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Well-being losses by providing informal care to elderly people: Evidence from 310 caregivers in Shanghai, China

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Abstract

A series of policies aimed toward rational resource allocation of long-term care have been actively discussed since the launch of the social long-term care insurance in Shanghai, and it is important to take a societal perspective for informed decision-making. This study aims to explore factors that are associated with well-being of informal caregivers in Shanghai, and to provide empirical evidence of application of an established well-being valuation method to monetise informal caregivers' well-being losses in a developing country. 310 informal caregivers of applicants for social long-term care insurance in Shanghai were interviewed. Univariate and multivariate analyses were conducted to explore the associated factors with life satisfaction of the caregivers. The monetary values of an additional hour of caregiving with and without specification of care tasks were estimated by the well-being valuation method. Life satisfaction was consistently associated with monthly income, health status, and caring hours of the caregivers. The money needed to compensate one additional hour of caring per week was 12.58 CNY (0.3% of the monthly income), and 96.95 CNY (2.0% of the monthly income) for activities of daily living (ADL) tasks. Income, health status, and caregiving are significantly associated with well-being of informal caregivers. Caregivers in relatively poor health condition and/or involved in more ADL tasks should be particularly considered in supporting policies in Shanghai.

KEYWORDS

informal care, informal caregivers, Shanghai, well-being, well-being valuation method

1 | INTRODUCTION

Informal care has long been considered as a zero-cost substitution for formal care, and has been largely neglected in long-term care and healthcare policies (Van Exel et al., 2008). In fact, informal caregiving produces economic, health, and social issues among caregivers. For example, studies have demonstrated that the wages of informal caregivers are significantly lower than those of non-caregivers (Colombo & Mercier, 2012), and they are usually confronted with

higher risks of morbidity, depression, and anxiety (Pinquart & Sörensen, 2003, 2007; Pirraglia et al., 2005; Sklenarova et al., 2015; Vitaliano et al., 2003). However, most researchers agree that caregiving can also lead to positive utility while caring for those who are significant to the caregivers (Brouwer et al., 2005; Koopmanschap et al., 2008).

Theoretically, all costs and benefits should be considered in economic valuations and policies, irrespective of whether they are direct or indirect (Al-Janabi et al., 2013; Van den Berg et al., 2004). In order

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to include caregiving effects into policies and researches, numerous tools have been developed to evaluate the burdens of caregivers, primarily by monetary measures of objective and/or subjective value of informal care. For example, the opportunity cost method and the proxy good method constitute the two most utilised methods for valuing the objective input and output of informal caregiving. The former calculates the opportunity costs of caregiving by multiplying forgone time in caring and the best salary that he or she can obtain in the labor market (Chari et al., 2015; Koopmanschap et al., 2008); whereas, the latter calculates the costs by multiplying caring time and the market price of formal care (Koopmanschap et al., 2008; Van den Berg et al., 2006). These methods, however, have been criticised for not considering the preferences of the caregivers, and measuring only the cost of caregiving without taking the potential positive utility derived from taking care of beloved ones into account (Brouwer et al., 2005). Consequently, contingent and conjoint valuation methods, which have been broadly employed in measuring economic values of non-market goods, were introduced to value informal care (De Meijer et al., 2010). These evaluation projects, however, have encountered certain technical challenges, such as non-responsiveness, protective answers, and the anchoring effect (Fujiwara, 2013). The well-being valuation method, which indirectly estimates the value of non-market goods by calculating the marginal rates of substitution between income and caring hours, is easier to conduct than other preference-based methods, and has been adopted to value unemployment, pollution, therapies, etc. (Ferrer-i-Carbonell & Van Praag, 2002). However, there has been limited empirical application of the well-being valuation method to informal care, and these have been mostly implemented in developed countries (Schneider & Kleindienst, 2016; Van den Berg & Ferrer-i-Carbonell, 2007; Van den Berg et al., 2014).

Because of social filial norms and social security system design, the majority of long-term caring is currently performed by informal caregivers in China, particularly family members, who are typically the spouse or child of the recipient. Although it comprises a significant part of long-term care, only few studies have explored the burdens of family caregivers in China (Lu et al., 2015). Recent literature has revealed that objective burdens of caring are associated with the subjective burdens of family caregivers (Cao & Yang, 2020; Yang et al., 2019).

Shanghai has the largest population of elderly people among all cities in China. In 2015, the percentage of people above 60-years-old reached 30.2% of the residents in Shanghai (Shanghai Bureau of Statistics, 2016). Accordingly, in 2016, Shanghai was selected as one of the first piloting cities of China's social long-term care insurance system. According to the application policy in Shanghai, all residents who are above 60-years-old can apply for this insurance. In order to become covered by the insurance, the elder resident should receive a demand evaluation, which contains a variety of dependency indicators. When the application is approved, the insurance will co-pay 90% of the expenses of formal care services (up to 7 hr/w, according to the result of the demand evaluation) provided by designated care providers. The launch of the long-term insurance is considered to

What is known about this topic

- Caregiving induces well-being losses of informal caregivers.
- The monetary value of informal caregiving can be measured by the well-being valuation method.
- Costs and benefits are sensitive to different caregiving contexts.

What this paper adds

- Hours spent on activities of daily living tasks are likely to induce considerable reduction in life satisfaction of informal caregivers in Shanghai.
- The money needed to compensate one additional hour of caring per week was 12.58 CNY, and 96.95 CNY for activities of daily living tasks.
- Caregivers in relatively poor health condition and/or involved in more ADL tasks should be particularly considered in supporting policies in Shanghai.

encourage the elderly to age in place, so as to alleviate the pressure of increasing demand on very limited institutional care resources in Shanghai (Liu et al., 2020). A series of policies aimed toward rational resource allocation of long-term care, which will impact both elderly people and their informal caregivers, are being actively discussed, and solid empirical evidence is called for in order to ensure informed decision-making.

Consequently, it is of considerable importance for both researchers and decision-makers to thoroughly understand informal care. However, no informal care study has yet been carried out to measure the economic value of informal care via the well-being valuation method in China or any other developing country. This study aims to explore factors that are associated with informal caregivers' well-being, and to estimate the economic value of informal care provided by primary caregivers of elderly people in Shanghai using the well-being valuation method.

2 | METHODS

2.1 | Sample and study design

Caregivers were recruited through 31 randomly selected communities of Shanghai. All of the informal caregivers of elderly people applying for the social long-term insurance from January 1, 2019 to June 1, 2019 at the residents' committees were invited to participate. Considering heterogeneity in caregiving time of different caregivers, as well as the cognitive ability to answer questions relating to caregiving and happiness, several requirements were established for inclusion of the respondents. The caregiver should: (a) be the primary caregiver, who spent more time with the recipient than any

other caregiver; (b) be 16-years-old or older; and (c) spent at least 1 hr/d providing care. Written and verbal consent of participants were obtained prior to the interviews. A total of 439 caregivers voluntarily participated in the interviews, and 310 of the participants were considered as eligible respondents for this research. Specifically, 129 respondents were excluded for incomplete information ($N = 6$), being under 16-years-old ($N = 7$), not the primary caregiver ($N = 22$), and non-responsiveness of life satisfaction question ($N = 39$). Respondents who reported to provide caregiving over 16 hr/d ($N = 55$) were also excluded, because the possibility would exist that the caregiver was exaggerating about care hours, which would cause over-pledging bias.

2.2 | Well-being valuation method

The well-being valuation method denotes that a caregiver's well-being is a function of his or her income, provision of care, and other covariates (Fujiwara, 2013). The econometric model can be expressed as:

$$w_i = \beta_0 + \beta_1 y_i + \beta_2 c_i + X_i' \beta_3 + \varepsilon_i \quad (1)$$

where w_i denotes the well-being of respondent i ; y_i is the income; c_i is the caring hours of caregiver i ; X_i is a vector of demographic variables (e.g., age, gender, education, etc.); β_0 denotes the intercept term; β_1 , β_2 , and β_3 are the regression coefficients (or coefficient vector); and ε_i represents the unobservable error term. Since both income and care-providing influence caregivers' well-being, the estimated monetary value of an additional hour of caregiving can be derived as follows:

$$\frac{\delta y_i}{\delta c_i} = \frac{\delta w_i / \delta c_i}{\delta w_i / \delta y_i} = \frac{\beta_2}{\beta_1} \quad (2)$$

There are several approaches available for well-being measurement, and life satisfaction constitutes one of the most frequently adopted proxies (Diener et al., 2002). In this study, the happiness of the respondents was assessed by asking, "All things considered, on a scale of 0 to 10, where 0 denotes not satisfied at all and 10 denotes completely satisfied, how satisfied are you with your current life?". The respondents were asked to mark their answer on a visual analogue scale (see Figure 1). However, some elder caregivers preferred to point on the scale with their fingers. In this case, in order to increase the response rate, the interviewer would put a cross on the scale for the respondent and confirm the answer with the caregiver.

2.3 | Data and statistical methods

2.3.1 | Measures

Questionnaire-based face-to-face interviews were conducted by five trained interviewers. The questionnaire begins with several demographic questions, which are considered as the independent variables in the analysis, including the caregiver's gender, age, education level, employment, marital status, income, and relationship to the recipient. Monthly income was calculated by adding all sources of income (after tax) in the previous month, including salary and/or pension, rent, return on financial investment, transfers, gifts, etc. The currency used in measurement and statistical analyses was the Chinese Yuan (CNY). In addition, the health status of both the caregiver and the recipient were also included as the independent variables. The health status of the caregiver and recipients was captured by using the Charlson Comorbidity Index (CCI). The CCI is an index that assigns each morbidity a score ranging from 1 to 6, according to disease severity and resource intensity (Charlson et al., 1987). Previous investigations have employed numbers of diseases or grip strength as proxies of the health status of the caregivers and recipients, which has been criticised as being unable to elicit the severity of morbidity. However, in this case, the CCI is likely to be able to capture both the number and severity of morbidities. A few more care-related questions were asked, which included the duration of caring, care time per week according to care tasks, and sources of other informal care and/or formal care. In accordance with other valuation projects (Van den Berg & Spauwen, 2006), care time was measured by asking the time spent on a list of care tasks in the week prior to the interview, including household activities of daily living (HDL) tasks, activities of daily living (ADL) tasks, instrumental ADL (IADL) tasks, and supervision and companionship. Previous researches have obtained care time by asking care time in a typical week. However, in the pilot study, the respondents reported difficulty in identifying a "typical" week by referring to care activities performed recently. In order to alleviate the response burden, the previous week method was adopted.

2.3.2 | Analytical strategy

Categorical and continuous variables were described via numbers and percentages, and means and standard deviations (SD), respectively. Log transformed continuous variables were employed in univariate and multivariate analyses to correct for decreasing marginal effects on utility, and a detailed process of

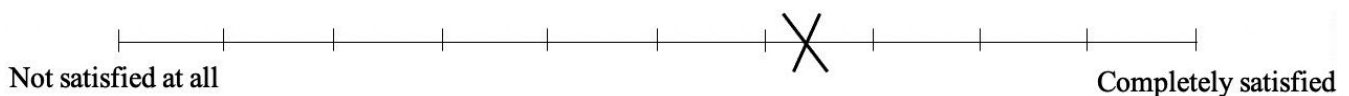


FIGURE 1 Visual analogue scales of life satisfaction.

deriving the shadow price for logarithmic data is detailed in previous literature (Schneider & Kleindienst, 2016; Van den Berg & Ferrer-i-Carbonell, 2007). Student's *t*-test, one-way analysis of variance (ANOVA), Chi-square test, and Pearson correlation were utilised in univariate analyses to elucidate the association of variables with life satisfaction. Ordinary least squares (OLS) was employed in multivariate analyses to derive the coefficients of the covariates (Schneider & Kleindienst, 2016; Van den Berg & Ferrer-i-Carbonell, 2007). Two models were introduced in this study. Model 1 aimed to estimate the overall influence of informal caring on life satisfaction, and model 2 explored the relationship between life satisfaction and hours spent on four specified categories of care tasks. EpiData version 3.1 and SPSS version 20.0 were used for data entry and analysis, respectively.

3 | RESULTS

3.1 | Characteristics of the caregivers

A total of 310 respondents were included (see Table 1). There were more female ($N = 172$, 55.5%) than male ($N = 138$, 44.5%) caregivers interviewed. Compared to studies carried out in other cities and provinces in China (Hou et al., 2013; Ma et al., 2020), it is interesting that males constituted a considerable proportion of the primary caregivers in Shanghai. The average age of the caregivers was 56.43 ($SD = 11.60$). Most caregivers received 7 to 15 years of education ($N = 196$, 66.2%) and were employed ($N = 169$, 54.5%). The fact that more than half of the caregivers were employed implied that the possible trade-off between time of caring and time of work or leisure can vary markedly. 92% ($N = 276$) of the caregivers were married. The average disposable monthly income was 4,864.84 CNY ($SD = 1686.89$). This result is lower than the average monthly personal disposable income in 2018 in Shanghai, which is 5,348.58 CNY, as reported by the Shanghai Bureau of Statistics (Shanghai Bureau of Statistics, 2019). 34.0% ($N = 101$) of the caregivers and 18.4% ($N = 56$) of the care recipients had a CCI equal to 0. 55.2% ($N = 164$) and 67.1% ($N = 204$) had a CCI equal to 1 or 2, respectively. 10.3% ($N = 45$) of the caregivers' and 14.5% ($N = 44$) of the recipients' CCI were 3 or above. The majority of caregivers ($N = 209$, 65.5%) had one or more chronic disease(s). Among the primary caregivers interviewed, 28.2% ($N = 86$) were the spouse and 71.8% ($N = 219$) were the child of the recipient, suggesting that the child is the main source of care for elderly people in Shanghai. On average, the caregivers had been taking care of the recipients for 7.44 ($SD = 4.97$) years. The average hours of care giving each week was 44.36 ($SD = 28.98$). Specifically, 13.57 ($SD = 10.54$), 8.78 ($SD = 7.82$), 10.43 ($SD = 9.84$), and 11.44 ($SD = 13.42$) hours of HDL tasks, ADL tasks, IADL tasks, and supervision and companionship were provided, respectively. 60.3% ($N = 187$) of the care recipients also received formal care, and 42.9% ($N = 133$) of the recipients also received informal care in addition to the caring provided by the

TABLE 1 Characteristics of the caregivers

	N/(Mean)	%/(SD)
Gender		
Male	138	44.5
Female	172	55.5
Age	(56.43)	(11.60)
Education	(Missing = 14)	
0–6 years	9	3.0
7–15 years	196	66.2
Above 15 years	91	30.8
Employment		
Employed	169	54.5
Retired	90	29.0
Unemployed	51	16.5
Marital status	(Missing = 10)	
Married	276	92.0
Unmarried or divorced	15	5.0
Widowed	9	3.0
Monthly income (in CNY)	4,864.86	1686.89
CCI of the caregiver	(Missing = 13)	
CCI = 0	101	34.0
CCI ≤ 2	164	55.2
CCI ≥ 3	45	10.3
CCI of the care recipient	(Missing = 6)	
CCI = 0	56	18.4
CCI ≤ 2	204	67.1
CCI ≥ 3	44	14.5
Relationship to the recipient	(Missing = 5)	
Spouse	86	28.2
Child	219	71.8
Care duration (in years)	(7.44)	(4.97)
Care time (hours/week)	(44.36)	(28.98)
Care time by care task (hours/week)		
HDL tasks	(13.57)	(10.54)
ADL tasks	(8.78)	7.82
IADL tasks	(10.43)	9.84
Supervision and companionship	(11.44)	13.42
The recipient receives formal care		
Yes	187	60.3
No	123	39.7
The recipient receives other informal care		
Yes	133	42.9
No	177	57.1
Life satisfaction score	7.90	1.28

primary caregiver. The average life satisfaction of the caregivers was 7.90 ($SD = 1.28$).

3.2 | Factors associated with informal caregivers' life satisfaction

The results of the univariate analysis are presented in Table 2. Education ($p = .003$), employment ($p = .002$), and health status ($p < .001$) of the caregivers were significantly associated with life satisfaction scores. As expected, more monthly income ($p < .001$) and shorter length of caregiving per week ($p = .009$) were correlated with higher life satisfaction. Specifically, hours spent on ADL tasks ($p = .015$) was found to be significantly correlated with life satisfaction score. In addition, the average life satisfaction score was significantly higher for caregivers of recipients who also received formal care than for those did not ($p = .003$). Moreover, when other variables were controlled, received formal care was no longer significantly associated with life satisfaction score. However, it remains interesting that caregivers who also received assistance from formal care were more satisfied with their life, while the association between assistance from other informal care and the life satisfaction score was not significant.

The results of the multivariate analysis are presented in Table 3. Income, health status, and caring hours were consistently associated with the well-being of informal caregivers. According to the results of multivariate analysis without specification of care tasks (model 1: $R^2 = 0.278$, adjusted $R^2 = 0.270$, $p < .001$), controlling for other variables, caregivers with higher monthly income, healthier status, and performing fewer hours of caring reported higher life satisfaction scores. Specifically, increasing caregivers' monthly income (β coefficient = 1.416, 95% CI β coefficient = 1.037–1.795, $p < .001$), and CCI equal to 0 (β coefficient = 0.529, 95% CI β coefficient = 0.239–0.820, $p < .001$) were found to be significantly correlated with higher life satisfaction. In addition, longer hours of caregiving (β coefficient = -0.164 , 95% CI β coefficient = -0.301 – -0.027 , $p = .019$) was negatively associated with caregivers' life satisfaction. In model 2 ($R^2 = 0.309$, adjusted $R^2 = 0.299$, $p < .001$), the impact of caregiving time of ADL tasks on life satisfaction was explored. Consistent with model 1, higher monthly income (β coefficient = 1.290, 95% CI β coefficient = 0.878–1.701, $p < .001$) and healthier status (β coefficient = 0.681, 95% CI β coefficient = 0.369–0.992, $p < .001$) were associated with higher levels of life satisfaction of caregivers. Furthermore, hours of providing ADL tasks per week (β coefficient = -0.236 , 95% CI β coefficient = -0.470 to -0.002 , $p = .048$) was negatively associated with life satisfaction.

3.3 | Monetary value of informal caregiving

According to model 1 and equation (2), for an informal caregiver who provided an average of 44.36 hr/w of caring, and had an average monthly income of 4,864.86 CNY, the monetary value derived from the estimation was 12.58 CNY for 1 hr of increased caring, representing 0.3% of the monthly income of the caregiver. With the increasing of caring hours, the marginal monetary value of care

TABLE 2 Univariate analysis of associated factors with informal caregivers' life satisfaction

	Mean	SD	p
Gender			
Male	7.86	1.31	.909
Female	7.88	1.29	
Ln (age)	0.105		.072
Education			
0–6 years	7.41	1.42	.003*
7–15 years	7.72	1.23	
Above 15 years	8.24	1.22	
Employment			
Employed	8.08	1.17	.002*
Retired	7.74	1.45	
Unemployed	7.40	1.28	
Marital status			
Married	7.91	1.28	.120
Widowed	7.78	1.79	
Unmarried or divorced	7.20	1.34	
Ln (monthly income)	0.445		<.001**
CCI of the caregiver			
CCI = 0	8.51	0.98	<.001**
0 < CCI ≤ 2	7.55	1.25	
CCI ≥ 3	7.61	1.18	
CCI of the care recipient			
CCI = 0	8.22	1.18	.137
0 < CCI ≤ 2	7.84	1.29	
CCI ≥ 3	7.85	1.29	
Relationship			
Spouse	7.80	1.50	.576
Child	7.90	1.21	
Ln (care duration)	−0.067		.244
Ln (care time)	−0.152		.009*
Ln (care time by care task)			
HDL tasks	−0.111		.072
ADL tasks	−0.159		.015*
IADL tasks	−0.105		.115
Supervision and companionship	−0.095		.145
Receives formal care			
Yes	8.05	1.29	.003*
No	7.60	1.26	
Receives other informal care			
Yes	7.99	1.24	.156
No	7.78	1.34	

* $p < .05$.

** $p < .001$.

	β coefficient	95% CI β coefficient	SE	Standardised β coefficient	p
Model 1 ($R^2 = 0.278$, adjusted $R^2 = 0.270$, $p < .001$)					
Constant	-3.627	-6.802 to -0.451	1.613		.025
Ln (monthly income)	1.416	1.037-1.795	0.193	0.406	<.001
CCI of the caregiver CCI = 0	0.529	0.239-0.820	0.147	0.202	<.001
Ln (care time)	-0.164	-0.301 to -0.027	0.070	-0.126	.019
Model 2 ($R^2 = 0.309$, adjusted $R^2 = 0.299$, $p < .001$)					
Constant	-2.660	-6.136-0.816	1.763		.133
Ln (monthly income)	1.290	0.878-1.701	0.209	0.380	<.001
CCI of the caregiver CCI = 0	0.681	0.369-0.992	0.158	0.266	<.001
Ln (ADL tasks)	-0.236	-0.470 to -0.002	0.119	-0.115	.048

TABLE 3 Multivariate analysis of factors associated with informal caregivers' life satisfaction score

Caring hours	Model 1		Caring hours of ADL tasks	Model 2	
	CNY	% of monthly income		CNY	% of monthly income
28.00 to 29.00 hr	19.81	0.4	3.50 to 4.50 hr	228.89	4.7
38.50 to 39.50 hr	14.47	0.3	7.00 to 8.00 hr	120.31	2.5
56.00 to 57.00 hr	9.98	0.2	14.00 to 15.00 hr	61.79	1.3
44.36 to 45.36 hr	12.58	0.3	8.78 to 9.78 hr	96.95	2.0

TABLE 4 Monetary values of informal care

decreased. Specifically, the monetary value of well-being losses of increasing 1 hr of general caregiving from 28.00, 38.50, and 56.00 hr/w were equivalent to 0.4%, 0.3%, and 0.2% of the monthly income, respectively. In model 2, with task specification in the explanatory variables, the estimated monetary value for an additional hour beyond the average hours (8.78 hr/w) of providing ADL tasks was 96.95 CNY (2.0% of the monthly income) for a caregiver with an average monthly income. The monetary values of well-being losses by an extra hour from 3.50, 7.00, and 14.00 hr/w of performing ADL tasks were 4.7%, 2.5%, and 1.3% of the monthly income, respectively. The monetary values for an extra hour from the quartiles, the median, and the mean hours of caring are presented in Table 4. Since the caregiving hours of the other three categories of tasks were not significantly associated with life satisfaction, the monetary values of these tasks were not estimated.

4 | DISCUSSION

Overall, providing more care decreased the self-reported well-being of the caregivers. The estimated monetary value for an additional

hour of caring per week as determined by the well-being valuation method was 12.85 CNY, constituting 0.3% of the average personal income per month. In particular, the monetary value for an additional hour of caring in ADL tasks was 96.95 CNY (2.0% of the monthly income). Moreover, the percentage of income needed for compensation was lower than that reported in other well-being valuation studies conducted in more developed countries (Van den Berg & Ferrer-i-Carbonell, 2007).

Hours spent on ADL tasks is likely to induce considerable reduction in life satisfaction. The impact of providing ADL tasks on well-being, however, is mixed in the extant literature. For example, a Swedish study reported a significantly lower life satisfaction of caregivers providing ADL tasks (Borg & Hallberg, 2006). However, Schneider et al. (2016) found that caregivers providing mainly personal care (which is included in ADL tasks) had higher life satisfaction (Schneider & Kleindienst, 2016). They inferred that taking care of beloved ones can be emotionally less burdensome for caregivers. However, more empirical evidence is needed to make further conclusions regarding the relationship between caregiving tasks and life satisfaction. Moreover, the amount of money required to compensate for an additional hour of performing ADL tasks is higher than

the cost of hiring professional home nursing care in Shanghai (which is approximately 65 CNY/h, according to informal interviews with several social workers in neighborhood committees). However, it is much easier to find someone who can provide HDL tasks in the market at a lower price (approximately 35 CNY/h). This phenomenon could be explained by the fact that it is not easy to find qualified formal home care service in Shanghai, and the high transaction costs involved could constitute the underlying explanation for this disparity. In addition, most of the informal caregivers provided HDL services to their family, irrespective of whether or not the care recipients needed them, and the significance of association between time involved in HDL tasks and life satisfaction was insignificant in this study. These results also emphasise the importance of care task specification in valuation studies.

Generally, the caregivers in this study had higher average life satisfaction (7.90) compared to that reported in previous studies performed in developed countries. For instance, the average life satisfaction of informal caregivers was reported to be 7.81 in a study conducted in 12 European countries (Schneider & Kleindienst, 2016), 5.63 in a study in The Netherlands (Van den Berg & Ferrer-i-Carbonell, 2007), and 7.78 in a study in Australia (Van den Berg et al., 2014). Furthermore, different explanatory variables were reported in these investigations. Most researchers agree that positive utility can be derived from caregiving activities because of self-fulfilment and self-esteem obtained from helping beloved ones. However, life satisfaction measures respondents' well-being as a whole, and a higher life satisfaction should not be interpreted as an indicator of higher process utility. Researchers could consider measuring the positive and negative utility derived from caregiving, respectively, to differentiate the effects. A potential way to realise this separation could be the use of a reference group of non-caregivers (Van den Berg et al., 2014).

Income and health status were consistently associated with life satisfaction. As anticipated, a higher monthly income was a reliable predictor of higher life satisfaction. In addition, health status of the caregivers was also determined to be correlated with life satisfaction in almost all relevant studies. For example, Van den Berg and Ferrer-i-Carbonell (2007) reported that having a disease was significantly associated with lower self-reported well-being (Van den Berg & Ferrer-i-Carbonell, 2007). However, in our sample, 65.5% of the caregivers had a CCI above 0, and 10.3% had a CCI equal to 3 or above. Although studies have adopted different measures of caregivers' health status, numerous researches demonstrated that longer hours of caregiving has an impact on caregivers' physical health. Even though the causal relationship is undetermined in this study, these results indicate that more attention should be paid to the health of informal caregivers in supporting policies and measures, e.g., health management, care-friendly adaptation of home environments, caregiving skill training, etc. Before and after design using the well-being valuation method can also derive useful results for cost-benefit analysis of supporting projects.

The non-responsiveness of the life satisfaction question was 8.9%. According to previous studies using stated preference methods (e.g., the contingent valuation method), non-responsiveness

varies from 19.0% to 49.0% (De Meijer et al., 2010; Van den Berg et al., 2005; Van den Berg et al., 2005). Well-being valuation, as expected, had a lower non-responsiveness than did stated preference methods. Indeed, non-responsiveness is considered as one of the major challenges with stated preference valuation methods concerning informal care, especially regarding stating a price for caring for recipients who are significant to the caregivers. Our research provides further evidence that measuring the value of non-market goods using the well-being valuation method is applicable in developing countries and regions. Since the well-being valuation method is relatively easier and less expensive to conduct, with the increasing demand in economic evaluations of long-term care related projects and policies, it is possible to employ this method to obtain relevant quantitative evidence. This is especially crucial when informal care is the major source of care, and formal care resources are under great pressure from the rapid aging of the population.

Our research possesses several limitations. First, this study only analysed the well-being loss of informal caregivers in general. However, studies have demonstrated heterogeneity in caregiving and caregivers. We strongly recommend interested researchers to perform the well-being valuation method in different subgroups, for example, male and female caregivers, employed and unemployed, etc. Previous investigations also have shown that the caregiver's well-being is related to his or her freedom of choice regarding preferences (Al-Janabi et al., 2013). However, the well-being valuation method is aimed to capture a complete effect of caregiving by calculating the marginal substitution rates between variables. When considering disaggregating effects of caregiving according to preference, it will be more appropriate to use the contingent valuation method, the conjoint valuation method, or the discrete valuation method. Second, we only interviewed informal caregivers of applicants for social long-term care insurance, and selection bias could exist because these might be people who required formal care. However, since all residents in Shanghai who are above 60-years-old can apply for the insurance without actually using it, the impact of selection bias should be small. Researchers should consider using larger datasets to minimise this bias. Third, as we aimed to elucidate the well-being of the most important providers of informal care, only primary caregivers were included in this study. According to international experience, spouses, children, neighbors, friends, and relatives can all be important informal caregivers of elderly people. However, no other relationship between the caregiver and the recipient was found, except for spouses and children, indicating that family caregivers are the major source of long-term care in Shanghai. In addition, researchers have demonstrated that family caregivers would over-report their care time because they also count daily activities that are irrelevant to caring into informal care hours (Van den Berg & Ferrer-i-Carbonell, 2007; Van den Berg & Spauwen, 2006). Moreover, empirical evidence showed that family caregivers experience larger well-being losses (Van den Berg & Ferrer-i-Carbonell, 2007). Further studies can purposely invite informal caregivers who are not the spouse or the child of the recipients to determine the well-being change of non-family caregivers.

5 | CONCLUSIONS

This research provided the first empirical evidence of applying an established well-being valuation method to value informal care in China. Income, health status, and caregiving are demonstrated to be significantly associated with well-being of informal caregivers. The results imply that supporting caregivers who are in relatively poor health status and/or perform longer hours of ADL tasks should be prioritised in relevant policies.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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