

# The effect of socioeconomic status among adult married females on informal caregiving for parents: Evidence from China

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## Research article

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# Abstract

**Background:** Married female caregivers face a higher risk of informal care burden. There is no study to explore the effect of socioeconomic status (SES) among married female caregivers on informal care intensity in China. The purpose of this study is to empirically examine how the SES of married female caregivers affects the amount of informal care they provide for their parents/in-law in China.

**Methods:** 8 waves of the China Health and Nutrition Survey were pooled, and that the selection comprised only those women whose parents/in law had a need for care and were living in the same city. Informal caregivers were divided into three categories: non-caregivers (0 hrs/week), low-intensity caregivers (less than 10 hrs/week), and high-intensity caregivers (10 hrs/week and above). Chi-square tests and one-way analysis of variance (ANOVA) were used to compare the SES of the women between non-, low-, and high-intensity caregivers. Multinomial logistic regression analysis was used to calculate relative risk ratios (RRR) for various SES variables to assess the relation of SES on the likelihood of a low- and high-intensity caregiving in the household, adjusting for age, marital status, family characteristics and wave.

**Results:** Of the 2741 respondents, high-intensity and low-intensity caregivers account for 16.42% and 21.38% respectively. Multinomial logistic regression result shows that the likelihood of being a high-intensity caregiver versus (vs.) a non-caregiver increases as the caregiver's education attainment increases ( $p < 0.05$ ), and high income is related to the likelihood of being a high-intensity caregiver, but it is only significant at 10% level. Urban females are 1.34 times more likely than their rural counterparts to provide low-intensity care vs. no care ( $p < 0.05$ ) and are 1.34 times more likely to provide high-intensity care vs. no care ( $p < 0.05$ ). Employed females are 1.27 times more likely than those non-employed to provide low-intensity care vs. no care ( $p < 0.05$ ).

**Conclusions:** Differences in SES are found between high-intensity caregivers and low-intensity caregivers. Women with high educational attainment and urban *Hukou* are more likely to provide high-intensity informal care, and women who are employed and with urban *Hukou* are more likely to provide low-intensity care.

## Background

With the rapid economic growth, longer life expectancy, and declining fertility rates, China has entered an aging society since 1999 [1]. The United Nations defines an aging society as a country or region in which 10 percent of the population is aged over 60 or 7 percent is aged over 65 [2]. It took 115 years for France, 85 years for Switzerland, 80 years for the United Kingdom, 60 years for the United States, but just 18 years for China to enter an aging society [3]. In China, the National Bureau of Statistics generally defines older people as those over 65 years [4]. According to the latest data from the World Bank, the number of people aged 65 years and above had reached 160 million (11.5% of the population) by 2019 in China, and this number is estimated to increase to 239 million (16.9%) by 2030. Meanwhile, the number of older people in need of care is also increasing, and will inevitably bring serious challenges to long-term care services in China [5].

The World Health Organization (WHO) defines long-term care as a systematic activity, undertaken by informal caregivers (family members, friends or neighbors) or formal caregivers (such as professional medical institutions), to ensure that individuals incapable of fully caring for themselves can maintain a high quality of life [6]. In China, formal long-term care still in its infancy, there were only 2.7 registered nurses per thousand people and 29.1 beds provided by nursing homes per thousand older people by the end of 2018 [7]. China is confronting unprecedented shortages in formal caregiving provision and care for older people is still mainly based on informal care for a long time in the future [8].

In China, influenced by both traditional gender norms and Confucianism ideals of filial piety, adult daughters (or daughters-in-law) usually provide daily help for their parents (or parents-in-law), while sons are more likely to provide intermittent assistance such as home repair, financial management [9-12]. However, females (daughters or daughters-in-law) may be more vulnerable than males—females have a risk of lower income, lower educational attainment, and limited opportunities to access resources, and the majority of informal care is provided by females [9-11, 13]. According to the data from the China Statistics Bureau, females are 2.90 and 2.54 times more likely than males to do housework and to care for older people, respectively. Married females, in particular, deserve more attention because this group have to consider not only the care of their parents, but also the responsibilities of taking care of their parents-in-laws, as well as the pressures of taking care of their families and jobs. There are two choices for married females when they have parents/in-law in need of care: to provide informal care or not. Socioeconomic status (SES), a comprehensive indicator measuring the position of individuals within systems of inequality in the society [14], plays a key role in providing informal care process. It is important to understand how the SES of married female caregivers affects the amount of informal care they provide for their parents/in-law in China. The SES disparity among married female caregivers on the distribution of informal care burdens contributes to design welfare programs for fair contribution and compensation of informal care in society, and deserves policy attention.

Previous studies on the association between SES of caregivers and informal caregiving mainly focused on high-income countries and showed mixed results. Most of studies have indicated that caregivers with low SES may provide more informal caregiving [15-20]. By contrast, a study compared informal caregiving between Hungary, Poland and Slovenia, and found that high education was associated with a higher probability of being a caregiver in Poland, but there was no statistical difference in Hungary and Slovenia [21]. However, different contexts in Low and Middle Income Countries (LMICs) make these results from high-income countries be less generalizable to LMICs. One study using the World Health Survey data from 48 LMICs found that most of the informal caregivers had high SES, compared with non-caregivers [22]. Nevertheless, evidence from China remains lacking, especially the study about SES of caregivers in informal care intensity in China among daughters/in law. What's more, existing studies have mostly focused on comparing the demographics and SES of caregivers and non-caregivers, making little distinction between the different intensities of informal care [15, 17, 23, 24]. High-intensity caregivers differ significantly from low-intensity caregivers in a variety of ways, ranging from their demographic characteristics and their responsibilities in caregiving to the impact of caregiving on those they care for and also themselves. With increasing caregiving intensity, the percentage of caregivers reporting fair or

poor general health also increases [25, 26]. High-intensity care providers may be particularly vulnerable to higher emotional stress, economic stress, health issues, and a lower quality of life [27-29]. Therefore, it is necessary to classify different caregiving intensities to fully understand what SES affects informal caregivers to provide informal care among married females in China.

In this study, we aim to empirically examine the association between SES of married female caregivers and informal caregiving for their elderly parents when in need in China. Specifically, we focus on the effect of educational attainment, Hukou, household income, and employment status of female caregivers on the intensity of informal caregiving.

## Methods

### Study Design and Participants

Data for this study were extracted from the China Health and Nutrition Survey (CHNS), a large-scale, longitudinal study in both urban and rural areas from nine provinces: Liaoning, Shandong, Heilongjiang, Henan, Jiangsu, Hubei, Hunan, Guizhou, and Guangxi. CHNS is a joint project between the University of North Carolina at Chapel Hill and the Chinese Center for Disease Control and Prevention, and the goal is allow researchers to understand how social, economic, and demographic changes in China affected health and health behaviors across the life cycle [30]. The original survey launched in 1989 used a multistage random-cluster sampling process to select a sample from 72 counties in nine provinces in China [30], and nine additional survey were collected in 1991, 1993, 1997, 2000, 2004, 2006, 2009, 2011, and 2015. In this study, we pooled eight waves of the data from 1993 to 2015 because the information of *Hukou* status was incorporated since 1993 [31]. Although the data include a panel of individuals, the number of repeated interviewees in the 8 waves of sample is not large, the proportion of two and three times or more repeated ones was only 13.5% and 3.4%, respectively. Thus, we analyzed the data as eight waves of repeated cross-sections to avoid the cohort as the age of the panel data changing over time and used clustering robust standard error to avoid individual autocorrelation.

The respondents were restricted to married women with at least one living parent or parent-in-law with care needs. The age range was from 18 to 52 due to the supplementary survey of the CHNS on intergenerational linkages was restricted to ever-married women (including married, widows and divorced women) under the age of 52. Of the original 20,819 married women respondents, 3,182 participants were included for having at least one living parent or parent-in-law with care needs (Respondents who provided an affirmative answer to the question “Does your parent/parent-in-law need to be taken care of in daily life and shopping?” were classified as having an elderly parent with care needs). Then, 425 participants were excluded for the incomplete data; 16 women were excluded to eliminate the impact of the living distance, because they did not live with their parents/parents-in-law who need care in the same city/county. Finally, 2,741 respondents with complete data were included in our analysis.

### Outcome variable

In this study, we defined the informal care intensity provided by daughters or daughters-in-law as the dependent variable. Weekly hours of informal care were estimated with survey responses from the following question: “During the past week, how much time did you spend taking care of your parents or parents-in-law?” As defined by current literature, we defined the intensity of informal caregiving into three categories: non-caregivers (0 hrs/week of caregiving), low-intensity caregivers (less than 10 hrs/week of caregiving), and high-intensity caregivers (10 hrs/week of caregiving and above) [9, 32].

## **Independent variables**

The key explanatory variable in this study was socioeconomic status (SES). SES conventionally included three indicators of educational attainment, household income, and employment status. Some researchers indicated that Hukou status should be included in the SES, as it dictated the social benefits a person received in China [33-35]. Hukou system (also called household registration system) of China classified all residents into rural and urban holders. Compared with urban Hukou holders, those with a rural Hukou may have lower education, fewer job opportunities, lower access to health benefits as well as poorer living conditions [31]. Thus, we defined respondents with urban Hukou as high SES and receiving higher benefits, compared with their rural counterparts. Therefore, this study used educational attainment (Illiteracy, Primary school degree, Junior high school degree, high school degree, and university degree or above); economic status (net household income per year), employment status (employed, unemployed), and *Hukou* status (urban or rural) to measure SES of the women. Control variables included age, marital status (including married, widows and divorced), the number of siblings, the number of care recipient, the age of care recipient (only information about whether they are older than 50 was available in the CHNS database), and wave. We chose all the independent variables based on previous studies [9, 17] on the determinants of informal care and the behavioral model of care services utilization proposed by Anderson and Newman [36]. Anderson model divided potential determinants of informal care into three factors: need factors characteristics, enabling resources and actual need for care. Predisposing characteristics mainly included the number of care recipient and the age of care recipient age. Enabling characteristics mainly included caregiver's age, education, marital status, number of siblings, etc. Wave was controlled in order to capture the time variation.

## **Statistical analysis**

We compared the SES of the caregivers across informal care intensities using one-way analysis of variance (ANOVA) and Chi-square tests as appropriate. Multinomial logistic (MNL) estimations were performed, using informal care intensity as the dependent variable and adjusting for the care recipient's age and the survey year. Relative risk ratios (RRR) for different SES variables were computed. We also test the independence of irrelevant alternatives (IIA) by using the Hausman-McFadden test to avoid inconsistent and IIA non-compliant parameter estimates [37]. We used STATA 14.2 (StataCorp, College Station, TX, USA) for all analyses.

## **Results**

## Descriptive results

Table 1 provides summary statistics of the individual characteristics by caregiving intensity using the pooled sample of the 1993-2015 waves. The average age of the respondents is 41 years old, and the total number of respondents whose parents or parents-in-law need to be cared for is 2,741, of which 1,705 (62.20%) do not provide informal care. The proportion of high-intensity caregivers (16.42%) is lower than low-intensity caregivers (21.38%). Using Chi-square tests or ANOVA analysis, we found a statistically significant difference in the four indicators of SES: educational attainment, *Hukou* status, household income, and employment status. In terms of educational attainment, those with a university degree or above accounted for 16.67% and 11.95% of high-intensity and low-intensity caregivers, respectively. Both these proportions are higher than those who did not provide care at all (8.68%). Regarding *Hukou* status, the percentages of urban *Hukou* holders are higher among high-intensity caregivers (50.22% vs. 49.78%) than low-intensity caregivers (46.76% vs. 53.24%). The economic status of high-intensity caregivers (47,830 yuan/year) is higher than low-intensity caregivers (39,212 yuan/year), and the economic status of low-intensity caregivers is higher than non-caregivers (34,227 yuan/year). We calculated the average care intensity (total care hours / parent numbers) and the result indicates that the average care intensity of high-intensity caregivers are higher than low-intensity caregivers ( $p < 0.001$ ). Table 1 also indicates that there is a statistically significant difference in age, number of siblings, number of parents, and the wave at 5% level.

**Table 1** Descriptive statistics of socio-economic characteristics of the intensity of women's informal care in China.

Marital status					0.536
Married	2661(97.08)	1660(97.36)	566(96.59)	435(96.67)	
Divorced/widowed	80(2.92)	45(2.64)	20(3.41)	15(3.33)	
<i>Family characteristics</i>					
Number of siblings	2.94(1.66)	2.89(1.71)	2.95(1.64)	3.11(1.51)	0.005

Characteristic	All n (%)	Non- caregiver n (%)	Low-intensity n (%)	High-intensity n (%)	<i>P</i> -value
Total	2741	1705(62.20)	586(21.38)	450(16.42)	
<i>Socioeconomic status</i>					
Educational attainment					<0.001
Illiteracy	655(23.90)	444(26.04)	135(23.04)	76(16.89)	
Primary school degree	524(19.12)	351(20.59)	95(16.21)	78(17.33)	
Junior school degree	882(32.10)	557(32.38)	192(32.76)	136(30.16)	
High school degree	387(14.12)	207(12.14)	94(16.04)	86(19.11)	
University or above	293(10.69)	148(8.68)	70(11.95)	75(16.67)	
<i>Hukou status</i>					
Rural	1604(58.52)	1068(62.64)	312(53.24)	224(49.78)	
Urban	1137(41.48)	637(37.36)	274(46.76)	226(50.22)	
Inflation-adjusted total annual household income, mean	37525.653 (49496.45)	34226.569 (38920.966)	39211.668 (46158.549)	47829.951 (79208.513)	<0.001
<i>Employment status</i>					
Unemployed	834(30.43)	516(30.26)	159(27.13)	159(35.33)	0.017
Employed	1907(69.57)	1199(69.71)	427(72.87)	292(64.75)	
<i>Demographic characteristics</i>					
Age, mean (SD)	41.15(7.02)	40.81(7.22)	41.99(6.41)	41.32(6.94)	0.002
<i>Number of care recipient</i>					
1	2009(73.29)	1284(75.31)	431(73.55)	294(65.33)	0.003
2	533(19.45)	305(17.89)	113(19.28)	115(25.56)	
3	128(4.67)	70(4.11)	30(5.12)	28(6.22)	
4	71(2.59)	46(2.70)	12(2.05)	13(2.89)	
Average care intensity (total care hours / parent numbers)	4.67(13.88)	0	3.36(2.21)	24.08(26.59)	<0.001
<i>Age of care recipient</i>					
<50	52(1.90)	45(2.64)	5(0.85)	2(0.44)	0.001
≥50	2689(98.10)	1660(97.36)	581(99.15)	448(99.56)	
<i>Wave, n (%)</i>					
1993	263(9.60)	185(10.85)	54(9.22)	24(5.33)	<0.001
1997	297(10.84)	201(11.79)	60(10.24)	36(8.00)	
2000	366(13.35)	241(14.13)	76(12.97)	49(10.89)	
2004	420(15.32)	273(16.01)	84(14.33)	63(14.00)	
2006	349(12.73)	234(13.72)	56(9.56)	59(13.11)	
2009	280(10.22)	165(9.68)	63(10.75)	52(11.56)	
2011	376(13.72)	207(12.14)	93(15.87)	76(16.89)	
2015	390(14.23)	199(11.67)	100(17.06)	91(20.22)	

SD referred to standard deviation.

## Multinomial logistic regression analyses

Table 2 presents the multinomial logistic regression results for the SES of respondents, with non-caregivers defined as the reference group. We found that those with higher educational attainment and economic status are more likely to be a high-intensity caregiver, and those with employed status are more likely to be a low-intensity caregivers. Additionally, respondents with urban *Hukou* are 1.34 times more likely to be a low-intensity caregiver ( $p < 0.01$ ) and are 1.34 times more likely to be a high-intensity caregiver ( $p < 0.05$ ). Regarding employment status, employed respondents are 1.27 times more likely than unemployed females to be a low-intensity caregiver versus no care ( $p < 0.05$ ). In terms of the economic status, high income is related to the likelihood of being a high-intensity caregiver, but it is only significant at 10% level.

**Table 2** Socioeconomic status of the intensity of women's informal care: results of multinomial logistic regression using pooled CHNS data 1993–2015 (n=2741)

Variables	Low-intensity RRR (SE)	High-intensity RRR (SE)
<i>Socioeconomic status</i>		
Educational attainment		
Primary school degree	0.92 (0.14)	1.26 (0.23)
Junior school degree	1.11 (0.16)	1.19 (0.20)
High school degree	1.32 (0.23)	1.89*** (0.37)
University degree or above	1.15 (0.24)	1.87*** (0.41)
Economic status	1.01 (0.01)	1.01* (0.01)
Employment status: Employed	1.27** (0.14)	0.87 (0.10)
<i>Hukou</i> status: Urban	1.34** (0.16)	1.34** (0.17)
<i>Controlled variables</i>		
Age	1.02*** (0.01)	1.00 (0.01)
Marital status: Married	0.86 (0.24)	0.83 (0.26)
Number of siblings	0.97 (0.07)	0.94 (0.07)
Number of care recipient		
2	1.05 (0.13)	1.58*** (0.21)
3	1.15 (0.27)	1.57* (0.37)
4	0.67 (0.22)	0.94 (0.32)
Age of care recipient: $\geq 50$	2.80** (1.34)	4.19* (3.17)
Wave		
1997	1.02 (0.22)	1.38 (0.39)
2000	1.24 (0.22)	1.85 (0.72)
2004	1.14 (0.20)	1.93* (0.73)
2006	0.86 (0.17)	2.03* (0.77)
2009	1.41 (0.28)	2.44** (0.95)
2011	1.55 (0.29)	2.49** (0.92)
2015	1.79* (0.35)	3.07*** (1.10)
Constant	0.04*** (0.02)	0.02*** (0.02)

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ;

RRR: Relative risk ratio;

Robust standard errors were reported in parenthesis;

Reference: Illiteracy (Educational attainment), Unemployed (Employment status), Rural (*Hukou* status), Divorced/widowed (Marital status), Age < 50 (Care recipient), 1 (Number of

parents who need cared for), 1993 (Wave).

In Table 2, we also present the results of control variables included in the analysis. When the age of care recipients is over 50, the likelihood of being a high-intensity caregiver is 4.19 times higher than non-caregiver ( $p < 0.05$ ) and the likelihood of being a low-intensity caregiver is about 2.80 times higher ( $p < 0.05$ ) than non-caregiver. No statistical significance is found in marital status and number of siblings. However, those who have two care-needing parents are 1.58 times more likely to be a high-intensity caregiver than those who have only one parent ( $p < 0.01$ ). Results from time trends analyses suggest a significant upward trend of high-intensity care. The relative risk ratio increased year by year since 2004 and reached 3.07 in 2015, which indicates the respondents are more likely to be a high-intensity caregiver since 2004.

Table 3 shows the Hausman test results, which indicates that none of the three options would reject the IIA assumption (See Table 3). Spearman coefficients are used to test the correlation between SES variables (See Appendix Table1).

**Table 3** Hausman test results of the IIA.

Omitted	Chi2	df	P Chi2	evidence
0	8.560	11	0.662	for Ho
1	9.852	11	0.544	for Ho
2	11.285	11	0.420	for Ho

## Discussion

In this study, 62.2% of the participants whose parents or parents-in-law need to be taken care of in daily life and shopping, do not provide informal care. Theoretically, this condition may result from other siblings taking care of their parents or the use of formal care. We add the number of siblings of caregivers as a control variable in order to eliminate the impact of sibling care, and the regression results show that the number of siblings have no statistical significance. Regarding the impact of formal care, we don't know whether formal care exists due to the limitations of the database, but formal long-term care still in its infancy in China [38], only in a few countries like Denmark (which has the one of the most extensive systems of home care services) do a large proportion of older people receive regular help or assistance from public social services [39]. Moreover, Chinese people attach great importance to the concept of family affection, and informal care given by adult children can provide the necessary emotional support for older people. Thus, even if a degree of formal care exists, informal care remains indispensable and cannot be replaced by formal care. This is also one of the significance of this study.

SES is one key indicator affecting both caregiver and care-recipient in the caregiving context. It is crucial to develop targeting measures by analyzing the SES among female caregivers, so as to design welfare programs for informal care in China. To our knowledge, this is the first study to investigate the SES of married females who providing intensity informal care for their parents/parents-in-law in need of care in China, and this study contributes to the literature on the 'supply side' of informal care. However, what we

should highlight in the study is that this sample only include married women (including married, widows and divorced), so we need to be careful when extrapolating our findings. One of the key conclusion can be drawn from our findings is that high SES females are more likely to provide informal care for their older parents compared with low SES females, which is in agreement with the study from 48 LMICs by Louis et al. [40]. To be specific, those with high educational attainment, high economic status and urban *Hukou* are more likely to provide high-intensity care, and females who are employed and with urban *Hukou* are more likely to provide low-intensity care.

The current study finds that the females with high educational attainment are more likely to play the role of be high-intensity caregivers, while this education effect is not found to be statistically significant in low-intensity informal caregivers. This finding is in agreement with the conclusion of Petra et al. that high education was associated with a higher probability of being a caregiver in Poland, though they did not particularly focus on females [21]. One important reason for this finding might be due to the “feedback theory” proposed by Xiaotong Fei [41]. The “feedback theory” pointed out that children have the responsibility to support their parents in order to repay for their upbringing and education. Education has long been an important factor in social and personal development, and attaining higher education requires greater parental and household investment. Those have attained higher education may view caregiving as a way to provide for parents and repay them for their investment [42]. In addition, females with high education tended to be motivated by Chinese traditional culture that it is a virtue to support parents, especially when they are under need of care [43, 44].

Surprisingly, the employed women are found to be more inclined to provide low-intensity informal care, whereas this association is not statistically significant in high-intensive care. In order to further explain this phenomenon, we did an in-depth analysis to examine the correlation of the different variables of SES (See the Appendix Table 1). We find that there is a positive correlation between education, income, and *Hukou*, while employment status is only negatively correlated with *Hukou*. Based on this result, we speculate there may be a selection effect involved, especially for those with low SES. In recent decades, the awareness of work and economic participation has increased [45], thus, low SES women also have to find a job for basic livelihood. It may be that when they are weighing decision to find a job versus to take care of their parents or parents-in-law who need care, they would consider the care intensity the parents need. If the parents or parents-in-law just need a low-intensity care, they would prefer to work. But high-intensity care required a certain amount of time and effort, respondents have to spend much time providing informal care for their parents or parents-in-law, regardless of the employment status.

Consistent with previous studies, we also find that women with urban *Hukou* are more likely to provide informal care than those with rural *Hukou* [40, 46]. Because we have excluded those who do not live with their parents in the same city or county, so the living distance caused by rural respondents moving to urban areas for better job opportunities is eliminated. As we have mentioned in the introduction, respondents with urban *Hukou* receive higher benefits compared with their rural counterparts. Thus, one of the potential explanations for the urban-rural disparity observed in this study may be that rural *Hukou* holders have limited time to care for their parents due to livelihood or lack the awareness of care for their

parents who in need. In addition, compared with rural women, urban women have higher educational level, and higher education was found to be associated with more informal caregiving. The association was also demonstrated in the Appendix Table 1.

The negative association between SES of caregivers and informal care has been found in some previous studies, which are inconsistent with the current study. However, these studies have mainly focused on high-income countries. For example, in Germany, those who provide high-intensity informal caregiving tend to have a low educational attainment and an unemployment status [18]. A study in Belgium finds that women who are not formally employed are more likely to be informal caregivers [15]. Another study in Japan finds women with lower education are more likely to be informal caregivers [17]. Agree & Glaser [47] suggested that SES may behave in different ways across societies and countries. One of the explanations for the inconsistent results may be due to the difference of long-term care system between China and those countries. The economic and social development of high-income countries is ahead of the occurrence of population aging, which has a good economic and social foundation to deal with population aging. Consequently, like the United States, Germany, Japan and other high-income countries have gradually established a relatively complete long-term care service system, some social services work with health services to provide care for dependent older people, but in many LMICs, social services do not exist or remain dysfunctional [48]. This thus, the women with higher SES have a greater capacity to purchase formal institutional care for their older parents instead of informal care in the above mentioned high-income countries. Although the study in Poland is consistent with our findings [21], it may be due to its lack of a public insurance fund for long-term care for older people. By contrast, in China and many other LMICs, the long-term care system is still in its infancy, and informal care remains the dominant. Women with low SES may be less able to provide care for their older parents, which may be due to the fact that they have to prioritize a paid job due to financial needs and lower levels of social security in rural Hukou holders.

As can be seen from time trends, the number of people providing high-intensity informal care has been increasing over the last two decades. There are two possible reasons for this finding. First, according to the National Bureau of Statistics [4], the proportion of the population over 65 years has been entering into a rapid increasing period since 2000, which brings a higher need for high-intensity care for the elderly. However, the Chinese government has not been well ready for coping for this challenge, and the supply for the formal care is not sufficient. As an alternative, an increase in the informal high-intensity care is observed. Second, even though we used clustering robust standard error to avoid individual autocorrelation across eight waves of the data, the increase of high-intensity care in recent waves might be partly due to the fact that the care recipients are older, and also the need for high-intensity care increased.

The present study has several limitations. First, since the sample only includes married women aged 52 and below who participated in the supplementary survey on intergenerational linkages to parents, we may have underestimated the results of informal caregiving. Second, owing to the cross-sectional nature of the study, we cannot exclude the possibility of reverse causation. For example, the intensity of informal

caregiving could conversely affect the employment status or income. Third, the sample size is not very large. There is no difference in marital status may be since a great majority is married. Finally, respondents were not asked what kind of care was being provided and whether a formal caregiving was being used, and the information of the specific age of care recipient were not available in the database, making the analysis less comprehensive.

## Conclusions

In this study, we empirically examine the association between SES of married female caregivers and informal caregiving for their older parents when in need in China, and find that there are differences in SES between high-intensity informal female caregivers and low-intensity female caregivers. Women with high educational attainment and urban Hukou are more likely to provide high-intensity informal care, and women who are employed and with urban Hukou are more likely to provide low-intensity care. These findings suggest that low SES women may be less able to provide care for their older parents, which may be due to the fact that they have to prioritize a paid job due to financial needs and lower levels of social security in rural Hukou holders. Therefore, policy makers should consider the opportunity costs to informal care provision among the married females when making policy recommendations about the design and funding of public long-term care programs in the future.

## List Of Abbreviations

SES: socioeconomic status; CHNS: China Health and Nutrition Survey; RRR: Relative risk ratios

## Declarations

### Ethics approval and consent to participate

This research has been approved by the Institutional Review Board of the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health, Chinese Center for Disease Control and Prevention. All participants gave written informed consent for their participation in the survey.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets are open to all of the potential users online. [<http://www.cpc.unc.edu/projects/china>].

### Competing interests

The authors declare that they have no competing interests.

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### Authors' contributions

CZ conceived the idea and polished the manuscript. YW and JL coded and analyzed data and wrote the manuscript. LZ, YF, XT, and LS participated in interpretation of the data. All authors read and approved the final manuscript.

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