (81.45%) of the population had two children or more. Over half (53.54%) of the population had social activity.

The characteristics of the 6871 caregivers are as follows. They were younger (59.20 years old) than non-caregivers. They were more likely

(54.53%) to be female than non-caregivers. Their average annual income was $1,734, which was lower than non-caregivers. 77.88% of them live in rural areas, which was slightly higher than non-caregivers. 69.09% of them attended more than middle school education, which was higher than non-caregivers. 67.33% of them were employed. They were highly independent than non-caregivers, with 96.45% of them ADL functionally independent and 89.06% of them IADL functionally independent. Their health was better than non-caregivers, with 78.62% of the caregivers having at least one chronic disease. 42.40% of them lived in one-generation families, which was lower than non-caregivers. Their average children's number (2.48) was lower than non-caregivers. 80.93% of them had two or more adult children. They were more active than non-caregivers, with 41.13% of them did not have social activity.

Table 2 Descriptive comparisons between non-caregiving group and all caregiving group (n=15511)

	Non-caregiving n=8640	All caregiving n=6871	X^2 or t
	n(%)	n(%)	
Age(years)			
Mean±SD	62.27 (±10.32)	59.20±7.53	t=21.42***
45-54	2260(26.16)	1766(25.70)	X^2=558.81***
55-64	2394(27.71)	2979(43.36)	
65-74	2506(29.00)	1561(22.72)	
75+	1480(17.13)	565(8.22)	
Gender			
Male	4444(51.44)	3124(45.47)	X^2=54.33***
Female	4196(48.56)	3747(54.53)	
Income($)			
Mean±SD	2091±4039	1,734±3099	t=6.23***
< $3,636	6664(77.13)	5506(80.13)	X^2=20.26***
>=$3,636	1976(22.87)	1365(19.87)	
Location			
Rural	6661(77.13)	5351(77.88)	X^2=1.30
Urban	1979(22.87)	1520(22.12)	
Education			
Less than primary school	2958(34.24)	2124(30.91)	X^2=19.04***
Middle school and above	5682(65.76)	4747(69.09)	
Employment			
No	2826(32.71)	2245(32.67)	X^2=0.00
Yes	5814(67.29)	4626(67.33)	
ADL			
No ADL disability	8140(94.21)	6627(96.45)	X^2=41.41***
ADL disability	500(5.79)	244(3.55)	
IADL			
No IADL disability	7446(86.18)	6119(89.06)	X^2=28.57***
IADL disability	1194(13.82)	752(10.94)	
Having chronic disease			
No	1784(20.65)	1469(21.38)	X^2=1.20
Yes	6856(79.35)	5402(78.62)	
Household composition			
One-generation	5537(64.09)	2913(42.40)	X^2=939.44***
Two-generation	2232(25.83)	2175(31.65)	
Multi-generation	871(10.08)	1783(25.95)	

Child Number			
Mean±SD	2.78 ±1.60	2.48±1.32	t=13.06***
<=1	1603(18.55)	1310(19.07)	X^2=0.63
>=2+	7037(81.45)	5561(80.93)	
Activity			
No social activity	4014(46.46)	2826(41.13)	X^2=43.87***
Have social activity	4626(53.54)	4045(58.87)	

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

4.1.2 Family caregiving provision and health of the sample

Table3 shows the family caregiving provision and health comparisons between non-caregiving group and all caregiving group.

The average self-rated health score of non-caregivers was 2.93. Over half of them (74.12%) had poor self-rated health. The average score of depression was 8.58. 37.22% were depressed.

The average intensity of all caregivers was 60.96 hours per week. 76.98% of all caregivers provided care for 20 hours and above per week. The average care duration of all caregivers was 45.54 weeks per year. 79.04% of the caregivers were providing care on the 20 weeks and above per week. The average self-rated health score of all caregivers was 2.90. Over half (74.36%) of all caregivers have poor self-rated health. The average score of depression among all caregivers was 8.27, which was lower than non-caregivers. 36.24% of all caregivers were depressed.

Table 3 Family caregiving provision and health comparisons between non-caregiving group and all caregiving group (n=15511)

	Non-caregiving	**All caregiving**	
	n=8640	**n=6871**	**X^2 or t**
	n(%)	n(%)	
Care intensity(hours)			
Mean±SD		60.96±53.37	
0	8640(100.00)		
1-20 h		1582(23.02)	
>20 h		5289(76.98)	
Care duration(weeks)			
Mean±SD		45.54±30.03	
0	8640(100.00)		
1-20 weeks		1440（21.96）	
>20 weeks		5431（79.04）	
Self-rated health			
Mean ± SD	2.93 ±1.04	2.90±1.00	t=1.61
1	1118(12.94)	869(12.65)	X^2=14.81***
2	1118(12.94)	893(13.00)	
3	4208(48.70)	3502(50.97)	
4	1665(19.27)	1264(18.40)	
5	531(6.15)	343(4.99)	
Self-rated health			
Not good (3-5)	6404(74.12)	5109(74.36)	X^2=0.10
Good (1-2)	2236(25.88)	1762(25.64)	
Depression (CES-D10)			
Mean± SD	8.58 ±6.63	8.27±6.31	t=2.91***
Depressed (>=10)	3216(37.22)	2490(36.24)	X^2=1.55
Undepressed (<10)	5424(62.78)	4381(63.76)	

Note: $^{+}$p<0.1; *p<0.05; **p<0.01; ***p<0.001

4.2 Sample characteristics by care type

4.2.1 Descriptive statistics of the sample by care type

Table 4 shows the descriptive comparisons among non-caregiving group and three-care type groups.

The descriptive statistics of caregivers who provided caregiving to parents only are as follows. They were relatively younger (53.51) than non-caregivers. Over half (51.28%) of them were male. Their average annual income ($3,037) was somewhat higher than non-caregivers. They were more likely to be urban residents (29.76%) than non-caregivers. They were higher educated than non-caregivers, with 79.87% of them attended middle school education and above. They were more likely to be employed (83.73%) than non-caregivers. They were highly independent than non-caregivers, with 98.50% of them ADL functionally independent and 94.86% of them IADL functionally independent. They were less likely to have chronic disease than non-caregivers, with 69.38% of them had at least one chronic disease. They were more likely to live in two-generation families, with 48.07% of them lived in two-generation families. Their average children's number (1.94) was slightly lower than non-caregivers. They were more active than non-caregivers, with over half (69.16%) having social activity.

The descriptive statistics of caregivers who provided caregiving to grandchildren only are as follows. They were younger (60.48 years old) than non-caregivers. They were more likely to be female (54.99%) than

non-caregivers. Their average annual income ($1,510) was lower than non-caregivers. They were more likely to be rural residents (79.19%) than non-caregivers. Their education levels (66.70% attended middle school education and above) were higher than non-caregivers. They were more likely to be unemployed (33.30%) than non-caregivers. They were highly independent than non-caregivers, with 96.06% of them ADL functionally independent and 87.87% of them IADL functionally independent. Their health was slightly worse than non-caregivers, with 80.40% of the caregivers having at least one chronic disease. 42.60% of them lived in one-generation families, which was lower than non-caregivers. Their average children's number (2.60) was higher than non-caregivers. 43.87% of them did not have social activity. They were less active than non-caregivers.

The descriptive statistics for caregivers who provided caregiving to both parents and grandchildren are as follows. They were younger (56.52 years old) than non-caregivers. They were more likely to be female (59.66%) than non-caregivers. Their annual income was $1702, which was lower than non-caregivers. They were more likely to be rural residents (78.12%) than non-caregivers. Their education levels (73.68% attended middle school education and above) were higher than non-caregivers. They were more likely to be employed (71.62%) than non-caregivers. They were highly independent than non-caregivers, with 96.75% of them ADL functionally independent and 90.6% of them IADL functionally independent. 77.09% of them had at least one chronic disease. They were more likely to live in a two-generation family

(35.04%) than non-caregivers. Their average children's number (2.24) was less than non-caregivers. 32.48% of them did not have social activity, and they were more active than non-caregivers.

Table 4 Descriptive comparisons between non-caregiving group and three-care type groups (n=15511; 0: Non-caregiving, 1: Parent caregiving only, 2: Grandchild caregiving only, 3: Both)

	Non caregiving	Parent caregiving only	Grandchild Caregiving only	Both (n=585)	X^2 or F	Scheffe
	n (%)	n (%)	n (%)	n (%)		
Age(years)						
Mean±SD	62.27 ±10.32	53.51 ±6.47	60.48 ±7.32	56.52 ±5.91	F=323.90***	1<3<2<0
45-54	2260(26.16)	556(59.53)	1017(19.00)	193(32.99)	$X^{2=}$1326.80***	
55-64	2394(27.71)	242(25.91)	2451(45.80)	286(48.89		
65-74	2506(29.00)	67(7.17)	1434(26.79)	60(10.26)		
75+	1480(17.13)	69(7.39)	450(8.41)	46(7.86)		
Gender						
Male	4444(51.44)	479(51.28)	2409(45.01)	236(40.34)	$X^{2=}$73.82***	
Female	4196(48.56)	455(48.72)	2943(54.99)	349(59.66)		
Income($)						
Mean±SD	2091 ±4039	3,037 ±4536	1,510 ±2,722	1,702	F=59.07***	2<3<<0<1
< $3,636	6664(77.13)	619(66.27)	4409(82.38)	478(81.71)	$X^{2=}$143.45***	
>=$3,636	1976(22.87)	315(33.73)	943(17.62)	107(18.29)		
Location						
Rural	6661(77.13)	656(70.24)	4238(79.19)	457(78.12)	$X^{2=}$37.83***	
Urban	1979(22.87)	278(29.76)	1114(20.81)	128(21.88)		
Education						
Less than primary school	2958(34.24)	188(20.13)	1782(33.30)	154(26.32)	$X^{2=}$87.89***	
Middle school and above	5682(65.76)	746(79.87)	3570(66.70)	431(73.68)		
Employment						

No	2826(32.71)	152(16.27)	1927(36.01)	166(28.38)	$X^{2=}$146.06***	
Yes	5814(67.29)	782(83.73)	3425(63.99)	419(71.62)		
ADL						
No ADL disability	8140(94.21)	920(98.50)	5141(96.06)	566(96.75)	$X^{2=}$52.43***	
ADL disability	500(5.79)	14(1.50)	211(3.94)	19(3.25)		
IADL						
No IADL disability	7446(86.18)	886(94.86)	4703(87.87)	530(90.60)	$X^{2=}$65.60***	
IADL disability	1194(13.82)	48(5.14)	649(12.13)	55(9.40)		
Having chronic disease						
No	1784(20.65)	286(30.62)	1049(19.60)	134(22.91)	$X^{2=}$60.41***	
Yes	6856(79.35)	648(69.38)	4303(80.40)	451(77.09)		
Household composition						
One generation	5537(64.09)	415(44.43)	2280(42.60)	218(37.26)	$X^{2=}$1269.40***	
Two generation	2232(25.83)	449(48.07)	1521(28.42)	205(35.04)		
Multi generation	871(10.08)	70(7.50)	1551(28.98)	162(27.69)		
Child Number						
Mean±SD	2.78 ±1.60	1.94 ±1.11	2.60 ±1.35	2.24 ±1.02	F=113.00***	1<3<2<0
<=1	1603(18.55)	329(35.22)	863(16.12)	118(20.17)	$X^{2=}$191.36***	
>=2+	7037(81.45)	605(64.78)	4489(83.88)	467(79.83)		
Activity						
No social activity	4014(46.46)	288(30.84)	2348(43.87)	190(32.48)	$X^{2=}$118.32***	
Have social activity	4626(53.54)	646(69.16)	3004(56.13)	395(67.52)		

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.00**

4.2.2 Caregiving provision and health of the sample by care type

Table 5 shows the caregiving provision and health between non-caregiving group and three-care type groups.

The caregiving provision and health for caregivers who provided caregiving to parents only are as follows. Their average intensity was 30.68 hours per week. 51.18% of them provided care for less than 20 hours per week. Their average duration was 29.33 weeks per year. 59.31% of them provided care for more than 20 weeks per year. Their average self-rated health score (2.74) was lower than non-caregivers. They were less likely to have poor self-rated health (69.16%) than non-caregivers. Their average depression score (7.21) was lower than non-caregivers. They were less likely to be depressed (29.87%) than non-caregivers.

The caregiving provision and health for caregivers who provided caregiving to grandchildren only are as follows. Their average intensity was 62.67 hours per week, which was higher than caregivers who only care for parents. Over half of them (80.36%) provided care for more than 20 hours per week, which was higher than caregivers who only care for parents. Their average duration was 45.48 weeks per year, which was higher than caregivers who only care for parents. Over half of them (81.37%) provided care for more than 20 weeks per year, which was higher than caregivers who only care for parents. Their average self-rated health score was 2.9. 75.41% of them had not good self-rated health. Their average depression score was 8.47. 37.56% of them were

depressed.

The caregiving provision and health for caregivers who provided caregiving to parents and grandchildren are as follows. Their average intensity was 93.60 hours per week, which was higher than caregivers who only provided caregiving to parents. 90.94% of them provided care for more than twenty hours, which was higher than caregivers who only provided caregiving to parents. Their average duration of caregivers was 71.94 weeks per year, which was higher than caregivers who only provided caregiving to parents. 89.23% of them provided care for more than 20 weeks per year, which was higher than caregivers who only provided caregiving to parents. Their average self-rated health score (2.83) was lower than non-caregivers. 72.99% had poor self-rated health. Their average depressive symptoms score was 8.10. 34.36% of them were depressed.

Table 5 Descriptive comparisons between non-caregiving group and three-care type groups (n=15511; 0: Non-caregiving, 1: Parent caregiving only, 2: Grandchild caregiving only, 3: Both)

	Non caregiving (n=8670)	**Parent caregiving only (n=934)**	**Grandchild Caregiving only (n=5352)**	**Both (n=585)**	**X^2 or F**	**Scheffe**
	n (%)	**n (%)**	**n (%)**	**n (%)**		
Care intensity(hours)						
Mean±SD		30.68 ±38.68	62.67 ±51.45	93.60 ±65.65	F=91.63***	1<2<3
0	8640(100.00)					
1-20 h		478(51.18)	1051(19.64)	53(9.06)	$X^{2=}$516.71***	
>20 h		456(48.82)	4301(80.36)	532(90.94)		
Care duration(weeks)						
Mean±SD		29.33 ±26.29	45.48 ±27.56	71.97±37.81	F=120.29***	1<2<3
0	8640(100.00)					
1-20 weeks		380(40.69)	997(18.63)	63(10.77)	$X^{2=}$273.61***	
>20 weeks		554(59.31)	4355(81.37)	522(89.23)		
Self-rated health						
Mean ± SD	2.93 ±1.04	2.74 ±0.98	2.94 ±1.01	2.83 ±0.95	F=11.99***	1<0,2
1	1118(12.94)	142(15.20)	654(12.22)	73(12.48)	$X^{2=}$58.73***	
2	1118(12.94)	146(15.63)	662(12.37)	85(14.53)		
3	4208(48.70)	491(52.57)	2697(50.39)	314(53.68)		
4	1665(19.27)	125(13.38)	1044(19.51)	95(16.24)		
5	531(6.15)	30(3.21)	295(5.51)	18(3.08)		
Not good (3-5)	6404(74.12)	646(69.16)	4036(75.41)	427(72.99)	$X^{2=}$16.95***	
Good (1-2)	2236(25.88)	288(30.84)	1316(24.6)	158(27.01)		

Depression (CES-D10)						
Mean± SD	8.58 ±6.63	7.21 ±5.77	8.47±6.36	8.10 ±6.45	F=12.98***	1<0,2,3
Depressed (>=10)	3216(37.22)	279(29.87)	2010(37.56)	201(34.36)	$X^{2=}$22.76***	
Undepressed (<10)	5424(62.78)	655(70.13)	3342(62.44)	384(65.64)		

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.00**

4.3 Factors associated with care intensity

4.3.1 Bivariate analysis of the factors associated with care intensity

Table6 shows results on factors associated with care intensity, stratified by care type.

Table6 presents the factors associated with care intensity: age, gender, income, location, education, employment, ADL, IADL, chronic disease, household composition, child number, activity, and care type for all caregivers. For caregivers, female, lower-income, unemployed, more complex household composition, and more children were significantly associated with a higher care intensity ($p<.001$). Younger age was significantly associated with more care intensity when caregivers are less than 74 ($p<.001$). Grandchild caregiving only was significantly associated with higher care intensity ($p<.001$). Providing caregiving to parents and grandchild was significantly associated with more care intensity ($p<.001$).

For caregivers who provided caregiving to parent only, rural hukou and lower-income were significantly associated with higher care intensity ($p<.01$). ADL disability, IADL disability, and no social activity were significantly associated with higher care intensity ($p<.05$). For caregivers who provided caregiving to parents only, a more complex household composition was significantly associated with higher care intensity ($p<.01$). Unemployed caregivers were more likely to provide higher care intensity ($p<.05$).

For caregivers who provided caregiving to grandchildren only, female, lower-income, unemployed, simpler household composition, and more children were significantly associated with higher care intensity ($p<.001$). Besides this, caregivers aged 55 to 64 were more likely to provide higher care intensity than other age group caregivers ($p<.001$). Rural caregivers were more likely to provide higher care intensity than urban caregivers ($p<.05$).

For caregivers who provided caregiving to parents and grandchildren, the two-generation family was significantly associated with more care intensity ($p<.001$). Having a chronic disease or more and no social activity were significantly associated with higher care intensity ($<.01$). Female and more children were significantly associated with higher care intensity ($p<.05$).

Table 6 Bivariate analysis of the factors associated with care intensity

	All caregiving		Parent caregiving only		Grandparent caregiving only		Both	
	β	SE	β	SE	β	SE	β	SE
Age								
45-54(ref)								
55-64	0.39***	0.04	0.15	0.11	0.15***	0.04	0.08	0.34
65-74	0.24***	0.04	0.28	0.18	-0.04	0.05	0.003	0.98
75+	0.25***	0.06	0.06	0.18	0.05	0.06	0.06	0.69
Gender								
Male(ref)								
Female	0.19***	0.03	-0.08	0.09	0.18***	0.03	0.16*	0.03
Income								
< $3,636(ref)								
>=$3,636	-0.29***	0.04	-0.06	0.10	-0.19***	0.04	-0.11	0.24
Location								
Rural (ref)								
Urban	-0.11**	0.04	0.12	0.10	-0.09*	0.04	0.003	0.98
Education								
Less than primary school (ref)								
Middle school and above	-0.10**	0.03	-0.01	0.12	-0.03	0.03	-0.02	0.82
Employment								
No(ref)								
Yes	-0.23***	0.03	-0.30*	0.12	-0.11***	0.03	-0.11	0.17

ADL								
No ADL disability(ref)								
ADL disability	0.16*	0.08	-0.22	0.38	0.09	0.08	0.17	0.42
IADL								
No IADL disability(ref)								
IADL disability	0.10*	0.05	0.06	0.21	0.02	0.05	-0.05	0.70
Having chronic disease								
No (ref)								
Yes	0.14***	0.04	0.11	0.10	0.03	0.04	0.24**	0.01
Household composition								
One generation(ref)								
Two generation	0.17***	0.03	0.41**	0.09	0.18***	0.04	0.29***	0.00
Multi generation	0.29***	0.04	0.54***	0.18	0.14***	0.04	0.17+	0.07
Child number								
<=1(ref)								
>=2+	0.28***	0.04	-0.03	0.10	0.16***	0.04	0.23*	0.01
Activity								
No social activity(ref)								
Have social activity	-0.06*	0.03	0.09	0.10	-0.007	0.03	-0.22**	0.01
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	1.11***	0.04						
Both	1.64***	0.06						

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

4.3.2 Multivariate analysis of the factors associated with care intensity

Table7 shows results on factors associated with care duration, stratified by care type.

Table7 presents the factors associated with care intensity: age, gender, income, employment, household composition, child number, and care type for all caregivers. For caregivers in the 55-64 age group (β=0.15, p<.001), female (β=0.10, p<.001), a two-generation family (β=0.23, p<.001), more children (β=0.10, p<.01), caregivers who provided caregiving to grandchildren only (β=1.02, p<.001), and caregivers who provided caregiving to parents and grandchildren (β=1.53, p<.001) were significantly associated with higher care intensity. For all caregivers, high income (β=-0.12, p<.01) and employment (β=-0.15, p<.001) were significantly associated with lower care intensity.

For caregivers who provided caregiving to parents only, unemployed (β=-0.27, p<.05) was significantly associated with higher care intensity from the care type grouping results. A multi-generation family (β=0.54, p<.01) was significantly associated with higher care intensity.

For caregivers who provided caregiving to grandchildren only, 55-64 age (β=0.15, p<.001), female (β=0.13, p<.001), and a two-generation family (β=0.17, p<.05) were significantly associated with more care intensity.

For caregivers who provided caregiving to grandchildren only, high-

income (β=-0.12, p<.05), employed (β=--0.14, p<.05), and social activity (β=-0.24, p<.001) were significantly associated with less care intensity. Female (β=0.20, p<.05), chronic disease (β=0.25, p<.01), two-generation families (β=0.30, p<.001), and more children (β=0.23, p<.05) were significantly associated with more care intensity.

Table 7 Multivariate analysis of the factors associated with care intensity

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Age								
45-54(ref)								
55-64	0.15***	0.04	0.20^{+}	0.11	0.15***	0.04	0.07	0.08
65-74	-0.02	0.06	0.34^{+}	0.19	-0.04	0.05	-0.02	0.13
75+	0.05	0.03	0.06	0.18	0.05	0.06	-0.05	0.14
Gender								
Male(ref)								
Female	0.10***	0.04	-0.10	0.10	0.13***	0.03	0.20*	0.08
Income								
< $3,636(ref)								
>=$3,636	-0.12**	0.04	-0.10	0.11	-0.12*	0.05	-0.06	0.11
Location								
Rural (ref)								
Urban	-0.001	0.04	0.07	0.12	-0.03	0.05	0.07	0.11
Education								
Less than primary school (ref)								
Middle school and above	0.02	0.03	-0.05	0.12	0.03	0.03	0.10	0.09
Employment								
No(ref)								
Yes	-0.15***	0.03	-0.27*	0.13	-0.14***	0.03	-0.10	0.09

ADL								
No ADL disability(ref)								
ADL disability	0.06	0.08	-0.43	0.40	0.08	0.08	0.20	0.22
IADL								
No IADL disability(ref)								
IADL disability	-0.05	0.05	0.10	0.22	-0.05	0.05	-0.17	0.14
Having chronic disease								
No(ref)								
Yes	0.06^{+}	0.03	0.06	0.10	0.03	0.04	0.25**	0.09
Household composition								
One generation(ref)								
Two generation	0.23***	0.03	0.47***	0.10	0.17***	0.04	0.30***	0.09
Multi generation	0.17***	0.03	0.54**	0.18	0.13***	0.04	0.17^{+}	0.09
Child number								
<=1(ref)								
>=2+	0.10**	0.04	-0.08	0.11	0.15***	0.04	0.23*	0.10
Activity								
No social activity(ref)								
Have social activity	0.01	0.03	0.07	0.10	0.02	0.03	-0.24**	0.08
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	1.02***	0.04						
Both	1.53***	0.06						

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

4.4 Factors associated with care duration

4.4.1 Bivariate analysis of the factors associated with care duration

Table8 presents the factors associated with care duration: age, gender, income, education, employment, IADL, chronic disease, household composition, child number, and care type for all caregivers. For all caregivers, younger age, female, lower-income, lower education level, unemployed, more generation, more children, care for grandchildren only, and care for both parents and grandchildren were significantly associated with longer care duration ($p<.001$). For all caregivers, having IADL disabilities and chronic diseases were significantly associated with longer care duration ($p<.01$).

For caregivers who provided caregiving to parents only, urban hukou ($p<.001$), two-generation family ($p<.001$), more children ($p<.01$) were significantly associated with longer care duration. ADL disability was significantly associated with shorter care duration ($p<.05$).

For caregivers who provided caregiving to grandchildren only, females, lower-income, lower education level, and unemployed, more generations were significantly associated with longer care duration ($p<.001$). A lower education level was significantly associated with longer care duration ($p<.01$). Besides this, younger age was significantly associated with longer care duration ($p<.05$).

For caregivers who provided caregiving to parents and grandchildren, More generations ($p<.001$) were significantly associated

with longer care duration. Low-income and unemployed were significantly associated with longer care duration ($p<.05$).

Table 8 Bivariate analysis of the factors associated with care duration

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	SE	β	SE	β	SE	β	SE
Age								
45-54(ref)								
55-64	0.37***	0.03	0.18	0.11	0.23***	0.04	0.09	0.08
65-74	0.32***	0.04	0.26	0.18	0.18***	0.04	0.06	0.12
75+	0.24***	0.05	-0.04	0.18	0.15*	0.06	0.19	0.13
Gender								
Male(ref)								
Female	0.13***	0.03	-0.01	0.09	0.12***	0.03	0.08	0.07
Income								
< $3,636(ref)								
>=$3,636	-0.20***	0.03	0.13	0.10	-0.16***	0.04	-0.20*	0.09
Location								
Rural (ref)								
Urban	0.02	0.03	0.44***	0.10	-0.01	0.03	0.11	0.08
Education								
Less than primary school (ref)								
Middle school and above	-0.11***	0.03	0.10	0.11	-0.10**	0.03	-0.03	0.08
Employment								
Unemployment(ref)								
Employment	-0.23***	0.03	-0.08	0.12	-0.16***	0.03	-0.17*	0.07

ADL								
No ADL disability(ref)								
ADL disability	0.02	0.07	-0.79*	0.38	0.01	0.07	0.004	0.19
IADL								
No IADL disability(ref)								
IADL disability	0.12**	0.04	0.08	0.21	0.06	0.04	-0.01	0.12
Having chronic disease								
No (ref)								
Yes	0.10**	0.03	0.11	0.10	0.03	0.04	-0.02	0.08
Household composition								
One generation(ref)								
Two generation	0.27***	0.03	0.36***	0.10	0.29***	0.03	0.38***	0.08
Multi generation	0.46***	0.03	0.23	0.18	0.36***	0.03	0.46***	0.08
Child number								
<=1(ref)								
>=2+	0.14***	0.03	-0.27**	0.10	0.10**	0.04	0.13	0.08
Activity								
No social activity(ref)								
Have social activity	-0.04	0.03	0.18^{+}	0.10	-0.03	0.03	-0.07	0.07
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	0.80***	0.04						
Both	1.36***	0.06						

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

4.4.2 Multivariate analysis of the factors associated with care duration

Table9 presents the factors associated with care duration: age, gender, income, location, employment, household composition, and care type for all caregivers. For all caregivers in the 55-64 age group (β=0.22, p<.001), female (β=0.06, p<.001), urban hukou (β=0.10, p<.05), a multi-generation family (β=0.38, p<.001) have long care duration. Caregivers with high income (β=-0.13, p<.001), employment (β=-0.13, p<.001) were significantly associated with shorter care duration. Grandchild caregiving only (β=0.67, p<.001) was significantly associated with longer care duration. Care for both parents and grandchildren (β=1.23, p<.001) was significantly associated with longer care duration.

From the care type grouping results, for caregivers who provided caregiving to parents only, 65-74 age group (β=0.49, p<.01), urban hukou (β=0.37, p<.01), and two-generation family (β=0.44, p<.001) were significantly associated with longer care duration. ADL disability (β=-1.01, p<.05), and more children (β=-0.24, p<.05) were significantly associated with shorter care duration.

For caregivers who provided caregiving to grandchildren only, younger age, female (β=0.07, p<.05), and more generation families were significantly associated with longer care duration. High income (β=-0.14, p<.01) and employment (β=-0.17, p<.001) were significantly associated with shorter care duration.

For caregivers who provided caregiving to parents and grandchildren, high income (β=-0.26, $p<.001$) and employment (β=-0.18, $p<.05$) were significantly associated with shorter care duration. Multi-generational families were significantly associated with higher care duration ((β=0.38, $p<.001$).

Table 9 Multivariate analysis of the factors associated with care duration

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Age								
45-54(ref)								
55-64	0.22***	0.03	0.31**	0.11	0.24***	0.04	0.08	0.07
65-74	0.17***	0.04	0.49**	0.19	0.18***	0.04	0.04	0.12
75+	0.12*	0.05	0.03	0.18	0.14*	0.06	0.11	0.13
Gender								
Male(ref)								
Female	0.06*	0.03	0.03	0.09	0.07*	0.03	0.05	0.07
Income								
< $3,636(ref)								
>=$3,636	-0.13***	0.04	-0.02	0.11	-0.14**	0.04	-0.26**	0.10
Location								
Rural (ref)								
Urban	0.10*	0.04	0.37**	0.12	0.02	0.04	0.15	0.10
Education								
Less than primary school (ref)								
Middle school and above	-0.03	0.03	-0.04	0.12	-0.04	0.03	0.04	0.08
Employment								
No (ref)								
Yes	-0.13***	0.03	0.13	0.13	-0.17***	0.03	-0.19*	0.08

ADL								
No ADL disability(ref)								
ADL disability	-0.10	0.07	-1.00*	0.39	-0.05	0.08	-0.06	0.20
IADL								
No IADL disability(ref)								
IADL disability	0.02	0.04	0.35	0.22	-0.004	0.05	-0.02	0.12
Having chronic disease								
No (ref)								
Yes	0.02	0.03	0.10	0.10	0.02	0.03	-0.005	0.08
Household composition								
One generation(ref)								
Two generation	0.34***	0.03	0.44***	0.10	0.30***	0.03	0.39***	0.08
Multi generation	0.38***	0.03	0.22	0.18	0.37***	0.03	0.47***	0.08
Child number								
<=1(ref)								
>=2+	-0.01	0.03	-0.24*	0.10	0.06	0.04	0.10	0.09
Activity								
No social activity(ref)								
Have social activity	0.01	0.03	0.08	0.10	0.01	0.03	-0.06	0.07
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	0.66***	0.04						
Both	1.23***	0.06						

Note: $^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

4.5 The relationship between family caregiving provision and self-rated health

4.5.1 Bivariate analysis of the relationship between family caregiving provision and self-rated health

Table10 shows the relationship between family caregiving provision and health, factors associated with health, stratified by care type.

Table10 presents the factors associated with self-rated health: age, gender, income, location, education, employment, ADL, IADL, chronic disease, household composition, child number, activity, care type, care duration, and care intensity for all caregivers. For all caregivers, female, lower-income, rural hukou, lower-education, unemployed, ADL disability, IADL disability, chronic disease, more children, no social activity, and care for grandchildren only were significantly associated with worse self-rated health ($p<.001$). Older caregivers who are under 74 have worse self-rated health ($p<.001$). A multi-generation family was significantly associated with worse self-rated health ($p<.05$).

From the care type grouping results, for caregivers who provided caregiving to parents only, 55-64, lower-income, ADL disability, IADL disability, and chronic disease were significantly associated with worse self-rated health ($p<.001$). Rural hukou and lower education were significantly associated with worse self-rated health ($p<.01$). Women were significantly associated with worse self-rated health ($p<.05$).

For caregivers who provided caregiving to grandchildren only, 65-74, lower-income, rural hukou, lower education level, unemployed, ADL disability, IADL disability, chronic disease, and more children were significantly associated with worse self-rated health ($p<.001$). Women were significantly associated with worse self-rated health ($p<.01$).

For caregivers who provided caregiving to parents and grandchildren, lower-income, ADL disability, IADL disability, chronic disease, more children, and no social activity were significantly associated with worse self-rated health ($p<.001$).

Table 10 Bivariate analysis of the relationship between family caregiving provision and self-rated health[a]

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	SE	β	SE	β	SE	β	SE
Age								
45-54(ref)								
55-64	0.12***	0.03	0.28***	0.08	0.07+	0.04	-0.05	0.09
65-74	0.27***	0.03	0.17	0.13	0.24***	0.04	-0.02	0.14
75+	0.13**	0.05	0.05	0.12	0.13*	0.06	-0.10	0.16
Gender								
Male(ref)								
Female	0.10***	0.24	0.14*	0.06	0.08**	0.03	0.13	0.08
Income								
< $3,636(ref)								
>=$3,636	-0.32***	0.03	-0.39***	0.07	-0.27***	0.04	-0.44***	0.10
Location								
Rural (ref)								
Urban	-0.16***	0.03	-0.21**	0.07	-0.12***	0.03	-0.25**	0.10
Education								
Less than primary school (ref)								
Middle school and above	-0.21***	0.03	-0.24**	0.08	-0.20***	0.03	-0.10	0.09
Employment								
No (ref)								
Yes	-0.21***	0.03	-0.09	0.09	-0.23***	0.03	0.03	0.09

ADL								
No ADL disability(ref)								
ADL disability	1.05***	0.07	0.99***	0.26	1.05***	0.07	0.83***	0.22
IADL								
No IADL disability(ref)								
IADL disability	0.84***	0.04	0.76***	0.14	0.83***	0.04	0.81***	0.13
Having chronic disease								
No (ref)								
Yes	0.75***	0.03	0.68***	0.07	0.76***	0.03	0.75***	0.09
Household composition								
One generation(ref)								
Two generation	-0.01	0.03	-0.07	0.07	0.03	0.03	-0.05	0.09
Multi generation	0.06*	0.03	0.06	0.13	0.05	0.03	0.05	0.10
Child number								
<=1(ref)								
>=2+	0.15***	0.03	0.13^{+}	0.07	0.13***	0.04	0.12	0.10
Activity								
No social activity(ref)								
Have social activity	-0.19***	0.02	-0.13^{+}	0.07	-0.19***	0.03	-0.06	0.08
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	0.20***	0.04						
Both	0.09^{+}	0.05						

Care intensity(hours)	0.03**	0.01	0.03	0.02	0.02	0.01	0.01	0.04
Care duration(weeks)	0.03*	0.01	0.004	0.02	0.02	0.01	0.002	0.05

Note: ref=reference

[a] **Self-rated health: 1→5(very good→very poor)**

[+]**p<0.1**; ***p<0.05; **p<0.01; ***p<0.001**

4.5.2 Multivariate analysis of the relationship between family caregiving provision and self-rated health

Table11 presents the factors associated with self-rated health scores: income, location, education, employment, ADL, IADL, chronic disease, household composition, and social activity status for all caregivers.

For all caregivers, high income (β=-0.22, p<.001), urban hukou (β=-0.06, p<.1), higher education (β=-0.05, p<.1), employed (β=-0.13, p<.001), and having a social activity or more (β=-0.10, p<.001) were significantly associated with better self-rated health. However, for all caregivers, ADL disability (β=0.48, p<.001), IADL disability (β=0.56, p<.001), chronic disease (β=0.68, p<.001), with a multi-generation family (β=0.06, p<.05) were significantly associated with worse self-rated health.

For caregivers who provided caregiving to parents only, female (β=0.14, p<.05), IADL disability (β=0.46, p<.01), chronic disease (β=0.63, p<.001) were significantly associated with worse self-rated health. For caregivers who provided caregiving to parents only, high income (β=-0.23, p<.01) was significantly associated with better self-rated health.

For caregivers who provided caregiving to grandchildren only, high income (β=-0.20, p<.001), high education (β=-0.06, p<.05), employment (β=-0.16, p<.001), and having social activity (β=-0.11, p<.001) were significantly associated with better self-rated health. For

caregivers who provided caregiving to grandchildren only, ADL disability (β=0.50, p<.001), IADL disability (β=0.56, p<.001), chronic disease (β=0.69, p<.001), and with a multi-generation family (β=0.06, p<.05) were significantly associated with worse self-rated health.

For caregivers who care for alive parents and grandchildren, high income (β=-0.43, p<.001) was significantly associated with better self-rated health. For caregivers who care for living parents and grandchildren, IADL disability (β=0.56, p<.001), chronic disease (β=.73, p<.001) was significantly associated with worse self-rated health.

Table 11Multivariate analysis of the relationship between family caregiving provision and self-rated health[a]

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	SE	β	SE	β	SE	β	SE
Age								
45-54(ref)								
55-64	-0.02	0.03	0.14^{+}	0.07	-0.04	0.04	-0.08	0.08
65-74	0.03	0.04	-0.02	0.13	0.02	0.04	-0.02	0.13
75+	-0.05	0.05	0.01	0.12	-0.06	0.05	-0.09	0.14
Gender								
Male(ref)								
Female	-0.01	0.02	0.14*	0.06	-0.04	0.03	0.08	0.08
Income								
< $3,636(ref)								
>=$3,636	-0.22***	0.03	-0.23**	0.07	-0.20***	0.04	-0.43***	0.11
Location								
Rural (ref)								
Urban	-0.06^{+}	0.03	-0.09	0.08	-0.06	0.04	-0.01	0.11
Education								
Less than primary school (ref)								
Middle school and above	-0.05^{+}	0.03	-0.04	0.08	-0.06*	0.03	0.12	0.09
Employment								
No (ref)								
Yes	-0.13***	0.03	0.09	0.09	-0.16***	0.03	0.01	0.09

ADL								
No ADL disability(ref)								
ADL disability	0.48***	0.07	0.42	0.26	0.50***	0.07	0.28	0.22
IADL								
No IADL disability(ref)								
IADL disability	0.56***	0.04	0.46**	0.15	0.56***	0.04	0.56***	0.14
Having chronic disease								
No (ref)								
Yes	0.68***	0.03	0.63***	0.07	0.69***	0.03	0.73***	0.09
Household composition								
One generation(ref)								
Two generation	0.02	0.03	0.001	0.07	0.05	0.03	-0.06	0.09
Multi generation	0.06*	0.03	0.06	0.12	0.06*	0.03	0.06	0.09
Child number								
<=1(ref)								
>=2+	-0.02	0.03	-0.07	0.07	-0.01	0.04	-0.02	0.10
Activity								
No social activity(ref)								
Have social activity	-0.10***	0.02	-0.10	0.07	-0.11***	0.03	-0.05	0.08
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	-0.02	0.04						
Both	-0.06	0.5						

Care intensity	0.01	0.01	0.02	0.02	0.01	0.01	-0.04	0.04
Care duration	-0.003	0.01	0.002	0.02	-0.01	0.01	-0.01	0.05

Note: ref=reference

[a] Self-rated health: 1→5(very good→very poor)

[+]p<0.1; ***p<0.05; ****p<0.01; *****p<0.001**

4.6 The relationship between family caregiving provision and depressive symptom

4.6.1 Bivariate analysis of the relationship between family caregiving provision and depressive symptom

Table12 presents the factors associated with depression: age, gender, income, location, education, IADL, chronic disease, child number, care type, and care intensity for all caregivers. For all caregivers, female, lower-income, rural hukou, lower education level, ADL disability, IADL disability, chronic disease, more children, no social activity, and grandchild caregiving only were significantly associated with worse depression ($p<.001$).

For caregivers who provided caregiving to parents only, the female, lower-income, rural hukou, lower education level, ADL disability, IADL disability, chronic disease, and more children were significantly associated with more depressive symptoms ($p<.001$). No social activity was significantly associated with more depressive symptoms ($p<.01$).

For caregivers who provided caregiving to grandchildren only, female, lower-income, rural hukou, lower education level, ADL disability, IADL disability, chronic disease, more children, no social activity, and more care intensity were significantly associated with more depressive symptoms($p<.001$). Two-generation families and longer care duration were significantly associated with more depressive symptoms ($p<.05$).

For caregivers who provided caregiving to parents and grandchildren, lower-income, rural hukou, lower education level, ADL disability, IADL disability, chronic disease, more children, no social activity, and more care intensity were significantly associated with more depressive symptoms ($p<.001$). Female, unemployed were significantly associated with more depressive symptoms ($p<.01$). Two-generation families and more children were significantly associated with more depressive symptoms ($p<.05$).

Table 12 Bivariate analysis of the relationship between family caregiving provision and depressive symptom[a]

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	SE	β	SE	β	SE	β	SE
Age								
45-54(ref)								
55-64	0.50**	0.19	0.54	0.45	0.26	0.24	-0.44	0.60
65-74	0.35	0.22	0.61	0.75	0.08	0.26	-1.68^{+}	0.95
75+	0.65*	0.30	-0.42	0.74	0.64^{+}	0.36	-0.53	1.06
Gender								
Male(ref)								
Female	2.03***	0.15	1.86***	0.37	2.07***	0.17	1.67**	0.54
Income								
< $3,636(ref)								
>=$3,636	-3.45***	0.19	-2.81***	0.39	-3.45***	0.22	-3.93***	0.67
Location								
Rural (ref)								
Urban	-2.38***	0.18	-1.68***	0.41	-2.38***	0.21	-3.02***	0.63
Education								
Less than primary school (ref)								
Middle school and above	-2.14***	0.16	-1.77***	0.47	-2.07***	0.18	-2.52***	0.60
Employment								
No (ref)								
Yes	-0.18	0.16	0.23	0.51	-0.24	0.18	1.69**	0.59

ADL								
No ADL disability(ref)								
ADL disability	7.58***	0.40	9.07***	1.53	7.16***	0.44	9.96***	1.45
IADL								
No IADL disability(ref)								
IADL disability	5.61***	0.23	6.28***	0.83	5.36***	0.26	6.95***	0.87
Having chronic disease								
No (ref)								
Yes	2.45***	0.18	2.27***	0.40	2.34***	0.22	2.79***	0.63
Household composition								
One generation(ref)								
Two generation	0.32+	0.18	-0.13	0.39	0.45*	0.21	1.25*	0.63
Multi generation	0.04	0.19	-0.55	0.75	-0.11	0.21	0.69	0.67
Child number								
<=1(ref)								
>=2+	2.04***	0.19	1.35***	0.39	2.13***	0.24	1.45*	0.66
Activity								
No social activity(ref)								
Have social activity	-1.18***	0.15	-1.14**	0.41	-1.13***	0.18	-0.85	0.57
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	1.26***	0.22						
Both	0.89**	0.33						

Care intensity(hours)	0.32***	0.06	0.08	0.14	0.30***	0.08	0.28	0.30
Care duration(weeks)	0.11^{+}	0.07	-0.35*	0.14	0.18*	0.09	-0.39	0.33

Note: ref=reference

[a] Depressive symptom: CES-D-10 score (1-30; Higher score means more depressive symptom)

$^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

4.6.2 Multivariate analysis of the relationship between family caregiving provision and depressive symptom

Table13 presents the factors associated with depression score: age, gender, income, location, education, ADL, IADL, chronic disease, child number, social activity status, and care intensity for all caregivers. For all caregivers, the 65-74 age (β=-0.51, p<.05), high income (β=-1.85, p<.001), urban hukou (β=-0.69, p<.01), high education (β=-0.63, p<.001), and having one or more social activity (β=-0.40, p<.01) were significantly associated with fewer depressive symptoms. However, female (β=1.35, p<.001), ADL disability (β=4.34, p<.001), IADL disability (β=3.73, p<.001), chronic disease (β=2.01, p<.001), more children (β=0.70, p<.001), and more care intensity (β=0.14, p<.05) were significantly associated with worse depression status for all caregivers.

For caregivers who provided caregiving to parents only, high income (β=-1.72, p<.001) and longer duration (β=-0.31, p<.05) were significantly associated with fewer depressive symptoms. For caregivers who provided caregiving to parents only, female (β=1.69, p<.001), employment (β=1.31, p<.05), ADL disability (β=5.04, p<.001), IADL disability (β=4.20, p<.001), chronic disease (β=2.07, p<.001) were significantly associated with more depressive symptoms.

For caregivers who provided caregiving to grandchildren only, female (β=1.31, p<.001), ADL disability (β=4.09, p<.001), IADL disability (β=3.60, p<.001), chronic disease (β=1.98, p<.001), and more children

(β=0.95, p<.001) were significantly associated with more depressive symptoms. For caregivers who provided caregiving to grandchildren only, higher income (β=-1.82, p<.001), urban hukou (β=-0.77, p<.01), higher education (β=-0.67, p<.001), and having one or more activity (β=-0.37, p<.05) were significantly associated with fewer depressive symptoms.

For caregivers who care for alive parents and grandchildren, high income (β=-2.48, p<.001) was significantly associated with fewer depressive symptoms. For caregivers who provided caregiving to parents and grandchildren, female (β=1.20, p<.05), ADL disability (β=6.16, p<.001), IADL disability (β=4.24, p<.001), chronic disease (β=2.31, p<.001), and a two-generation family (β=1.19, p<.05) were significantly associated with more depressive symptom.

Table 13 Multivariate analysis of the relationship between family caregiving provision and depressive symptom[a]

	All caregiving		Parent caregiving only		Grandchild caregiving only		Both	
	β	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Age								
45-54(ref)								
55-64	-0.01	0.18	0.26	0.44	0.01	0.22	-0.03	0.56
65-74	-0.51*	0.23	-0.16	0.74	-0.48^{+}	0.26	-1.10	0.90
75+	-0.04	0.29	-0.39	0.69	0.04	0.34	-0.07	0.97
Gender								
Male(ref)								
Female	1.35***	0.15	1.69***	0.37	1.32***	0.17	1.20*	0.54
Income								
< $3,636(ref)								
>=$3,636	-1.85***	0.21	-1.72***	0.41	-1.82***	0.26	-2.48***	0.74
Location								
Rural (ref)								
Urban	-0.69**	0.21	-0.28	0.46	-0.77**	0.25	-0.81	0.73
Education								
Less than primary school (ref)								
Middle school and above	-0.63***	0.16	-0.15	0.48	-0.67***	0.18	-0.65	0.60
Employment								
No (ref)								
Yes	0.21	0.17	1.31*	0.52	-0.01	0.19	0.97	0.61

ADL								
No ADL disability(ref)								
ADL disability	4.34***	0.41	5.04**	1.54	4.09***	0.45	6.16***	1.49
IADL								
No IADL disability(ref)								
IADL disability	3.73***	0.25	4.20***	0.86	3.60***	0.27	4.24***	0.91
Having chronic disease								
No (ref)								
Yes	2.01***	0.17	2.07***	0.40	1.98***	0.20	2.31***	0.59
Household composition								
One generation(ref)								
Two generation	0.21	0.17	0.19	0.38	0.13	0.20	1.19*	0.59
Multi generation	-0.17	0.18	-0.53	0.70	-0.24	0.20	0.71	0.63
Child number								
<=1(ref)								
>=2+	0.70***	0.19	0.05	0.41	0.95***	0.23	-0.02	0.65
Activity								
No social activity(ref)								
Have social activity	-0.40**	0.15	-0.63	0.40	-0.37*	0.16	-0.46	0.53
Care type								
Caregiving to parents only(ref)								
Caregiving to grandchildren only	0.10	0.23						
Both	-0.14	0.33						

Care intensity	0.14*	0.06	0.12	0.13	0.14^{+}	0.08	0.06	0.28
Care duration	-0.09	0.07	-0.31*	0.13	-0.003	0.08	-0.61^{+}	0.32

Note: ref=reference

[a] Depressive symptom: CES-D-10 score (1-30; Higher score means more depressive symptom)

$^{+}$p<0.1; ***p<0.05; **p<0.01; ***p<0.001**

Chapter 5. Discussion

This study targets caregivers who care for parents and grandchildren in China. This study investigated caregivers' characteristics, caregiving provision, and health in China. Secondly, this study examined the factors associated with family caregiving provision. Besides that, the relationship between family caregiving provision and health and the factors related to health were identified.

The analysis results of this study and the consequences of previous studies are summarized as follows.

5.1 Caregivers' characteristics, caregiving provision, and health in China

Descriptive analysis was performed to examine the caregivers' characteristics, caregiving provision, and health in China. As a result, 6.02% of all samples provided caregiving to parents only. This result was slightly lower than the previous study (Xu H, 2019). 34.50% of all samples provided caregiving to grandchildren only. This result was somewhat higher than the earlier studies (KO PC et al., 2014; Xu H, 2019). 3.78% of all caregivers provided caregiving to parents and grandchildren. This result was slightly lower than the previous study (Xu H, 2019). In China, grandparents caring for grandchildren are common for many families. Firstly, grandparents care for their

grandchildren to get financial, emotional support from their children due to China's imperfect care and retirement policy. Secondly, a high level of co-residence between grandparents and grandchildren and extensive sharing of child-care responsibilities in China (Chen L et al., 2011). In addition to cultural factors, Chinese grandparents may take care of grandchildren due to their adult children's full-time work and the lack of childcare services (Zhou J et al., 2016). Low parent caregiving only and both caregiving prevalence may be explained by the low life expectancy of Chinese. In 2019, the Chinese population's average life expectancy was 77.3 years old (NBSC, 2020). This study found that non-caregivers were older than caregivers who only cared for parents who were younger (62.27 vs. 53.51 years old). This study also found that non-caregivers are older than caregivers who cared for both parents and grandchildren (62.27 vs. 56.52 years old). Thus, most non-caregivers may not have living parents.

This study compared the differences between non-caregivers and caregivers overall in individual characteristics, family characteristics, and social activity status using chi-square test and t-test. This study also compared the differences between non-caregivers and caregivers classified by three-care types in individual characteristics, family characteristics, and social activity status using chi-square test, ANOVA analysis, and Tukey HSD test.

This study found significant differences between non-caregivers and caregivers about depressive symptoms. Compared to non-caregivers, the average depression score of caregivers was lower (8.58 vs. 8.27). The

average depression score was between 7.44 and 9.54 in the previous study (Liu H, 2019). However, by separating the three types of caring, our results on caring on depressive symptoms yield a complex picture. This study did not find significant differences between non-caregivers and caregivers who only provided grandchildren caregiving or both. Among caregivers who only provided parent caregiving, caregiving provision predicted fewer depressive symptoms. In China, common family caregiving due to cultural traditions that accentuate family harmony and collective well-being, including intergenerational exchanges, filial family responsibilities, and social expectations (Lou & Chi, 2012). Providing family caregiving can interact and strengthen the international bond and benefit psychological health (Chen X et al., 2000; Ku L et al., 2013).

This study also found that poor self-rated health and depressive symptoms were most prevalent among caregivers who cared for grandchildren. This result may be due to the millions of left-behind children and older grandparents in China. Firstly, left-behind children mean that children's parents worked in a distant place. The children are left behind in their rural communities, cared for by their grandparents in China. This study found that about four times rural grandparents caring for grandchildren than urban grandparents (79.2 vs. 20.8%). Migrant parents from rural areas typically decided to leave their children behind, creating a potentially vulnerable subpopulation of left-behind children (LBC) in rural and urban areas (Tong L et al., 2019). This kind of migrant has led to a prevalence of family separation among migrant

workers, with millions of children left behind in their rural communities cared for by their grandparents in China (Liu, Li &Ge, 2009). The intensity was more than two times caregivers caring for grandchildren only than caring for parents only (30.68 vs. 62.67 hours per week). Providing care to grandchildren was almost equivalent to a full-time job. With children absent and high intensity of care for grandchildren, grandchild caregivers commonly feel burn out. Also, caregivers who only cared for grandchildren were older than other caregivers (60.48 vs. 53.51 and 56.52 years old). Older individuals may experience a deterioration of their health condition in older ages, limiting their capacity for social engagement and, in turn, influencing their well-being in later life (Schmidt AE et al., 2016).

Family caregivers were more likely to be younger, female, more active, and to live in larger households. These findings were consistent with previous studies (Arber S et al. in 1995; Glaser K et al., 2002; Schmid et al., 2011; Zhang Q, 2012; Carbonell, Á, 2019). In China, women were more likely to provide eldercare than men because they have more family responsibilities and more pressure to participate in socio-economic activities (Zhang Q, 2012). This study found no difference in location between non-caregivers and caregivers who provided both parent and grandchild caregiving. This finding differed from a previous study (Xu H, 2019). This study is a cross-sectional study, and the study of Xu H (2019) was longitudinal. Study type differences in family caregiving may create an inconsistent result.

5.2 Factors associated with family caregiving provision

5.2.1 Factors associated with family caregiving intensity

Multivariate regression analysis was conducted to identify factors related to care intensity.

The factors related to care intensity commonly suggested were age, gender, income, employment, household composition, child number, and care type for all caregivers. According to the research results, it was found that women are more likely to have a higher level of intensity than men, which is consistent with previous studies (Gilligan, 1982; Pinquart, 1983; Barusch&Spiaid, Ross, 1987; Barush & Spaid, 1989; Navaie-Waliser, M. et al., 2002; Pinquart M et al., 2006; Pinquart M et al., 2007). Caregivers who live in a two-generation family were more likely to have a higher intensity level. This study was consistent with the previous research (Verbakel, E., 2018). This study found that the rural population was more likely to provide high care intensity. This finding was consistent with an earlier study (Chen F, 2012). Unemployed caregivers were more likely to have a higher intensity level. This finding was consistent with the previous research (Verbakel, E., 2018). Caregivers living in a two-generation family were significantly associated with higher care intensity. This finding was consistent with the previous study (Verbakel, E., 2018). Care type was significantly associated with care intensity. This finding was consistent with the research earlier (Verbakel, E., 2018).

For caregivers who provided caregiving to parents only, unemployed was significantly associated with more care intensity. This result was consistent with several studies on the relationship between care type and care intensity (Yi Wang, 2020).

5.2.2 Factors associated with family caregiving duration

Multivariate regression analysis was conducted to identify factors related to care duration.

The factors related to care duration commonly suggested were age, gender, income, location, employment, household composition, and care type for all caregivers. According to the research results, it was found that female was more likely to provide care with longer duration than male, which was consistent with previous studies (Gilligan, 1982; Barusch&Spiaid; Ross, 1987; Barush & Spaid, 1989; Pinquart M et al., 2006; Pinquart M et al., 2007). Care type was significantly associated with care duration. This finding was consistent with the previous study (Verbakel, E., 2018).

5.3 The relationship between family caregiving provision and health

Multivariate regression analysis was conducted to identify the relationship between family caregiving provision and health and health-related factors.

5.3.1 The relationship between family caregiving provision and self-rated health

Following analysis of the samples' self-rated health, it was confirmed that there was a significant difference in age, gender, income, location, education, ADL, IADL, a condition of chronic disease, household composition, social activity. Female caregivers have worse self-rated health than male caregivers. This result was consistent with the previous study result (Coe and Van Houtven, 2010). Unemployed caregivers who provided caregiving to parents only have worse self-rated health than employed caregivers. This result was consistent with the previous study results (Hausler N et al., 2018). Providing grandchildren's care of a two-generation family was not significantly associated with self-rated health. This result was consistent with the result found in a previous study (McGarrigle CA., 2014). This study found that providing grandchild care was not significant with self-rated health, which consistent with the earlier study of China(Wang Hao et al., 2020)

For caregivers who provided caregiving to parents only, this study reported that female was more likely to report poor self-rated health than

male caregivers, which was consistent with previous studies(Chiou C. J et al.,2005; Coe N.B, 2009; Häusler, N et al., 2018).

For caregivers who provided caregiving to grandchildren only, this study reported that multi-generational caregivers were more likely to report worse self-rated health, which is in contrast with a previous study in China(Ku LJ,2013). This study found that care intensity was not significantly related to self-rated health. However, previous studies found that care intensity was significantly associated with self-rated health in China (Chen F, 2012; Han Baoqing, 2019). This study is a cross-sectional study, and the study of Chen F (2012) and Han Baoqing (2019) were longitudinal. The inconsistent evidence suggests that study type differences in family caregiving may create an inconsistent result. Besides, this study used five scale measurements (very good, good, fair, poor, and very poor) to measure self-rated health. However, Chen F (2012) used four scale measurements (excellent, good, fair, and poor) to measure self-rated health. The difference in measurements may create different results.

5.3.2 The relationship between family caregiving provision and depression

Multivariate regression analysis was conducted to identify the relationship between family caregiving provision and depression and related factors.

Following analysis of the caregivers' depressive symptoms, it was

confirmed that there was a significant difference between sex, income, location, education, ADL, IADL, income, state of chronic illness, number of children, social activity, and intensity of care. There was no significant relationship when only compares care type. This result was consistent with the results found in previous studies (Dura, Stukenberg, & Kiecolt-Glaser, 1991b; Schulz et al., 1995). Female caregivers have more depressive symptoms than male caregivers. This result was consistent with the results found in previous studies (Boucher A et al., 2019). Caregivers with higher education were significantly associated with less depressive symptoms. This result was consistent with the results found in previous studies (Mcgarrigle C A et al.,2019). Higher care intensity was significantly associated with more depressive symptoms. This result was consistent with the results found in previous studies (Wolf DA.,2018; Hirst,2005; Grammenos, 2005; SPRU,2009; OECD,2011). Caregiver duration was negatively associated with the health of caregivers who provided caregiving to parents only. This result was consistent with the results found in previous studies (Yihan Wang, 2019).

For caregivers who provided caregiving to parents only, this study indicated that caregivers with higher education were not significantly associated with depressive symptoms, which was consistent with the previous research (McGarrigle, C. A., 2019) Caregiving duration was negatively associated with caregivers' depressive symptoms, which was consistent with the earlier study of China (Yihan Wang, 2019). However, care intensity estimates higher depressive symptoms in foreign countries

(OECD,2011; Wolf DA, 2018). Caregiving intensity was not significantly associated with caregivers' depressive symptoms, which was consistent with the previous study in China (Yihan Wang, 2019).

For caregivers who provided caregiving to grandchildren only, this study reported that caregivers' income and location were significantly associated with grandchildren caregivers' depressive symptoms, which were consistent with previous studies (Butler et al. 2005; Wang et al., 2010; Ku, L. J. et al., 2013; Danielsbacka, M. et al., 2019). This study found that care duration and intensity were not significantly associated with caregivers' depressive symptoms, which was inconsistent with the previous research in China (Yihan Wang, 2019). The inconsistency is perhaps due to the effect of the family care type of these caregivers. Yihan Wang (2019) did not distinguish caregivers who provided caregiving to both parents and grandchildren from family caregivers. Thus, given that both parent and grandchildren caregiving have a bias to the results in Yihan Wang (2019)'s study.

5.4 Policy implications

This study suggests a policy drive to strengthen preventative and treatment services targeted at mental health for family caregivers.

Firstly, to develop financial support for family caregivers. Low-income caregivers have worse self-rated health and more depressive symptoms than high-income caregivers. The strong association between income and health suggests that promoting family caregivers' financial support could be an effective strategy to improve their health. For elderly care, it is an effective strategy for using financial support to integrate family caregivers and Long-Term Care Insurance (LTCI). During the 13th five-year plan (2016-2020) period, the Chinese government started developing the home and community-based care policy and integrated medical and aged care. Home and community-based care policies include building the home and community infrastructure and developing LTCI. It can be seen from the Chinese government's policies that the future community-based care policy will become the main direction of China's future care. Family caregivers will be the primary care source in the future. Therefore, it is necessary to improve the health of family caregivers at the family level. Since 2016, LTCI has started to launch pilots in 15 pioneer cities and two provinces in China. It is better to link family care for long-term care insurance. Internationally, in countries such as South Korea, the LTCI has attached to family caregivers. In June 2011, the administration announced a notification about the amendment of the compensations for in-home care

services offered by family caregivers, such as cash.

Secondly, promoting social activity for intergenerational caregivers at a community level. This study finds that more active caregivers have better self-rated health and less depressive symptoms. The strong association between social activity and health suggests that promoting social engagement within the family caregivers may be an effective strategy for better health. Grandparent care is a benefit for family and country. However, the support to grandchildren caregivers is lacking. Not only in China, but Western countries also did not have an appropriate policy. Community staff can organize these grandparents who take care of their grandchildren and help them be more active to improve their health.

Lastly, to decrease the urban-rural disparity in the social welfare sector. The results showed that rural caregivers had worse self-rated health and more depressive symptoms than urban caregivers. There is still an urban-rural disparity in social public infrastructure distribution (i.e., kindergartens, nursing homes) in China. The strong association between location and health suggests that the promotion of reducing rural-urban disparity in the distribution of public infrastructure could be an effective health equity strategy.

5.5 Significance and limitation of the study

This study is a valuable contribution to the caregiving literature. Firstly, unlike previous research in this field (Zhou J et al., 2016), this study used a population-based representative sample in China. Secondly, this study compared the relationship between family caregiving provision and health overall and between three-care types. Because the heterogeneity among caregivers is too substantial, we adopted the method of grouping linear regression analysis by the type of care. The same caregivers may have the same social background; therefore, grouping regression analysis can reduce caregivers' heterogeneity in the same group. By studying middle-aged and older adults' family caregiving provision characteristics, this study can help the population understand the factors related to family caregiving provision and the relationship between family caregiving provision and health. By studying family caregiving's health impacts, this study provides evidence to develop a family intervention policy. Lastly, this study contributes to provides evidence to develop health predictors of family caregivers. Compared with formal caregivers, the health predictors of family caregivers lack quantitative evaluation standards. This study offers three family caregiving measures (i.e., type, intensity, and duration), which proves that the type, intensity, and care duration impact family caregivers' health.

This study has several limitations. Firstly, although we considered the caregiving situation to be a predictor of self-rated health and depression,

this study is a cross-sectional study using single-year data. Therefore, this study could not investigate causality between caregiving and health. Furthermore, this study lacked information on whether family caregivers were still in the same position after the reference period and given the low number of family caregivers (parent caregiving only: n=934; both: n=585). Lastly, the distribution of self-rated health is biased. Nearly 50% of respondents selected the answer: fair. There wasn't any research investigating the Chinese version of this self-rated health 5-scale has good reliability and validity or not among the elderly population in China.

Despite the limitation, this study provides pioneering evidence for the relationship between family caregiving provision and health in China and its association with individual characteristics, such as gender. This study will prompt further discussion and investigation on the health interaction and its associated factors for family caregivers. It is also necessary to further discuss why the multivariate regression models have many significant variables but a low R-squared value.

Biography

Amirkhanyan A. A. Wolf D. A . (2003). Caregiver stress and noncaregiver stress: Exploring the pathways of psychiatric morbidity. The Gerontologist, 43, 817–827.

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *American journal of preventive medicine*, *10*(2), 77–84.

Aparicio-Fenoll, A., M. Vidal-Fernandez(2015). "Working Women and Fertility: The Role of Grandmothers' Labor Force Participation." CESifo Economic Studies. 61(1), 123–147.

Arber S, Ginn J. Gender differences in informal care. Health and Social Care in the Community 1995;3:19–31.

Barusch, A. S., & Spaid, W. M. (1989). Gender differences in caregiving: why do wives report greater burden?. The Gerontologist, 29(5), 667–676.

Baydar, N., & Brooks-Gunn, J. (1998). Profiles of Grandmothers Who Help Care for Their Grandchildren in the United States. Family Relations, 47(4), 385-393.

Berglund, E., Lytsy, P., & Westerling, R. (2015). Health and wellbeing in informal caregivers and non-caregivers: a comparative cross-sectional study of the Swedish general population. Health Qual Life Outcomes, 13, 109.

Bjorner, JB, Kristensen TS, Orth-Gomér K, Tibblin G, Sullivan M, Westerholm P. (1996). Self-rated health: A useful concept in research, prevention and clinical medicine. Stockholm: Swedish Council for Planning and Coordination of

Research.

Bolin, K., Lindgren, B., & Lundborg, P. (2008). Your next of kin or your own career? Caring and working among the 50+ of Europe. J Health Econ, 27(3), 718-738.

Bookwala, J. and R. Schulz (2000). "A comparison of primary stressors, secondary stressors, and depressive symptoms between elderly caregiving husbands and wives: the Caregiver Health Effects Study." Psychol Aging 15(4): 607-616.

Boucher, A., Haesebaert, J., Freitas, A., Adekpedjou, R., Landry, M., Bourassa, H., Legare, F. (2019). Time to move? Factors associated with burden of care among informal caregivers of cognitively impaired older people facing housing decisions: secondary analysis of a cluster randomized trial. BMC Geriatr, 19(1), 249.

Brody EM, Litvin SJ, Hoffman C, Kleban MH. (1992). Differential effects of daughters' marital status on their parent care experiences. Gerontologist. 32:58–67.

Broese Van Groenou, M. I., & de Boer, A. H. (2016). Providing informal care in a changing society. European Journal of Ageing, 13(3), 271-279.

Bucx, F., Trudie, F. v. W. and Hagendoorn, K. L. (2008). Intergenerational Contact and the Life Course Status of Young Adult Children. Journal of Marriage and Family, 70(1), 144-156.

Cano, A., Scaturo, D. J., Sprafkin, R. P., Lantinga, L. J., Fiese, B. H., & Brand, F. (2003). Family Support, Self-Rated Health, and Psychological Distress. Prim Care Companion J Clin Psychiatry, 5(3), 111-117.

Carbonell, Á., Navarro-Pérez, J. J., & Mestre, M. V. (2019). Risk factors associated with theintergenerational care of people with serious mental illness. Medicina oral, patologia oral y cirugia bucal, 24(4), e438–e443.

Carmichael, F., & Charles, S. (2003). The opportunity costs of informal care: does gender matter?. Journal of health economics, 22(5), 781–803.

Chan A, Malhotra C, Malhotra R, Rush AJ, Ostbye T. (2013). Health impacts of caregiving for older adults with functional limitations: results from the Singapore survey on informal caregiving. J Aging Health. 25:998–1012.

Chassin L, Macy JT, Seo DC, Presson CC, Sherman SJ.(2010). The association between membership in the Sandwich Generation and health behaviors: a longitudinal study. J Appl Dev Psychol .31:38–46.

Chen, F., Liu, G., & Mair, C. A. (2011). Intergenerational Ties in Context: Grandparents Caring for Grandchildren in China. Social forces; a scientific medium of social study and interpretation, 90(2), 571–594.

Chen, F., & Liu, G. (2012). The health implications of grandparents caring for grandchildren in China. J Gerontol B Psychol Sci Soc Sci, 67(1), 99-112.

Chen, J., et al. (2010). "Factors related to well-being among the elderly in urban China focusing on multiple roles." Biosci Trends 4(2): 61-71.

Chen, L., Zhao, N., Fan, H., & Coyte, P. C. (2015). Informal care and labor market outcomes: Evidence from Chinese married women. Research on Aging,39(2), 345–37.

Cheng, S., Chan, A. C. and Fung, H. H. (2006). Factorial structural of a short version of the Center for Epidemiologic Studies-Depression Scale. International Journal of Geriatric Psychiatry, 21, 333–336.

Chiou, C. J., Chen, I. P., & Wang, H. H. (2005). The health status of family caregivers in Taiwan: an analysis of gender differences. International journal of geriatric psychiatry, 20(9), 821–826.

Chen, X., & Silverstein, M. (2000). Intergenerational Social Support and the

Psychological Well-Being of Older Parents in China. Research on Aging, 22(1), 43–65.

Cho, E. (2007). A Proposed Theoretical Framework Addressing the Effects of Informal Caregivers on Health-Related Outcomes of Elderly Recipients in Home Health Care. Asian Nursing Research, 1(1), 23–34.

Choi, S., & Zhang, Z. (2018). Grandparenting and Self-Rated Health Among Older Korean Women. Research on Aging, 016402751876641.

Chou, S. P., Huang, B., Goldstein, R., & Grant, B. F. (2013). Temporal associations between physical illnesses and mental disorders--results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Comprehensive psychiatry, 54(6), 627–638.

Ciccarelli, N., & Van Soest, A. (2018). Informal Caregiving, Employment Status and Work Hours of the 50+ Population in Europe. Economist (Leiden), 166(3), 363-396.

Coe, N. B., & Van Houtven, C. H. (2009). Caring for mom and neglecting yourself? The health effects of caring for an elderly parent. Health Economics, 18, 991–1010.

Cook, S. K., & Cohen, S. A. (2018). Sociodemographic disparities in adult child informal caregiving intensity in the United States: Results from the new National Study of caregiving. Journal of Gerontological Nursing, 44, 15–20.

Danielsbacka, M., Tanskanen, A. O., Coall, D. A., & Jokela, M. (2019). Grandparental childcare, health and well-being in Europe: A within-individual investigation of longitudinal data. Soc Sci Med, 230, 194-203.

de Winter CF, Bastiaanse LP, Hilgenkamp TI, Evenhuis HM, Echteld MA.(2012). Overweight and obesity in older people with intellectual disability. Res Dev

Disabil. 33: 398–405.

Di Gessa, G., Glaser, K., & Tinker, A. (2016). The impact of caring for grandchildren on the health of grandparents in Europe: A lifecourse approach. Social science & medicine (1982), 152, 166–175.

Doran T, Drever F, Whitehead M. Health of young and elderly informal carers: analysis of UK census data. British Medical Journal 2003;327 (7428):1388.

Do, Y. K., Norton, E. C., Stearns, S. C., & Van Houtven, C. H. (2015). Informal care and caregiver's health. Health Econ, 24(2), 224-237.

Drobniak, S. M., Wagner, G., Mourocq, E., and Griesser, M. (2015). Family living: an overlooked but pivotal social system to understand the evolution of cooperative breeding. Behav. Ecol. 26, 805–811.

Du Peng, Sun Juanjuan, Zhang Wenjuan, Wang Xuehui.(2016). The Demands of Old-age Care and the Family and Social Resources for the Chinese Elderly: A Study Based on the 2014 China Longitudinal Aging Social Survey. Population Research, 40(6), 49-6. [in Chinese]

Dura, J. R., Stukenberg, K. W., & Kiecolt-Glaser, J. K. (1991). Anxiety and depressive disorders in adult children caring for demented parents. Psychology and aging, 6(3), 467–473.

Ensel, W. M., & Lin, N. (1991). The life stress paradigm and psychological distress. Journal of health and social behavior, 32(4), 321–341.

Ferrara J, Jankovic J. (2008). Psychogenic movement disorders in children. Movement Disord .23:1875–1881.

Ferraro KF. (1980). Self-ratings of health among the old and the old-old. J Health Soc Behav 21: 377-383.

Freedman VA, Spillman BC.(2014). Disability and care needs among older

Americans. Milbank Quarterly. 92(3):509–541.

García-Alberca JM, Lara JP, Berthier ML.(2011). Anxiety and depression in caregivers are associated with patient and caregiver characteristics in Alzheimer's disease. Int J Psychiatry Med. 41(1):57-69.

Garity, J. (1997). Stress, learning style, resilience factors, and ways of coping in Alzheimer Familycaregivers. American Journal of Alzheimer's Disease, 12(4), 171–178.

Gilligan, C. (1982). In a different voice: Psychological theory and women's development. Harvard University Press.

Glaser K, Grundy E. (2002). Class, caring and disability: evidence from the British Retirement Survey. Ageing & Society.22(3):325–42.

Gold, D. P., Franz, E., Reis, M., Senneville, C. (1994). The influence of emotional awareness and expressiveness on care-giving burden and health complaints in women and men. Sex Roles, 31,205-224.

Goodman CC, Silverstein M. (2002). Grandparents raising grandchildren: Family structure and well-being in culturally diverse families. The Gerontologist. 42,676–689.

Goren, A., Montgomery, W., Kahle-Wrobleski, K., Nakamura, T., & Ueda, K. (2016). Impact of caring for persons with Alzheimer's disease or dementia on caregivers' health outcomes: Findings from a community based survey in Japan. BMC Geriatrics, 16, 122.

Grundy, E. M., Albala, C., Allen, E., Dangour, A. D., Elbourne, D., & Uauy, R. (2012). Grandparenting and psychosocial health among older Chileans: A longitudinal analysis. Aging & Mental Health, 16, 1047–1057.

Guangya Liu, Matthew E. Dupre. (2016). Health Trajectories of Women in China:

The Role of Parental Caregiving, *The Journals of Gerontology: Series B*, Volume 71, Issue 2, 320–331.

Gupta, R. (2009) Systems perspective: Understanding care giving of the elderly in India. Health Care for Women International 30(12): 1040–1054.

Hammer, L. B., & Neal, M. B. (2008). Working sandwichedgeneration caregivers: Prevalence, characteristics, and outcomes. The Psychologist-Manager Journal, 11, 93-112.

Han Baoqing，Wang Shengjin. (2019). The Effect of Caring for Grandchildren on the Health of Middle and Old-Aged People. Population Research. 43(4): 85-96.[In Chinese]

Hank, K., & Buber, I. (2009). Grandparents Caring for their Grandchildren: Findings From the 2004 Survey of Health, Ageing, and Retirement in Europe. Journal of FamilyIssues, 30(1), 53–73.

Häusler, N., Hämmig, O. & Bopp, M. (2018). Which Life Domains Impact Most on Self-Rated Health? A Cross-Cultural Study of Switzerland and its Neighbors. Soc Indic Res **139,** 787–802.

Hays JC, Schoenfeld DE, Balzer DG. (1996). Determinants of poor selfrated health in later life. Am J Geriatr Psychiatry 4: 188-196.

HIRST, M. (2005). Carer distress: a prospective, population-based study, Social Science and Medicine. Social Science & Medicine, 61, 697-708.

Hong, I., Han, A., Reistetter, T. A., & Simpson, A. N. (2017). The risk of stroke in spouses of people living with dementia in Korea. Int J Stroke, 12(8), 851-857

Huang, Q. B., Wang, X. H. and Chen, G. (2015). Reliability and validity of 10-item CES-D among middle aged and older adults in China. China Journal of Health Psychology, 23, 1036–1041.

Hughes, M. E., Waite, L. J., LaPierre, T. A., & Luo, Y. (2007). All in the family: The impact of caring for grandchildren on grandparents' health. Journals of Gerontology Series B-Psychological Sciences and Social Sciences, 62(2), S108-S119.

Idler EL, Angel RJ. (1990). Self-rated health and mortality in the NHANES-I epidemiologic follow-up study. Am J Public Health 80: 446-452.

Idler EL, Benyamini Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. J Health Soc Behav 38: 21-37.

Igel C, Szydlik M. (2011). Grandchild care and welfare state arrangements in Europe. J Eur Soc Policy 21:210–224

Isaac, V., Stewart, R., & Krishnamoorthy, E. S. (2011). Caregiver Burden and Quality of Life of Older Persons With Stroke: A Community Hospital Study in South India. Journal of Applied Gerontology, 30(5), 643–654.

Josten E, De Boer A. (2015). Competition between paid work and informal care. The National Institute for Social Research, The Hague, the Netherlands

Kalmijn, M. (2019).The Effects of Ageing on Intergenerational Support Exchange: A New Look at the Hypothesis of Flow Reversal. Eur J Population 35, 263–284.

Ko, P. C., & Hank, K. (2014). Grandparents caring for grandchildren in China and Korea: findings from CHARLS and KLoSA. J Gerontol B Psychol Sci Soc Sci, 69(4), 646-651.

Ku LJ, Stearns SC, Van Houtven CH, Lee SY, Dilworth-Anderson P, Konrad TR.(2013). Impact of caring for grandchildren on the health of grandparents in Taiwan. J Gerontol B Psychol Sci Soc Sci. 68(6):1009-1021.

Ku, L. J., Liu, L. F., & Wen, M. J. (2013). Trends and determinants of informal and formal caregiving in the community for disabled elderly people in

Taiwan. Archives of gerontology and geriatrics, 56(2), 370–376.

Kumagai, N. (2017). Distinct impacts of high intensity caregiving on caregivers' mental health and continuation of caregiving. Health Econ Rev, 7(1), 15.

Legg, L., Weir, C. J., Langhorne, P., Smith, L. N., & Stott, D. J. (2013). Is informal caregiving independently associated with poor health? A population-based study. Journal of epidemiology and community health, 67(1), 95–97.

Lethin, C., Leino-Kilpi, H., Roe, B., Soto, M. M., Saks, K., Stephan, A., Karlsson, S. (2016) Formal support for informal caregivers to older persons with dementia through the course of the disease: An exploratory, cross-sectional study. BMC Geriatric 16(0): 32.

Li, B., Adab, P., & Cheng, K. K. (2015). The role of grandparents in childhood obesity in China - evidence from a mixed methods study. Int J Behav Nutr Phys Act, 12, 91.

Li Fen, Feng Xiaotian. (2016). Caring for the "Second" Grandchildren?——Study on the willingness to care for the urban elderly and its influencing factors[J]. Population and Development. Vol. 22(4): 87-96. [in Chinese]

Litwin H, Stoeckel KJ, Roll A. (2014). Relationship status and depressive symptoms among older co-resident caregivers. Aging Ment Health. 18:225–231.

Liu, H., and W. Q. V. Lou (2017). "Continuity and changes in three types of caregiving and the risk of depression in later life: a 2-year prospective study." Age Ageing 46(5): 827-832.

Liu, S., Li, C., Shi, Z., Wang, X., Zhou, Y., Liu, S.,Ji, Y. (2017). Caregiver burden and prevalence of depression, anxiety and sleep disturbances in Alzheimer's disease caregivers in China. J Clin Nurs, 26(9-10), 1291-1300.

Liu, Y., Insel, K. C., Reed, P. G., & Crist, J. D. (2012). Family caregivingof older

Chinese people with dementia: testing a model.

Liu, Z. K., Li, X. Y., & Ge, X. J. (2009). Left too early: The effects of age at separation from parents on Chinese rural children‟s symptoms of anxiety and depression. American Journal of Public Health, 99, pp.2049–2054.

Loh AZ, Tan JS, Zhang MW. (2016).The global prevalence of anxiety and depressive symptoms among caregivers of stroke survivors. J Am Med Dir Assoc. 18(2):111–6.

Lou, V. W. Q., & Chi, I. (2012). Grandparenting roles and functions. In K. K. Mehta & L. L. Thang (Eds.), Experiencing grandparenthood: An Asian perspective (pp. 47–59). Dordrecht, the Netherlands: Springer.

Luna, S., Rivera, F., & Ramos, P. (2019). Dual caregiving by grandmothers with older relatives: Personal factors influencing health and stress. J Health Psychol,

Mausbach BT, Roepke SK, Ziegler MG, Milic M, von Kanel R, Dimsdale JE.(2010). Association between chronic caregiving stress and impaired endothelial function in the elderly. Journal of the American College of Cardiology. 55:2599–2606.

Maher J, Green H.(2002). Carers 2000. London: The Stationery Office;

Malmberg, G., and Pettersson, A., 2008. Distance to elderly parents: Analyses of Swedish register data. Demographic Research, Volume 17: Book II: Articles 19 to 30, Special Collection 6, 17, 679.

McGarrigle, C. A., et al. (2014). "The impact of being the intermediate caring generation and intergenerational transfers on self-reported health of women in Ireland." Int J Public Health 59(2): 301-308.

McGarrigle, C. A., Timonen, V., & Layte, R. (2018). Choice and Constraint in the Negotiation of the Grandparent Role: A Mixed-Methods Study. Gerontol Geriatr Med, 4, 2333721417750944.

Mehta K. K. Thang L. L. (2012). Introduction: Grandparenthood in Asia. In Mehta K. K. Thang L. L. (Eds.), Experiencing grandparenthood: An Asian perspective (pp. 1–19).

Ministry of civil affairs of China. China Ministry Statistics Yearbook（2011-2020.）. Beijing: Pecking Union Medical College Press; [in Chinese]

National Health Commission of China. China Health Statistics Yearbook（2011-2020.）. Beijing: Pecking Union Medical College Press. [in Chinese]

National Bureau of Statistics of China. China Annual Statistical Yearbook (2011-2020). China Statistical Press, Beijing. [in Chinese]

Navaie-Waliser, M., Spriggs, A., & Feldman, P. H. (2002). Informal caregiving: differential experiences by gender. Med Care, 40(12), 1249-1259.

Nguyen, H. T., & Connelly, L. B. (2014). The effect of unpaid caregiving intensity on labour force participation: results from a multinomial endogenous treatment model. Soc Sci Med, 100, 115-122.

Ory MG, et al. (1999). Prevalence and impact of caregiving: a detailed comparison between dementia and nondementia caregivers. Gerontologist. 39(2):177–85.

OECD. (2011). Providing and Paying for Long-term Care.

Parker OD, Albright DL, Washington K, et al. (2013). Hospice caregiver depression: the evidence surrounding the greatest pain of all. J Soc Work End-of-Life Palliative Care. 9(4):256–71.

Pearlin, L., Menaghan, E., Lieberman, M., & Mullan, J. (1981). The Stress Process. Journal of Health and Social Behavior, 22(4), 337-356.

Penning, M. J., & Wu, Z. (2016). Caregiver Stress and Mental Health: Impact of Caregiving Relationship and Gender. Gerontologist, 56(6), 1102-1113.

Pinquart, M., & Sorensen, S. (2003). Differences between caregivers and

noncaregivers in psychological health and physical health: a meta-analysis. Psychol Aging, 18(2), 250-267.

Pinquart, M., & Sorensen, S. (2006). Gender differences in caregiver stressors, social resources, and health: an updated meta-analysis. J Gerontol B Psychol Sci Soc Sci, 61(1), P33-45.

Pinquart, M., & Sorensen, S. (2007). Correlates of physical health of informal caregivers: a meta-analysis. J Gerontol B Psychol Sci Soc Sci, 62(2), P126-137.

Pinquart, M., & Sorensen, S. (2011). Spouses, adult children, and children-in-law as caregivers of older adults: a meta-analytic comparison. Psychol Aging, 26(1), 1-14.

Posadas, J., M. Vidal-Fernandez (2013). Grandparents' Child Care and Female Labor Force Participation. IZA Journal of Labor Policy. 3(14), 1–20.

Qualls, S. H. (2016). Caregiving families within the long-term services and support system for older adults. American Psychologist, 71(4), 283–293.

Robison, J., Fortinsky, R., Kleppinger, A., Shugrue, N., & Porter, M. (2009). A broader view of Familycaregiving: effects of caregiving and caregiver conditions on depressive symptoms, health, work, and social isolation. J Gerontol B Psychol Sci Soc Sci, 64(6), 788-798.

Rogerson, P. A., & Kim, D. (2005). Population distribution and redistribution of the baby-boom cohort in the United States: recent trends and implications. Proceedings of the National Academy of Sciences of the United States of America, 102(43), 15319–15324.

Ross A, Lloyd J, Weinhardt M, Cheshire H. (2008). Living and caring. London: International Longevity Centre UK.

Rozario, P. A., Morrow-Howell, N., & Hinterlong, J. E. (2004). Role Enhancement

or Role Strain: Assessing the Impact of Multiple Productive Roles on Older Caregiver Well-Being. Research on Aging, 26(4), 413–428.

Sallim AB, Sayampanathan AA, Cuttilan A, et al. (2015). Prevalence of mental health disorders among caregivers of patients with Alzheimer disease. J Am Med Dir Assoc. 16 (12):1034–41.

Savage, S., Bailey, S. (2004) .The impact of caring on caregivers' mental health: A review of the literature. Australian Health Review 27(1): 111–117.

Schmidt, A.E., Winkelmann, J., Rodrigues, R., Leichsenring, K. (2016), Lessons for regulating informal markets and implications for quality assurance – the case of migrant care workers in Austria, Ageing & Society, Vol. 36, Issue 4, pp. 741-763.

Schreiner, A. S., Morimoto, T., Arai, Y., & Zarit, S. (2006). Assessing Familycaregiver's mental health using a statistically derived cut-off score for the Zarit Burden Interview. Aging & mental health, 10(2), 107–111.

Schulz, R., & Beach, S. R. (1999). Caregiving as a risk factor for mortality: the Caregiver Health Effects Study. JAMA, 282(23), 2215–2219.

Schulz R. Sherwood P . (2008). Physical and mental health effects of intergenerational caregiving. The American Journal of Nursing, 108(9 Suppl.), 23–27.

Shiba, K., Kondo, N., Kondo, K. (2016) Informal and formal social support and caregiver burden: The AGES caregiver survey. Journal of Epidemiology 26(12): 622–628.

Silverstein, M., Cong, Z., & Li, S. (2006). Intergenerational transfers and living arrangements of older people in rural China: consequences for psychological well-being. J Gerontol B Psychol Sci Soc Sci, 61(5), S256-266.

Stone R, Cafferata G, and Sangl J. Caregivers of the frail elderly: a national profile. Gerontologist 1987; 7: 616–626.

Spillman BC, Pezzin LE.(2000). Potential and active Familycaregivers: changing networks and the “sandwich generation.” Milbank Q; 78:347-74, 339.

Sun Juanjuan, & Zhang Hangkong. (2013). Analysis of the status and influencing factors of Chinese elderly caring for grandchildren. Digest of Educational Science (04), 104-105. [in Chinese]

Tan, S. Y. (2019). "Is informal care sufficient to meet the long-term care needs of older people with disabilities in China? Evidence from the China Health and Retirement Longitudinal Survey." Ageing and Society: 1-20.

Tian, Q., Guo, R. Y., & Gao, T. M. (2016). The situation of intergenerational transfer of Familywealth and the influencing factors: A study based on the CHARLS data. Jilin University Journal of Social Sciences Edition, 4, 16–27. 188.

Tong, L., Yan, Q., & Kawachi, I. (2019). The factors associated with being left-behind children in China: Multilevel analysis with nationally representative data. PloS one, 14(11).

Tu R, Pan KY, Cai G, Yamamoto T, Wang HX.(2019). The role of education in the association between self-rated health and levels of C-reactive protein: a cross-sectional study in rural areas of China. BMJ Open. 9(11):e027659.

Van Houtven, C. H., Coe, N. B., & Skira, M. M. (2013). The effect of informal care on work and wages. Journal of health economics, 32(1), 240–252.

Verbakel E, Tamlagsrønning S, Winstone L, Fjær EL, Eikemo TA.(2017). Informal care in Europe: findings from the European Social Survey (2014) special module on the social determinants of health. Eur J Public Health. Feb 1;27(suppl_1):90-95.

Wang, Hao & Fidrmuc, Jan & Luo, Qi, 2020. "Grandparenting and well-being of the elderly in China," BOFIT Discussion Papers 18/2020, Bank of Finland, Institute for Economies in Transition.

Wang, Y., & Gonzales, E. (2019). Examining the prevalence, risk and protective factors to Family caregivingin China: findings from CHARLS. China Journal of Social Work, 12(1), 3-19.

Wang, Y., Li, J., Zhang, N., Ding, L., Feng, Y., Tang, X., Zhou, C. (2020). Urban–Rural Disparities in Informal Care Intensity of Adult Daughters and Daughters-in-Law for Elderly Parents from 1993–2015: Evidence from a National Study in China. Social Indicators Research.

Wolf, D.A., Middleton, F.A. (2018) A role for genes in the 'caregiver stress process'?. Transl Psychiatry 8, 228.

Wu, H. (2019).The impact of care for grandchildren on the supports for elderly parents of first-generation only-child parents in urban China. China popul. dev. stud. **2,** 412–429.

Wu, S., Wang, R., Zhao, Y., Ma, X., Wu, M., Yan, X., & He, J. (2013). The relationship between self-rated health and objective health status: a population-based study. BMC public health, 13, 320.

Xu, H. (2019). "Physical and mental health of Chinese grandparents caring for grandchildren and great-grandparents." Soc Sci Med 229: 106-116.

Xu, L., & Chi, I. (2016). Grandparent Caregiving and Self-Rated Health among Rural Chinese Older Adults: A Longitudinal Study Using Latent Difference Score Analysis. Journal of Gerontology & Geriatric Research, 5(5).

Yang, W., & Tan, S. (2019). Is informal care sufficient to meet the long-term care needs of older people with disabilities in China? Evidence from the China Health

and Retirement Longitudinal Survey. Ageing and Society, 1-20.

Yihan Wang & Ernest Gonzales (2019) Examining the prevalence, risk and protective factors to intergenerational caregiving in China: findings from CHARLS, China Journal of Social Work, 12:1, 3-19.

Zhang, Q. (2012). Family care by women to old parents and its determinants. Doctoral dissertation, Fudan University. (in Chinese).

Zhong, Y., Wang, J., & Nicholas, S. (2020). Social support and depressive symptoms among Familycaregivers of older people with disabilities in four provinces of urban China: the mediating role of caregiver burden. BMC Geriatr, 20(1), 3.

Zhou, J., Mao, W., Lee, Y., & Chi, I. (2016). The Impact of Caring for Grandchildren on Grandparents' Physical Health Outcomes: The Role of Intergenerational Support. Research on Aging, 39(5), 612–634.

국문초록

중국 중고령 층의 가족 돌봄과 돌봄자의 건강관의 관계

양옥령

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중국의 인구는 2010 년부터 2019 년까지는 빠르게 고령화되어 60 세 이상 인구 비율은 13.26 %에서 18.1 %로 증가했다 (NHCC, 2011-2020; NBSC, 2011-2020). 중국 고령화 문제 빠르게 심하하고 있으며 가족 돌봄은 노인 돌봄의 압력을 완화하는 데 중요한 역할이다. 그러나 가족 돌봄은 신체적, 정신적 건강에 부정적인 결과를 초래할 수 있다. 특히 돌봄의 효과에 대한 연구는 서양 국가에서 많이 이루어집니다. 서양 국가 돌봄의 연구 결과가 서구 국가와 가족 구조및 관계를 다른중국 사회에 적용되는지는 의문이다. 따라서 본 연구는 중국 대표적인 자료를

사용하여 중국의 중고령층 세대간 가족 돌봄과 돌봄자의 건강 상태와의 관계를 살펴보고 관련 요인을 하악하고자 하였다. 이 연구는 전체적으로 그리고 세 가지 돌봄 유형 그룹 간의 관계를 비교했다(부모님 돌보자만, 손자녀 돌봄자만, 둘다 돌봄자).

이 연구는 중국 건강 및 퇴직 패널조사 (CHARLS) 4 차 자료를 이차 분석을 수행하였다. CHARLS 자료는 중국에서 45 세 이상 성인을 대상으로 한 전국 패널조사이다. 연구의 개념적 틀은 문헌에 대한 포괄적인 검토를 통해 도출되었고 개인 특성, 가족 자원, 사회적 참여, 가족 돌봄현황, 건강상활을 포함한 분석 모델을 만드는 데 활용되었다. 가족 돌봄 현황은 돌봄 종류, 돌봄 강도, 돌봄 기간을 포함하였다. 돌봄 유형은 부모님만 돌봄,손자녀만 돌봄, 둘다 돌봄을 포함하였다. 건강상황은 주관적 건강인식 및 우울감을 포함을 하였다. 주관적 건강인식은 5 점 척도 질문으로 측정되었다. 우울감을 측 30 점 척도인 CESD-10 을 사용하였다.

이 연구는 카이 제곱 검정과 t- 검정을 사용하여 개인 특성, 가족 특성 및 사회 활동 상태에서 비돌봄자 및 돌봄자 간의 차이를 전반적으로 비교했다. 다음으로, 이 연구는 카이 제곱 검정과 ANOVA 분석 및 Tukey HSD 검정을 사용하여 개인 특성,

가족 특성 및 사회 활동 상태에서 비돌봄자 및 세종류 돌봄자 간의 차이를 전반적으로 비교했다. 마지막으로는 단변량 분석, 다변량 회귀분석을 실행하여 가족 돌봄 특성과 관련된 요인, 돌봄와 건강 상태 간의 관계를 파악하였다.상세한 결과는 다음과 같다.

6,871 명의 돌봄자을 대상으로 한 분석 자료중 74.36 %는 주관적 건강인식이 좋지 않았으며 36.24 %는 CES-D10 으로 측정한 우울 증상을 나타냈다.

다변량 분석 결과에 따르면 소득, 거주 위치, 교육, 고용상태, ADL, IADL, 만성 질환, 가구 구성 및 사회 활동 상태가 돌봄자의 주관적 건강인식과 관련된 요인으로 나타났다. 또한, 연구 결과에 따르면 연령, 성별, 소득, 거주 위치, 교육, ADL, IADL, 만성 질환, 자녀수, 사회 활동 및 돌봄 강도가 돌봄자의 우울 증상과 관련된 요인으로 나타났다.

돌봄 유형별로 다변량 분석 결과에 따르면 손자녀 돌봄한 사람에서나쁜 주관적 건강인식이 가장 많이 나타났다. 부모님 돌봄자 중 성별, 소득, IADL 및 만성 질환이 주관적 건강 인식의 중요한 요소 인 것으로 밝혀졌다. 손자녀 돌봄자 중 소득, 교육,

고용, ADL, IADL, 만성 질환, 가구 구성 및 사회 활동이 주관적 건강인식의 중요한 요소이다. 부모님 및 손자녀 두개 다 돌봄한 사람 중 소득, IADL 및 만성 질환은 주관적 건강인식의 중요한 요소이다.

돌봄 유형별로 다변량 분석 결과에 따르면 손자녀 돌봄자에서 우울증 증상이 가장 많이 나타났다. 부모 돌봄자 중 성별, 소득, 고용, ADL, IADL, 만성 질환 및 간호 기간이 자기 평가 건강의 중요한 요소로 밝혀졌습니다. 손자 보호자 중 성별, 소득, 위치, 교육, ADL, IADL, 만성 질환, 아동 수 및 사회적 활동이 자기 평가 건강의 중요한 요인으로 밝혀졌습니다. 돌봄자 중 성별, 소득, ADL, IADL, 만성 질환 및 가구 구성은 자기 평가 된 건강의 중요한 요소이다.

이 연구는 중국의 손자녀 돌봄자가 다른 유형의 가족 돌봄자보다는 주관적 건강상태 및 우울감이 가장 많이 나온 현상이 발견햇다. 이 결과는 중국의 수백만 명의 남은 자녀와 나이 많은 조부모 때문일 수 있습니다. 첫째, 중국에서 부모를 따라 외출하지 못하고 집에 남아있는 아이가 많이 있다.때문이다. 그런 아이들은 보통 조부모님의 보살핌을 받으며 시골에 남겨져 있다. 그래서

돌봄강도는 부모만을 돌보는 것보다 손자만을 돌보는 돌보는 사람의 2 배 이상이었다 (62.67 대 30.68 시간/주). 손자를 돌보는 일은 거의 정규직과 같았다. 자녀가 결석하고 손자를 돌보는 강도가 높기 때문에 손자 돌보는 사람은 일반적으로 지친 느낌을 받았다. 또한 손자녀 돌봄자는 다른 유형의 돌봄자보다 나이가 많았다 (60.48 세 대 53.51 세 및 56.52 세). 노년층은 노년기에 건강 상태가 악화되어 사회적 참여 능력이 제한되어 노년기의 복지에 영향을 미칠 수 있다.

이 연구 결과는 돌봄 강도, 돌봄 기간 및 주관적 건강상태의 통계적으로 유의한 연관성을 규명하지는 못하였다. 이전 연구와 비교할 때, 선행 연구와이 연구 간의 자기 평가 건강 및 연구 유형 측정의 차이는 다른 결과를 초래했을 수 있다. 주관적 건강상태와 우울 감에 영향을 미치는 요인들을 단면적으로 조사 하였다. 가족 돌봄 제공 및 건강 (주관적 건강상태, 우울감)에 영향을 미치는 요인은 개인 특성, 가족 구조 및 사회 활동 상태에서 일관되게 나타났다. 이는 가족 돌봄자의 돌봄 제공 및 건강이 소득과 같은 개인적 요인뿐만 아니라 가족 구조 및 사회 활동 상태에 의해 영향을 받았음을 시사했다.

주관적 건강상태 및 우울감과 관련된 다차원적 요인은 가족 돌봄자를 위한 개입 정책을 취하는 포괄적인 접근 방식의 필요성을 나타냈다. 소득과 건강 사이의 강력한 연관성은 가족 돌봄자의 재정적 지원은 건강을 개선하는 효과적인 전략이 될 수 있음을 시사한다. 사회 활동과 건강 상태 간의 강한 연관성은 가족 돌봄자 내에서 사회적 참여를 촉진하는 것이 더 나은 건강 상태를위한 효과적인 전략이 될 수 있음을 시사한다. 마지막으로, 결과는 농촌 거주자가 도시 거주자보다 세대 간 보살핌을 제공 할 가능성이 더 높다는 것을 보여주었습니다. 중국의 공공 시설 분포가 여전히 도시와 농촌의 차이가 있다(예, 유치원, 요양원). 정부는 도시-농촌 격차를 줄이기 위해 사회 복지 형평성을 달성하고 유지하기위한 포괄적 인 접근 방식을 개발해야 한다.

주요어: 중고령층,돌봄 특성, 주관적 간강인식, 우울

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