ARTICLE

Social exclusion and health outcomes among empty nest and non-empty nest older people in China

Zhixin Feng[1,2,3] [iD] and David R. Phillips[4]*

[1]School of Geography and Planning, Sun Yat-Sen University, Guangzhou, China, [2]Guangdong Key Laboratory for Urbanization and Geosimulation, Sun Yat-Sen University, Guangzhou, China, [3]Guangdong Provincial Engineering Research Center for Public Security and Disaster, Guangzhou, China and [4]Department of Sociology and Social Policy, Lingnan University, Tuen Mun, Hong Kong (SAR), China
*Corresponding author. Email: phillips@ln.edu.hk

Abstract

Many existing studies lack a comprehensive picture of the social exclusion statuses and health outcomes of empty nesters and those empty nesters living alone or with a spouse only. Cross-sectional analysis was conducted on representative national data from the 2014 China Longitudinal Aging Social Survey, focusing on respondents aged 60 and above (N = 7,923). Four dimensions of social exclusion (social relationships, subjective feeling of being excluded, social activities and financial products) and three health outcomes (self-reported health (SRH), activities of daily living (ADLs) and depression), were considered. Results show that 'empty nest' older people were more likely to be excluded from social relationships and to experience subjective feelings of being excluded, and were less likely to participate in social activities than non-empty nesters. Empty nesters were significantly less likely to report fair SRH and ADL difficulties than non-empty nesters, but they were more likely to report having depression than non-empty nesters. Among 'empty nest' older people, empty nesters who were living alone were associated with higher levels of being excluded from social relationships and to experience subjective feelings of being excluded than those who were living with a spouse only. Future research could focus on the development of age-friendly communities which act as health interventions to address relevant situations of social exclusion and depression among empty nesters.

Keywords: empty nest; social exclusion; self-reported health; depression; China

Introduction

Intergenerational co-residence has declined significantly in Western countries over the past half a century due to a combination of factors including rising demands for 'privacy' and income growth (Michael *et al.*, 1980; Boyd, 1991; Grundy, 2000). China's household structure has experienced similar changes from traditional

multigenerational (or intergenerational) co-residence to shrinking household sizes, with the proportions of one-couple households rising steadily from the 1980s onwards (Hu and Peng, 2015). The 'empty nest' phenomenon as seen in the West has also strongly emerged. This commonly refers to households in which older people are living alone or with a spouse only, and whose children or grand-children have left home. Following China's 40+ years of the One-child policy and subsequent modifications, the 'empty nest' has become the main family pattern among older people in China. There were 58 million empty nest families in China in 2010 (Hu and Peng, 2015) and the number of empty nest older people is expected to reach 200 million in 2030 (Yuan, 2017). Empty nesters are thought to be at higher potential risk of being socially excluded than non-empty nesters as they may have limited social contacts or lesser participation in various domains of life activities (Feng, 2011; Phillips and Cheng, 2012; Scharf and Keating, 2012; Van Regenmortel et al., 2016; Feng et al., 2018). Empty nesters appear increasingly likely to form a social phenomenon, a group which will present numerous social, economic, and possibly health and policy implications in the coming decades.

Many existing studies in Asia and the West have tended to analyse social exclusion as a primary outcome or have focused on selected health outcome(s) among empty nesters. Consequently, we lack a more comprehensive picture of the social statuses of empty nesters and those empty nesters living alone or with a spouse only. Therefore, this study aims to investigate more broadly the physical and mental health outcomes and four dimensions of social exclusion, comparing empty nest and non-empty nest older people, and empty nesters who were living alone or with a spouse only. The findings will help to fill the empirical knowledge gap about the relationships between empty nesting, health outcomes and social exclusion in a non-Western country, China, but where similar 'empty nest' characteristics are evident but it is currently without the more developed formal old-age support seen in many Western societies.

Empty nesters, non-empty nesters and associations with health

The pathways through which individuals become 'empty nesters' can vary and may indeed change over time. They can be assessed objectively or subjectively through the lifecourse and can cause mixed feelings in older parents. Given their ramifications, they may affect and lead to different mental and physical health statuses. Children leaving home and living independently from their parents is a major rite of passage for children and is, of course, the key objective reason for older parents becoming 'empty nesters'. Parents may have a range of different emotional responses and expectations about their children's 'usual' nest-leaving behaviour. The 'launching' of children from the home, as some call it, might extend the breakup of family ties and can exacerbate the empty nest syndrome. The range of emotions can include negative ones, such as depression, anxiety, guilt and stress, that may lead to chronic stress in their later life (Grover and Dang, 2013; Mitchell and Wister, 2015; Tanis et al., 2017). In addition, being empty nesters can lean older people towards having less emotional support from their adult children. Without appropriate support, empty nest older people could be in a more vulnerable position with regard to the fairly common psychological and physical problems of older age.

There is little doubt that non-empty nesters can more easily access emotional and instrumental support from their (co-resident) children than empty nesters, which could help older parents maintain higher levels of physical and mental functioning in older age (*e.g.* Glaser *et al.*, 2004). Non-empty nesters' health could also be more easily observed and monitored by their co-resident children which could result in older parents having better health, or quicker interventions, than their empty nest counterparts. Aranda (2015) used a difference-in-difference propensity score-matching approach and Courtin and Avendano (2016) used an instrumental variable approach to address the causal relationships between co-residence and mental health among older Europeans, and both studies found robust evidence of a positive effect of co-residence on their mental health. Yuan *et al.* (2021) applied the endogenous treatment effect model and found that older persons who lived with their children were happier than those who did not. Conversely, from a strain relief perspective, the departure from home of children could perhaps reduce older parents' exposure to stressors such as daily demands and work–family conflicts. Living with adult children might also lead to a loss of autonomy and independence among older people, an increase in their dependence and potential conflict between children (Hughes and Waite, 2002). In Asian countries, using a factor structure model, which accounts for non-random selection and heterogeneous treatment effect with two waves of data, Johar and Maruyama (2014) found a negative co-residence effect on health outcomes. In Japan, another factor structure model study with two waves supported the proposition that co-residence may worsen elderly parents' health because care burdens on adult children create disincentives for the parents to invest in longevity (Maruyama, 2015). In Western-based studies, Tosi and Grundy (2018) applied fixed-effects linear regression models with four waves of data and found that a child returning to the home could be associated with decreases in older parents' quality of life in Nordic countries. Davis *et al.* (2018), using ordinary least squares (OLS) regression with two waves of data, noted that co-residence with a child can be associated with lower parental marital quality in the United States of America (USA). Similarly, in the USA, Caputo (2019) employed OLS regression with three waves of data and concluded that a child returning to the home could be associated with an increase in depressive symptoms among older people. Indeed, Davis *et al.* (2018) argued that the detrimental effect of co-residence on parental marital quality may be valid when co-residence is non-normative or when co-resident children are themselves suffering problems. A transition to co-residence with adult children showed the potential to violate values and normative expectations and financial stress in Tosi and Grundy's (2018) and Caputo's (2019) studies.

In general, different living arrangements are associated with different health outcomes and the detrimental effects or beneficial effects of co-residence with children seems to vary according to different culture, societies and countries (Courtin and Avendano, 2016; Tosi and Grundy, 2018; Caputo, 2019). Living with a spouse has been consistently found to be beneficial for the survival and health of older people (Waite and Hughes, 1999; Feng *et al.*, 2015). Manzoli *et al.* (2007) observed that marriage provides provision of social or economic support which could be attributed as a protective effect to the risk of mortality, and better health behaviours of married individuals, especially males, may in turn be a direct effect of marriage

on health outcomes. Older people who live with a spouse or alone are more likely to develop better coping mechanisms and contingency plans (such as using formal health services) than those in other living arrangements (Davis *et al.*, 1997).

Whilst many studies have been Western-based, in China, many older people are expected to carry out household chores for the entire family or to care for grandchildren in return for their traditional family (filial piety) care from children, whether or not in intergenerational co-residence or living with adult children, because of underdeveloped formal old-age support. Some studies suggest that these demands may lead to a decline in physical function (Wang *et al.*, 2009), and the wellbeing and quality of life of such persons may also be affected by potential intergenerational conflicts (Zhou and Qian, 2008). Older empty nesters often appear to have changed needs for daily living, health care and social support (Liu *et al.*, 2015), which could lead to psychological and physical problems. However, Sereny (2011) showed that older people in China, especially those of higher socio-economic status, often preferred to live independently, which could be a key subjective reason for some older parents having become 'empty nesters' in recent years. 'Empty nest' parents can have more freedom and leisure time (Mitchell and Wister, 2015; Tanis *et al.*, 2017) and may avoid potential intergenerational conflicts.

Empty nesting and social exclusion

Studies have shown that older people can be more vulnerable to social exclusion than those in younger age groups as they may have limited social contacts or participation in various domains of life activities (Feng, 2011; Phillips and Cheng, 2012; Scharf and Keating, 2012; Van Regenmortel *et al.*, 2016; Feng *et al.*, 2018). The development of an 'empty nest' will inevitably influence older people's contact with family members away from direct contact, possibly daily, face-to-face communications, to indirect contact via phones or other social networking applications. A longitudinal study in the USA on parental empty nesters and social networking site (SNS) use showed that child-related SNS use reached a peak in the period directly after the child has 'left the nest' and gradually decreased over the subsequent two years (Tanis *et al.*, 2017). The empty nest syndrome, loosening direct contacts between family members, could act together with population ageing to impact on many aspects of society but especially the nature and frequency of relationships among family members, as well as government policies for family support and organisations that provide services to older adults (Chen *et al.*, 2012). Social exclusion may be an unavoidable factor for empty nesters and especially those in the oldest age groups. Empty nesters are thought to be at higher potential risk of being socially excluded than non-empty nesters.

There are many expressions of rural and urban disparities in modern China, many of which are of concern to national policy makers (*i.e.* China's 13th Five-year Plan). These do not merely reflect geographical differences in residence but many features can also interact with the empty nest phenomenon and social exclusion. For older people in rural areas, many effects of urbanisation potentially leave them both physically and socially isolated in rural areas as younger generations are attracted away by educational and employment opportunities and they subsequently work and often stay in cities, whilst their parents remain in rural

areas (Wang and Zhao, 2011; Chen *et al.*, 2012, 2017). Consequently, the empty nest phenomenon has tended to be more severe in rural than in urban areas (Gao *et al.*, 2014). Subsequent continuing separation and isolation could reduce the quality as well as frequency of relationships between older adults and their children (Chen *et al.*, 2012). For older people in urban areas, the fundamental changes in economic, demographic and social structures coming with urbanisation have also been accompanied by certain changes in social attitudes towards older people (Feng *et al.*, 2019). In addition, rapid socio-economic development and demographic changes are widely assumed to be associated with a generalised decline in close family relationships and also in the tenets of support via filial piety, whether or not this is correct (Phillips and Cheng, 2012; Phillips and Feng, 2018). On the other hand, the housing reforms since the 1990s mean more housing availability and accommodation of better quality, which can enable some older people who prefer to live alone to do so in urban areas (Meng and Luo, 2008). These older people would generally be 'voluntary' empty nesters in urban areas. In comparison, in rural areas, many older people who live alone would likely be involuntary empty nesters, as their children or grandchildren have left home and work in urban areas. Different preferences and constraints underpin varieties in older persons' living arrangements in rural and urban areas which could result in different forms and extents of social exclusions in both areas. The combination of different economic conditions, culture, lifestyle, and exclusion from family and society in rural and urban areas, may well bring different challenges to the health of older empty nesters and non-empty nesters in China. Indeed, the increasingly evident differentials between urban and rural areas in China could increase social exclusion and differential health outcomes between empty nesters and non-empty nesters, and between empty nesters living alone and empty nesters living with a spouse. As increasing numbers of older people are and will become empty nesters in China, as well as globally, research comparing social exclusion and health among empty nesters and non-empty nesters is crucial.

Methods

Data

This study used the first wave of a national representative sample of the China Longitudinal Aging Social Survey (CLASS) which was conducted in 2014. This survey used a multistage sampling method. Primary sampling units were randomly selected with a 'proportionate to population size' sampling technique and county-level units (counties, county-level cities and districts) within provinces were selected as primary sampling units. Secondary sampling units were set as villages (*cun*) in rural areas and neighbourhoods (*shequ* or *juweihui*) in urban areas. There were 11,511 persons aged 60 and older in 476 villages/urban neighbourhoods within 134 counties covering 28 of 31 provinces (or municipalities) in China. We excluded childless and never-married older adults from CLASS. The data employed in this study include 7,923 respondents for whom complete responses are available.

The key dependent variables included four dimensions of social exclusion and three types of health outcomes. Four dimensions of social exclusion were

constructed according to Kneale's (2012) report: exclusion from social relation-ships, subjective feeling of exclusion, exclusion from social activities and exclusion from financial products; the three types of health outcomes are self-rated health (SRH), depression and whether an activity of daily living (ADL) difficulty was reported.

Exclusion from social relationships

Social relationships refer to the relationships with children, friends and other immediate family members. Respondents were asked the frequency of receiving help from a child, meeting with a child and contact with a child by phone, and they were allocated 0, 0.25, 0.5, 0.75 and 1, respectively, from 'almost never', 'couple of times a year', 'at least once a month', 'at least once a week' to 'almost every day' for up to four children (maximum 1 for each question). Respondents were also allo-cated 0, 0.5, 1 and 1.5 for 'number of close relationships with children', from 'none', 'one close child', 'two close children' and 'more than two close children'. Regarding the relationship with friends and immediate family, the number of friends/imme-diate family (ranging from 'none', 'one', 'two', 'three or four', 'five to eight' and 'nine and above') that they were able to meet each month, with whom they felt comfortable talking about private affairs and who were able to provide their help when needed, were assigned 0, 0.2, 0.4, 0.6, 0.8 and 1, respectively. Scores were summed to give an overall scale ranging from 0 to 26. Higher scores indicate a lower level of exclusion from social relationships.

Subjective feeling of exclusion

The frequency of respondent's feelings of being ignored, isolated and lonely in the last week were assigned 0, 0.5 and 1, respectively, for 'always', 'sometimes' or 'no'. In addition, 0, 0.25, 0.5, 0.75 and 1 were assigned for respondent's agreement (from 'completely agree', 'agree', 'fair', 'disagree' and 'completely disagree') with the view of feeling isolated because of their age, feeling of growing old as a form of loss (such as experiencing poorer health and loss of friends) and feeling that it is more difficult to make new friends. Scores were constructed by summing the points from these questions from 0 to 6. Again, a higher score indicates a lower level of subjective feeling of exclusion.

Exclusion from social activities

Respondents identified activities in which they had participated during the past three months, such as community security patrols, help for other older people, environmental protection, dispute resolution, chatting with others for psychological advice, providing professional volunteer services (such as to visit clinics), taking care of another family's children and any other participation. Respondents were allocated 0 if they did not participate in any activity ('excluded') and 1 if they par-ticipated in at least one social activity ('not excluded').

Exclusion from financial products

Financial products include short-term incomes (income from own labour and work as main financial sources), medium-term products (savings and other financial products) or long-term products (pensions and pension support), and respondents

were assigned scores of 2, 1 and 2, respectively, for having such products. Scores were constructed by summing the points from these products from 0 to 5, and we dichotomised this into 0 ('excluded') for scores 0–2 and 1 ('not excluded') for scores 3–5 following Kneale's (2012) cut-off point.

In terms of three health outcomes, SRH, depression and difficulty with performing ADLs were considered to represent physical and mental health outcomes. SRH has been found to be a reliable and sensitive indicator of an individual's current health status (Wu and Schimmele, 2006), and was scored on the scale: 'good' (very good or good), 'fair', 'poor' (poor or very poor); depression was measured as to whether respondents felt depressed during the last week; one's difficulty with ADLs includes six basic activities of dressing, bathing, eating, continence control, walking indoors and using the lavatory. The response categories for these indicators were: 'do not require assistance', 'require some assistance' and 'cannot do it'. A binary variable was constructed for a person's difficulty with ADLs as in previous studies in China (*i.e.* Evandrou *et al.*, 2014). If a respondent reported 'require some assistance' or 'cannot do it' in any activity, he or she has difficulty with ADLs (score of 1); zero represents no difficulty at all for any of the six ADLs.

The main independent variable, 'empty nester', was defined as older people who were living alone or living with a spouse only, whilst all other living arrangements with any child(ren) (*i.e.* living with children only, living with a spouse and children, and others (children and siblings or other relatives)) were recoded as non-empty nest older people (*i.e.* Zhai *et al.*, 2015; Gao *et al.*, 2017). In the analysis, living alone and living with a spouse only within the 'empty nest' category were further explored as support from a spouse might decrease the feelings of loneliness of older people (Wang and Zhao, 2011).

Control variables

Age, gender, ethnicity, urban–rural residency, educational attainment, being economically active, total personal income in the last year and housing tenure were used as control variables in this study (following Zhai *et al.*, 2015; Chen *et al.*, 2017; Gao *et al.*, 2017).

Analytic strategy

We began by exploring descriptive statistics regarding empty nest and non-empty nest, and among older people who were living alone or with a spouse only within the empty nest. An OLS model was used to examine the differentials of exclusion from social relationships and subjective feeling of exclusion between 'empty nest' and 'non-empty nest' older people, and a binomial logistic to examine the differentials of exclusion from social activities and exclusion from financial products between 'empty nest' and 'non-empty nest' older people. A binomial logistic regression was used to examine the differentials in the difficulty with ADLs between 'empty nest' and 'non-empty nest' older people, and a multinomial logistic regression was used to investigate the differentials of SRH between these two groups. Different methods were used according to the different number of response categories of the dependent variables. The analysis consists of a sequence of three models:

- Model 1 only includes living arrangements to explore differences between empty nesters and non-empty nesters.
- Model 2 is based on Model 1 and additionally includes control variables to explore how the coefficients on the empty nester dummy changes when control variables are included.
- Model 3 includes interactions between living arrangements and residence to explore how differences between older empty nesters and non-empty nesters vary according to urban and rural residence.

Results

Descriptive analysis

Empty nesters versus non-empty nesters

Table 1 presents descriptive statistics between empty nesters and non-empty nesters. Empty nesters were significantly more likely to be excluded from social relationships (8.29 *versus* 9.70), to express a feeling of being excluded than non-empty nesters (4.09 *versus* 4.18) (one-way analysis of variance test) and excluded from social activities (80% *versus* 77%) than non-empty nesters (Pearson's χ^2 test). In terms of health outcomes, empty nesters were significantly more likely to express no difficulty with ADLs (92% *versus* 90.6%) than non-empty nesters. For the covariate characteristics, empty nesters were significantly more likely to be of older age (70 *versus* 69), male (55.1% *versus* 52.9%), Han-Chinese (95.4% *versus* 92.3%), have high school and above level of educational attainment (24.7% *versus* 16%), be in the highest quintile of personal income (26.8% *versus* 19.4%) and own any property (91.1% *versus* 83.5%) than non-empty nesters.

Living alone versus living with a spouse only

Table 1 also presents descriptive statistics of empty nesters who were living alone and those who live with a spouse only. Empty nesters who live with their spouse only were significantly less likely to feel being excluded than those living alone (4.22 *versus* 3.70); and they were significantly more likely to report good SRH (48% *versus* 43.8%) and no depression (73.2% *versus* 59.4%) than those living alone. In terms of covariate characteristics, empty nesters with spouse only were significantly more likely to be of younger old age (69 *versus* 73), male (60.1% *versus* 40.9%), have high school and above level of educational attainment (26.5% *versus* 19.7%), economic activity (21.1% *versus* 15.1%), in the highest quintile of personal income (29% *versus* 20.5%) and own any property (93.1% *versus* 85.3%) than those who were living alone.

Regression analysis

Differentials in social exclusion and health outcomes between empty nesters and non-empty nesters

Table 2 presents three OLS models for exclusion from social relationships. Model 1 shows that, compared to non-empty nesters, empty nesters were associated with higher levels of exclusion from social relationships. In Model 2, all control variables were added and there were no substantial changes in the coefficients on the empty

Table 1. Descriptive analysis of the sample

	Whole sample		Empty nesters	
	Non-empty nesters	Empty nesters	Living alone	With spouse only
N	4,230	3,692	966	2,727
Exclusion from social relationships	$p < 0.01$			
	9.7	8.29	8.4	8.25
Subjective feeling of exclusion	$p < 0.01$		$p < 0.01$	
	4.18	4.09	3.7	4.22
Exclusion from social activities (%):	$p < 0.01$			
Excluded	76.8	79.3	78.8	79.4
Not excluded	23.2	20.7	21.2	20.6
Exclusion from financial products (%):				
Excluded	76.2	75.0	76.9	74.3
Not excluded	23.8	25.0	23.1	25.7
Age:	$p < 0.01$		$p < 0.01$	
Mean	69	70	73	69
Gender (%):	$p < 0.05$		$p < 0.01$	
Male	52.9	55.1	40.9	60.1
Female	47.1	44.9	59.1	39.9
Ethnicity (%):	$p < 0.01$			
Han-Chinese	92.3	95.4	95.8	95.3
Non-Han	7.7	4.6	4.2	4.7
Resident (%):			$p < 0.01$	
Urban	65.3	66.9	63.8	68.0
Rural	34.7	33.1	36.2	32.0
Educational attainment (%):	$p < 0.01$		$p < 0.01$	
No	21.6	18.7	26.6	16
Elementary school or below	38.4	32.7	34.0	32.2
Middle school	24.0	23.9	19.7	25.3
High school and above	16.0	24.7	19.7	26.5
Economic activity (%):			$p < 0.01$	
Active	20.1	19.5	15.1	21.1
Inactivity	79.8	80.4	84.8	78.8
Missing	0.1	0.1	0.1	0.1

(*Continued*)

Table 1. (*Continued.*)

	Whole sample		Empty nesters	
	Non-empty nesters	Empty nesters	Living alone	With spouse only
Total personal income (%):	*p* < 0.01		*p* < 0.01	
Lowest quintile	18.0	12.1	14.6	11.2
2nd	14.0	16.6	20.1	15.4
3rd	21.3	18.9	19.3	18.8
4th	17.7	19.4	18.4	19.7
Highest quintile	19.4	26.8	20.5	29.0
Missing	9.6	6.2	7.1	5.9
Housing tenure (%):	*p* < 0.01		*p* < 0.01	
Do not own any	15.9	8.6	14.2	6.6
Own	83.5	91.1	85.3	93.1
Missing	0.5	0.3	0.5	0.3
Self-rated health (%):			*p* < 0.01	
Good	45.4	46.9	43.8	48.0
Fair	31.8	29.8	28	30.5
Poor	22.8	23.3	28.3	21.6
Depression (%):			*p* < 0.01	
No	70.6	69.6	59.4	73.2
Yes	29.4	30.4	40.6	26.8
Activities of daily living (%):	*p* < 0.05			
No	90.6	92	91.3	92.2
Yes	9.4	8.0	8.7	7.8

nesters. In terms of the coefficient of control variables, the coefficient of 0.12 for age is significant and, being positive, indicates that the older the older persons, the lower their level of exclusion from social relationships. Older people who were female, non-Han-Chinese, rural residents, and not owning any property, were significantly associated with lower levels of exclusion from social relationships. Older people with middle school or high school education and in the third quintile income category were associated with higher levels of exclusion from social relationships. Model 3 shows that there were no significant differentials between older empty nesters and non-empty nesters according to residence in urban and rural areas.

In terms of the results for subjective feeling of exclusion, the results in Model 1 show that, compared to non-empty nesters, the scores of lower levels of subjective feeling of exclusion for empty nesters decreased by 0.1 units. Again, there were no

Table 2. Multivariate model results for exclusion from social relationships

	Model 1	Model 2	Model 3
	Coefficients (95% confidence intervals)		
Constant	9.7 (9.6, 9.8)***	1.19 (0.40, 1.99)***	1.18 (0.39, 1.98)***
Living arrangement (Ref. Others):			
Empty nest	−1.41 (−1.56, −1.26)***	−1.38 (−1.53, −1.24)***	−1.32 (−1.50, −1.15)***
Age		0.12 (0.11, 0.13)***	0.12 (0.11, 0.13)***
Female (Ref. Male)		0.36 (0.21, 0.51)***	0.36 (0.21, 0.51)***
Non-Han (Ref. Han-Chinese)		1.06 (0.76, 1.35)***	1.05 (0.75, 1.34)***
Rural (Ref. Urban)		0.23 (0.05, 0.42)**	0.3 (0.08, 0.53)***
Educational attainment (Ref. No):			
Elementary school or below		−0.01 (−0.21, 0.20)	−0.01 (−0.22, 0.20)
Middle school		−0.34 (−0.58, −0.09)***	−0.34 (−0.58, −0.10)***
High school and above		−0.59 (−0.86, −0.32)***	−0.59 (−0.86, −0.32)***
Economically active (Ref. Inactive):			
Activity		0.17 (−0.03, 0.37)*	0.17 (−0.03, 0.37)*
Missing		−0.46 (−2.84, 1.93)	−0.43 (−2.81, 1.96)
Income (Ref. Lowest quintile):			
2nd		0 (−0.26, 0.26)	0.01 (−0.25, 0.27)
3rd		0.36 (0.10, 0.61)***	0.36 (0.11, 0.61)***
4th		0.02 (−0.26, 0.29)	0.02 (−0.26, 0.29)

Table 2. (*Continued.*)

	Model 1	Model 2	Model 3
Highest quintile		−0.14 (−0.42, 0.14)	−0.14 (−0.43, 0.14)
Missing		0.35 (0.03, 0.66)**	0.35 (0.04, 0.67)**
House tenure (Ref. Own):			
No		0.46 (0.24, 0.68)***	0.45 (0.23, 0.67)***
Missing		−0.3 (−1.36, 0.75)	−0.31 (−1.37, 0.75)
Interaction between living arrangements and residence:			
Empty nest × Rural			−0.17 (−0.47, 0.14)

Note: Ref.: reference group.
Significance levels: * *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01.

substantial changes in the coefficients on the empty nester while all control variables and living arrangements were included in Model 2. Older age was associated with a higher level of subjective feeling of exclusion (coefficient = −0.01). Compared to urban residents and those without owning any property, the scores of lower level of subjective feeling of exclusion for rural residents and those owning their property decreased by 0.19 and 0.13 units, respectively; older people who were females, economically active, with formal educational attainment (elementary, middle school, or high school and above) and in higher income categories (the third, fourth and top quintile) were associated with a lower level of subjective feeling of exclusion. Model 3 shows that empty nesters in rural areas were significantly negatively associated with a lower level of subjective feeling of exclusion (coefficient = −0.13) (Table 3).

In terms of the results for exclusion from social activities, the results in Model 1 show that empty nesters were less likely to participate in social activities than non-empty nesters. In Model 2, there were no substantial changes in the coefficients on the empty nesters when all control variables were added. In terms of the coefficient of control variables, there was a marked non-linear association between age and exclusion from social activities: younger older people aged below around 70 had greater odds of participating in social activities, but for older old persons, the odds of participating in social activities reduced as age increased. Older people who were female, non-Han-Chinese, with middle school or high school and above educational attainment, were economically active and with incomes above the lowest quintile were significantly more likely to participate in social activities than those who were male, Han-Chinese, without formal educational attainments, economically inactive and in the lowest quintile of income. The interaction between living arrangements and residence was not significant in Model 3 (Table 4).

Table 5 presents the results for exclusion from financial products. The results in Model 1 show that no significant differences of exclusion from financial products were found between empty nesters and non-empty nesters in Model 1. There were no substantial changes in the coefficients on the empty nester while all control variables were included in Model 2. Older people who were male, rural residents, economically active, with income above the lowest quintile and who own property were significantly more likely to have financial products than older people who were female, urban residents, economically inactive, had the lowest quintile income and who did not own any property. The interaction results in Model 3 show that empty nesters in rural areas were significantly more likely to have financial products than the reference group (odds ratio = 1.3).

In terms of health outcomes, Tables 6–8 present the multinomial logistic regression model for SRH (reference group: good health), the binary logistic regression model for whether the repondents have depression and whether they reported ADL difficulties. The results in Model 1 show that empty nesters were significantly less likely to report fair SRH and ADL difficulties than non-empty nesters, but empty nesters were more likely to report having depression than non-empty nesters. There were no substantial changes in the results for three health outcomes between Models 1 and 2. In terms of the associations between control variables and health outcomes in Model 2, a quadratic term for age was found to be associated with fair or poor SRH and depression. Below around 80 years old, older people

Table 3. Multivariate model results for subjective feeling of exclusion

	Model 1	Model 2	Model 3
	Coefficients (95% confidence intervals)		
Constant	4.19 (4.15, 4.22)***	4.34 (4.07, 4.61)***	4.34 (4.06, 4.61)***
Living arrangement (Ref. Others):			
Empty nest	−0.1 (−0.15, −0.05)***	−0.15 (−0.2, −0.1)***	−0.11 (−0.17, −0.05)***
Age		−0.01 (−0.01, 0)***	−0.01 (−0.01, 0)***
Female (Ref. Male)		0.05 (−0.01, 0.10)*	0.05 (−0.01, 0.10)*
Non-Han (Ref. Han-Chinese)		−0.08 (−0.18, 0.02)	−0.09 (−0.19, 0.01)*
Rural (Ref. Urban)		−0.19 (−0.25, −0.13)***	−0.14 (−0.21, −0.06)***
Educational attainment (Ref. No):			
Elementary school or below		0.15 (0.08, 0.22)***	0.15 (0.08, 0.22)***
Middle school		0.28 (0.20, 0.36)***	0.28 (0.19, 0.36)***
High school and above		0.34 (0.25, 0.43)***	0.34 (0.24, 0.43)***
Economically active (Ref. Inactive):			
Activity		0.12 (0.06, 0.19)***	0.12 (0.06, 0.19)***
Missing		0.09 (−0.73, 0.9)	0.11 (−0.70, 0.92)
Income (Ref. Lowest quintile):			
2nd		0.01 (−0.08, 0.10)	0.02 (−0.07, 0.11)
3rd		0.26 (0.17, 0.34)***	0.26 (0.17, 0.34)***
4th		0.37 (0.28, 0.47)***	0.37 (0.28, 0.47)***

Highest quintile	0.49 (0.39, 0.58)***	0.48 (0.39, 0.58)***
Missing	0.21 (0.1, 0.32)***	0.21 (0.11, 0.32)***
House tenure (Ref. Own):		
No	−0.13 (−0.21, −0.06)***	−0.14 (−0.21, −0.06)***
Missing	−0.17 (−0.53, 0.19)	−0.17 (−0.53, 0.19)
Interaction between living arrangements and residence:		
Empty nest × Rural		−0.13 (−0.23, −0.02)**

Note: Ref.: reference group.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Multivariate model results for exclusion from social activities

	Model 1	Model 2	Model 3
	Coefficients (95% confidence intervals)		
Living arrangement (Ref. Others):			
Empty nest	0.86 (0.78, 0.96)***	0.85 (0.76, 0.95)***	0.9 (0.78, 1.03)
Age		1.42 (1.23, 1.65)***	1.42 (1.23, 1.65)***
Age^2		0.99 (0.99, 0.99)***	0.99 (0.99, 0.99)***
Female (Ref. Male)		1.18 (1.05, 1.32)***	1.18 (1.05, 1.32)***
Non-Han (Ref. Han-Chinese)		1.82 (1.49, 2.22)***	1.8 (1.47, 2.20)***
Rural (Ref. Urban)		1.09 (0.95, 1.25)	1.16 (0.98, 1.38)*
Educational attainment (Ref. No):			
Elementary school or below		1.06 (0.9, 1.24)	1.06 (0.9, 1.24)
Middle school		1.27 (1.05, 1.52)**	1.26 (1.05, 1.52)**
High school and above		1.21 (0.98, 1.48)*	1.2 (0.97, 1.47)*
Economically active (Ref. Inactive):			
Activity		1.25 (1.08, 1.45)***	1.25 (1.08, 1.45)***
Missing		0.71 (0.08, 5.98)	0.73 (0.09, 6.14)
Income (Ref. Lowest quintile):			
2nd		1.19 (0.97, 1.45)*	1.2 (0.98, 1.47)*
3rd		1.22 (1.01, 1.48)**	1.22 (1.01, 1.48)**
4th		1.08 (0.87, 1.34)	1.08 (0.87, 1.34)
Highest quintile		1.39 (1.12, 1.73)***	1.39 (1.12, 1.73)***
Missing		0.95 (0.74, 1.21)	0.95 (0.74, 1.22)
House tenure (Ref. Own):			
No		0.99 (0.84, 1.17)	0.99 (0.83, 1.17)
Missing		0.48 (0.17, 1.38)	0.48 (0.17, 1.37)
Interaction between living arrangements and residence:			
Empty nest × Rural			0.85 (0.67, 1.06)

Note: Ref.: reference group.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

had greater odds of reporting fair or poor SRH and depression while, for those aged over 80 years old, the odds of reporting fair or poor SRH and depression reduced as age increased and the odds of reporting ADL difficulties increased with age. Females were significantly more likely to report having poor SRH, depression and ADL difficulties than males. Higher educational attainment and income were associated with lower odds of reporting poor health, depression and ADL difficulties. Older people who were economically active were less likely to report having poor SRH, depression and ADL difficulties than those who were economically inactive. Older rural

Table 5. Multivariate model results for exclusion from financial products

	Model 1	Model 2	Model 3
	Coefficients (95% confidence intervals)		
Living arrangement (Ref. Others):			
Empty nest	1.07 (0.97, 1.19)	1.09 (0.97, 1.23)	0.95 (0.81, 1.12)
Age		0.99 (0.98, 1.00)***	0.99 (0.98, 1.00)**
Female (Ref. Male)		0.7 (0.61, 0.79)***	0.7 (0.61, 0.79)***
Non-Han (Ref. Han-Chinese)		0.83 (0.64, 1.07)	0.84 (0.65, 1.09)
Rural (Ref. Urban)		2.21 (1.91, 2.57)***	1.92 (1.59, 2.30)***
Educational attainment (Ref. No):			
Elementary school or below		1.14 (0.96, 1.36)	1.14 (0.96, 1.36)
Middle school		0.96 (0.78, 1.17)	0.96 (0.78, 1.18)
High school and above		0.97 (0.77, 1.22)	0.98 (0.78, 1.24)
Economically active (Ref. Inactive):			
Activity		8.92 (7.76, 10.26)***	8.95 (7.78, 10.30)***
Missing		5.42 (1.16, 25.38)**	5.15 (1.1, 24.22)**
Income (Ref. Lowest quintile):			
2nd		1.42 (1.14, 1.76)***	1.4 (1.12, 1.73)***
3rd		1.69 (1.36, 2.09)***	1.69 (1.36, 2.09)***
4th		1.3 (1.02, 1.66)**	1.3 (1.02, 1.66)**
Highest quintile		1.68 (1.31, 2.15)***	1.69 (1.32, 2.17)***
Missing		1.26 (0.96, 1.65)*	1.25 (0.95, 1.64)
House tenure (Ref. Own):			
No		0.76 (0.63, 0.93)***	0.77 (0.63, 0.94)**
Missing		0.93 (0.37, 2.38)	0.94 (0.37, 2.41)
Interaction between living arrangements and residence:			
Empty nest × Rural			1.38 (1.08, 1.77)***

Note: Ref.: reference group.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

residents and those who did not own any property were more likely to report poor health than urban residents, and those who owned any property. With regard to the interaction between living arrangements and residence, only empty nesters in rural areas were significantly (at the 10% level) more likely to report having fair health than the reference group (odds ratio = 1.23).

Differentials in social exclusion and health outcomes between empty nesters who were living alone and those who were living with a spouse only
The associations between control variables and social exclusion and the associations between control variables and health outcomes among empty nesters were similar

Table 6. Multivariate model results for self-rated health

	Model 1		Model 2		Model 3	
	Fair	Poor	Fair	Poor	Fair	Poor
			Odds ratios (95% confidence intervals)			
Living arrangement (Ref. Others):						
Empty nest	0.91 (0.82, 1.01)*	0.99 (0.88, 1.11)	0.88 (0.79, 0.97)**	1.07 (0.95, 1.20)	0.83 (0.73, 0.94)***	1.03 (0.88, 1.20)
Age			1.14 (1.02, 1.28)**	1.26 (1.10, 1.45)***	1.14 (1.02, 1.28)**	1.26 (1.10, 1.45)***
Age^2			0.99 (0.99, 0.99)**	0.99 (0.99, 0.99)***	0.99 (0.99, 0.99)**	0.99 (0.99, 0.99)***
Female (Ref. Male)			1.06 (0.95, 1.18)	1.12 (0.99, 1.27)**	1.06 (0.95, 1.18)	1.12 (0.99, 1.27)*
Non-Han (Ref. Han-Chinese)			0.93 (0.74, 1.17)	1.13 (0.90, 1.43)	0.94 (0.75, 1.18)	1.14 (0.91, 1.43)
Rural (Ref. Urban)			0.94 (0.82, 1.08)	1.53 (1.33, 1.77)***	0.86 (0.73, 1.02)*	1.46 (1.22, 1.74)***
Educational attainment (Ref. No):						
Elementary school or below			1.28 (1.09, 1.50)***	0.89 (0.76, 1.04)	1.28 (1.09, 1.50)***	0.89 (0.76, 1.04)
Middle school			1.31 (1.1, 1.58)***	0.65 (0.54, 0.80)***	1.32 (1.1, 1.58)***	0.66 (0.54, 0.8)***
High school and above			1.26 (1.04, 1.54)***	0.63 (0.5, 0.78)***	1.27 (1.04, 1.55)**	0.63 (0.5, 0.79)***
Economically active (Ref. Inactive):						
Activity			0.68 (0.58, 0.78)***	0.52 (0.44, 0.61)***	0.68 (0.58, 0.78)***	0.52 (0.44, 0.61)***
Missing			0.72 (0.13, 3.94)	0.47 (0.05, 4.45)	0.69 (0.13, 3.82)	0.46 (0.05, 4.38)

Income (Ref. Lowest quintile):				
2nd	0.98 (0.80, 1.21)	0.98 (0.81, 1.19)	0.97 (0.79, 1.19)	0.97 (0.8, 1.18)
3rd	0.82 (0.67, 0.99)**	0.57 (0.47, 0.70)***	0.81 (0.67, 0.99)**	0.57 (0.47, 0.69)***
4th	0.81 (0.66, 0.99)**	0.48 (0.39, 0.60)***	0.81 (0.66, 0.99)**	0.49 (0.39, 0.60)***
Highest quintile	0.92 (0.74, 1.13)	0.48 (0.38, 0.60)***	0.92 (0.74, 1.13)	0.48 (0.38, 0.60)***
Missing	1.08 (0.85, 1.37)	0.74 (0.58, 0.94)**	1.08 (0.85, 1.36)	0.74 (0.58, 0.94)**
House tenure (Ref. Own):				
No	0.95 (0.8, 1.12)	1.2 (1.01, 1.42)**	0.95 (0.81, 1.13)	1.2 (1.01, 1.42)**
Missing	2.18 (1.02, 4.67)**	1.43 (0.54, 3.78)	2.19 (1.03, 4.69)**	1.43 (0.54, 3.78)
Interaction between living arrangements and residence:				
Empty nest × Rural			1.23 (0.98, 1.55)*	1.12 (0.88, 1.42)

Note: Ref.: reference group.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7. Multivariate model results for depression

	Model 1	Model 2	Model 3
	Coefficients (95% confidence intervals)		
Living arrangement (Ref. Others):			
Empty nest	1.05 (0.95, 1.15)	1.17 (1.05, 1.29)***	1.12 (0.99, 1.27)*
Age		0.89 (0.80, 0.99)**	0.89 (0.80, 0.99)**
Age^2		1 (1.00, 1.00)**	1 (1.00, 1.00)**
Female (Ref. Male)		1.21 (1.09, 1.34)***	1.21 (1.09, 1.34)**
Non-Han (Ref. Han-Chinese)		1.26 (1.04, 1.54)**	1.27 (1.05, 1.54)
Rural (Ref. Urban)		1.06 (0.94, 1.20)	1.01 (0.87, 1.18)
Educational attainment (Ref. No):			
Elementary school or below		0.86 (0.75, 0.99)**	0.86 (0.76, 0.99)**
Middle school		0.71 (0.61, 0.84)***	0.71 (0.61, 0.84)***
High school and above		0.73 (0.6, 0.88)***	0.73 (0.61, 0.88)***
Economically active (Ref. Inactive):			
Activity		0.84 (0.74, 0.97)**	0.84 (0.73, 0.97)**
Missing		1.58 (0.35, 7.19)	1.55 (0.34, 7.08)
Income (Ref. Lowest quintile):			
2nd		0.91 (0.77, 1.08)	0.91 (0.77, 1.07)
3rd		0.71 (0.61, 0.84)***	0.71 (0.6, 0.84)***
4th		0.58 (0.49, 0.70)***	0.59 (0.49, 0.70)***
Highest quintile		0.42 (0.35, 0.51)***	0.42 (0.35, 0.51)***
Missing		0.79 (0.64, 0.97)**	0.79 (0.64, 0.96)**
House tenure (Ref. Own):			
No		1.03 (0.89, 1.20)	1.04 (0.89, 1.20)
Missing		2.07 (1.06, 4.08)**	2.08 (1.06, 4.09)**
Interaction between living arrangements and residence:			
Empty nest × Rural			1.11 (0.90, 1.36)

Note: Ref.: reference group.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

to those in the whole sample, therefore, the results of differentials in social exclusion and health outcomes between empty nesters who were living alone and those who live with a spouse only were summarised in Table 9 (Models 1–3). The full results can be found in the online supplementary material. The multivariate models' results in Model 1 show that, compared to those who live with a spouse only, empty nesters who were living alone were negatively associated with a lower level of exclusion from social relationships and subjective feeling of exclusion, and empty nesters who were living alone were more likely to participate in social activities.

Table 8. Multivariate model results for activities of daily living

	Model 2	Model 3	Model 4
	Coefficients (95% confidence intervals)		
Living arrangement (Ref. Others):			
Empty nest	0.84 (0.72, 0.98)**	0.85 (0.72, 0.99)**	0.82 (0.66, 1.01)*
Age		1.09 (1.07, 1.10)***	1.09 (1.07, 1.10)***
Female (Ref. Male)		0.92 (0.77, 1.09)	0.92 (0.77, 1.09)
Non-Han (Ref. Han-Chinese)		0.76 (0.53, 1.07)	0.76 (0.53, 1.08)
Rural (Ref. Urban)		1.21 (0.99, 1.47)*	1.17 (0.92, 1.49)
Educational attainment (Ref. No):			
Elementary school or below		0.84 (0.68, 1.03)*	0.84 (0.68, 1.03)*
Middle school		0.71 (0.54, 0.93)**	0.71 (0.54, 0.93)**
High school and above		0.63 (0.47, 0.87)***	0.64 (0.47, 0.87)***
Economically active (Ref. Inactive):			
Activity		0.74 (0.58, 0.96)**	0.74 (0.58, 0.96)**
Missing		4.67 (0.75, 29.04)	4.6 (0.74, 28.67)
Income (Ref. Lowest quintile):			
2nd		0.86 (0.66, 1.11)	0.85 (0.66, 1.11)
3rd		0.85 (0.65, 1.10)	0.85 (0.65, 1.10)
4th		0.64 (0.48, 0.87)***	0.64 (0.48, 0.87)***
Highest quintile		0.58 (0.42, 0.80)***	0.58 (0.43, 0.80)***
Missing		0.76 (0.55, 1.06)	0.76 (0.55, 1.06)
House tenure (Ref. Own):			
No		1.14 (0.91, 1.41)	1.14 (0.91, 1.42)
Missing		1.77 (0.66, 4.75)	1.77 (0.66, 4.78)
Interaction between living arrangements and residence:			
Empty nest × Rural			1.08 (0.77, 1.51)

Note: Ref.: reference group.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

There were no substantial changes in the coefficients or odds ratios on the empty nesters who were living alone while all control variables were included in Model 2. Regarding the interaction between living arrangements and residence in Model 3, empty nesters who were living alone in rural areas were significantly associated with higher levels of exclusion from social relationships and more likely to be excluded from financial products than the reference group.

In terms of health outcomes, in Model 1, empty nesters who were living alone were significantly more likely to report poor SRH than those living with a spouse only, while such significant differentials have been explained by control variables in

Table 9. Summary of multivariate model results (Models 1–3) for four dimensions of social exclusion and health outcomes for empty nesters who were living alone and with a spouse only

	Model 1	Model 2	Model 3
	Coefficients (95% confidence intervals)		
Exclusion from social relationships:			
Living arrangement (Ref. With spouse only):			
Alone	0.16 (−0.09, 0.41)	−0.6 (−0.85, −0.35)***	−0.32 (−0.63, −0.02)**
Interaction between living arrangements and residence:			
Alone × Rural			−0.78 (−1.28, −0.28)***
Subjective feeling of exclusion:			
Living arrangement (Ref. With spouse only):			
Alone	−0.52 (−0.61, −0.44)***	−0.46 (−0.55, −0.38)***	−0.44 (−0.55, −0.34)***
Interaction between living arrangements and residence:			
Alone × Rural			−0.05 (−0.22, 0.13)
	Odds ratios (95% confidence intervals)		
Not excluded from social activities:			
Living arrangement (Ref. With spouse only):			
Alone	1.04 (0.87, 1.24)	1.13 (0.93, 1.37)***	1.21 (0.96, 1.53)***
Interaction between living arrangements and residence:			
Alone × Rural			0.81 (0.55, 1.20)
Not excluded from financial products:			
Living arrangement (Ref. With spouse only):			
Alone	0.87 (0.73, 1.03)	1.14 (0.92, 1.40)	1.78 (1.36, 2.33)***
Interaction between living arrangements and residence:			
Alone × Rural			0.37 (0.24, 0.55)***
Fair self-rated health:			
Living arrangement (Ref. With spouse only):			
Alone	1 (0.84, 1.20)	0.91 (0.75, 1.09)	0.85 (0.68, 1.06)
Interaction between living arrangements and residence:			
Alone × Rural			1.23 (0.83, 1.81)
Poor self-rated health:			
Living arrangement (Ref. With spouse only):			
Alone	1.43 (1.2, 1.72)***	1.07 (0.88, 1.31)	1.02 (0.79, 1.32)
Interaction between living arrangements and residence:			
Alone × Rural			1.15 (0.78, 1.69)

(*Continued*)

Table 9. (*Continued.*)

	Model 1	Model 2	Model 3
Depression:			
Living arrangement (Ref. With spouse only):			
Alone	1.87 (1.6, 2.18)***	1.7 (1.44, 2.01)***	1.83 (1.49, 2.25)***
Interaction between living arrangements and residence:			
Alone × Rural			0.83 (0.60, 1.15)
Reported ADL difficulties:			
Living arrangement (Ref. With spouse only):			
Alone	1.13 (0.87, 1.47)	0.74 (0.56, 0.99)**	0.78 (0.54, 1.13)
Interaction between living arrangements and residence:			
Alone × Rural			0.88 (0.50, 1.53)

Notes: Ref.: reference group. ADL: activities of daily living.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Model 2. Empty nesters who were living alone were also significantly more likely to report depression than those who were living with their spouse only and such association remains significant after controlling for covariates. However, empty nesters who were living alone were significantly less likely to report ADL difficulties than those who were living with a spouse only, even after controlling for covariates. The interactions between living arrangements and residence were not significant for all health outcomes.

Discussion and conclusion

This study used a nationally representative dataset to study the characteristics of empty nest and non-empty nest older people in China and to further explore differentials in social exclusion and health between empty nest and non-empty nest older people, and between those older persons living alone and living with a spouse only. The descriptive findings in this study reinforce previous studies showing that older people of higher socio-economic status increasingly tend to choose to live independently in China (Sereny, 2011; Guo *et al.*, 2016).

Differentials in social exclusion between empty nesters and non-empty nesters

The findings provide evidence that empty nesters are significantly associated with higher levels of exclusion from social relationships and subjective feelings of being excluded, and also less likely to participate in social activities than non-empty nesters. This may not be surprising as the empty nest syndrome effectively results from or reflects loosened relationships with family members and could develop into exclusion from social relationships, particularly from relationships with children (Chen *et al.*, 2012). The syndrome also impacts on all aspects of society in which older people engage (particular organisations that provide services to older adults) and influences their participation in social activities. In China as

elsewhere, loneliness is a common feature of the empty nest syndrome (Wang *et al.*, 2017; Huang *et al.*, 2019) which results in older empty nesters being more likely to feel they were being excluded (ignored, isolated and lonely) in their later lives. In addition, being rural empty nesters was significantly associated with higher levels of subjective feelings of exclusion, but empty nesters in rural areas were significantly more likely to have financial products than the reference group. This may reflect the serious physical and social isolation in rural areas when younger generations subsequently work and remain to live in cities, whilst their parents remain in rural areas which could increase feelings of exclusion. One explanation is that the combination of development of rural pensions, as the Chinese government anticipates providing full coverage of rural pensions in all rural areas (Helpage International, 2015), and potentially more remittance funds from children who have moved away (Chen *et al.*, 2017) could be enabling empty nesters in rural areas to participate in financial products more than non-empty nesters.

Among empty nesters, it is not surprising that living alone was associated with higher levels of being excluded from social relationships and to subjective feelings of being excluded than living with a spouse only. Barnes *et al.* (2006) also found that living alone is related to exclusion from social relationships and civic activities in the United Kingdom (UK). In a later study, Kneale (2012) also found that living alone and those who started to live alone can relate to exclusion from social relationships and civic activities in the UK. Spouses can often provide support and help to maintain better health behaviours of married individuals (via contact with family members), perhaps decreasing feelings of loneliness (Manzoli *et al.*, 2007; Wang and Zhao, 2011). Indeed, being rural empty nesters who were living alone was significantly associated with higher levels of exclusion from social relationships and a greater likelihood of being excluded from financial products than the reference group. This indicates that those who were living alone in rural areas form the most vulnerable group as they lack social relationships as well as financial support for their later life.

Differentials in health outcomes among empty nesters and non-empty nesters

In terms of physical health, empty nesters were significantly less likely to report fair SRH and ADL difficulties than non-empty nesters. These findings are somewhat inconsistent with some previous research in China which indicates that being an empty nester can have a significantly adverse influence on older people's physical health (*i.e.* Xie *et al.*, 2010; Zhai *et al.*, 2015; Gao *et al.*, 2017; Wang *et al.*, 2017; Zhang *et al.*, 2019*a*). It could be that mundane daily factors such as not having to carry out household chores for the entire family or to care for grandchildren could prevent a decline in empty nesters' physical functioning. Such factors could explain why empty nesters were significantly less likely to report fair SRH and ADL difficulties than non-empty nesters. In terms of mental health, empty nesters were more likely to report having depression than non-empty nesters, consistent with previous research in China (such as Yuan *et al.*, 2021) and Western studies (*e.g.* Aranda, 2015; Courtin and Avendano, 2016). Non-empty nesters' emotions could be more easily monitored and they can more easily access emotional and instrumental support from their (co-resident) children than empty nesters.

Among empty nesters, people living alone were less likely to report ADL difficulties than those who were living with a spouse only. Li *et al.* (2009) also found that people living alone fared better than those in other living arrangements in terms of ADL disability. People living alone were more likely to report having depression than those who were living with a spouse only, which indicates that such people living alone are the most vulnerable to depression and could be a policy target group.

Whilst providing novel findings and insights from a large dataset, we should mention at least four limitations associated with this dataset and hence the findings. First, CLASS lacks information on *how long* older people have been empty nesters. Therefore, we are not able to explore the potential cumulative effects of being longer-term empty nesters on older people's social exclusion and health. Second, this is a cross-sectional study; it therefore reflects the risks of selectivity problems such as health outcomes which would determine a family's decisions on living arrangements. Older people in good health may want to live with their children and feel socially integrated through providing daily activities or child care to their children (voluntary); or a child may choose or need to live with his or her parents because of their declining health (involuntary). Third, it would be worthwhile to explore issues such as performance of household chores by non-empty nesters, which could help to understand differential health outcomes between empty and non-empty nesters. However, the CLASS data, like those in many major studies, lack such information. Fourth, the variable 'exclusion from social relationships' includes frequency of meeting with a child, which results in an endogenous relationship between living with a child and having frequent meetings with the child, as living with a child inevitably increases the frequency of contact with a child. However, it is not appropriate to simply exclude child(ren) who live with older people, and this variable was constructed and applied as Kneale (2012) did.

This paper nevertheless provides important insights into the growing challenges of the increasing 'empty nest' phenomenon among older people in China and informs this growing global phenomenon among ageing societies. Although the results may or may not be causal, the results highlight the need to develop more comprehensive social support in the community to address the involuntary empty nest syndrome, especially as it is likely to increase substantially in the future (*i.e.* Su *et al.*, 2012; Zhang *et al.*, 2019*b*). In the coming decades, the introduction of the 'two-child policy' notwithstanding, older people in China will have fewer children and fewer contacts, and there is a higher likelihood that many people will eventually live alone or with their spouse only. This calls for the development of more specifically age-friendly communities which provide sufficient social support to ensure involuntary empty nesters (particular those living alone) will have safe and supportive social networks to maintain their social relationships and to encourage residents to participate in social activities when their children are absent. Psychological counselling services are also likely to be required to help empty nesters face and ameliorate the effects of social exclusion stemming from possible ageism (accidental and deliberate) and social isolation. There is also a need to develop social security further to ensure that older empty nesters living alone in rural areas can access appropriate financial products, services and advice.

In conclusion, older people who were empty nesters in this study appeared more vulnerable to social exclusion than non-empty nesters in terms of exclusion from

social relationships and activities, and subjectively feeling being excluded. Empty nesters were significantly less likely to report fair SRH and ADL difficulties than non-empty nesters but they were more likely to report having depression than non-empty nesters. Empty nesters were more likely to report having depression than non-empty nesters, which has also been found in Western studies (*i.e.* Aranda, 2015; Courtin and Avendano, 2016). Those living alone in rural areas, unsurprisingly, form the most vulnerable group as they lack social relationships as well as financial security in their old age. In the UK, Kneale (2012) found that living alone was a risk factor for social exclusion; it appeared to be a significant barrier to participation in social relationships, civic activities, and access to information, local amenities and financial products. The findings of this study lend strong support to the need for policies to be developed and implemented to support the health-related needs of older involuntary empty nesters.

References

Aranda L (2015) Doubling up: a gift or a shame? Intergenerational households and parental depression of older Europeans. *Social Science & Medicine* **134**, 12–22.

Barnes M, Blom A, Cox K, Lessof C and Walker A (2006) *The Social Exclusion of Older People: Evidence from the First Wave of the English Longitudinal Study of Ageing (ELSA).* London: Office of the Deputy Prime Minister, Social Exclusion Unit. Available at https://ifs.org.uk/publications/3551.

Boyd M (1991) Immigration and living arrangements: elderly women in Canada. *International Migration Review* **25**, 4–27.

Caputo J (2019) Crowded nests: parent–adult child coresidence transitions and parental mental health following the Great Recession. *Journal of Health and Social Behavior* **60**, 204–221.

Chen DB, Yang XX and Aagard SD (2012) The empty nest syndrome: ways to enhance quality of life. *Educational Gerontology* **38**, 520–529.

Chen TC, Leeson GW and Liu CP (2017) Living arrangements and intergenerational monetary transfers of older Chinese. *Ageing & Society* **37**, 1798–1823.

Courtin E and Avendano M (2016) Under one roof: the effect of co-residing with adult children on depression in later life. *Social Science & Medicine* **168**, 140–149.

Davis MA, Moritz DJ, Neuhaus JM, Barclay JD and Gee L (1997) Living arrangements, changes in living arrangements, and survival among community dwelling older adults. *American Journal of Public Health* **87**, 371–377.

Davis EM, Kim K and Fingerman KL (2018) Is an empty nest best?: Coresidence with adult children and parental marital quality before and after the Great Recession. *Journals of Gerontology: Series B* **73**, 372–381.

Evandrou M, Fakingham J, Feng Z and Vlachantoni A (2014) Individual and province inequalities in health among older people in China: evidence and policy implications. *Health & Place* **30**, 134–144.

Feng W (2011) Social exclusion of the elderly in contemporary China: one empirical study based on the surveys in six provinces. Organisation for Economic Co-operation and Development, Paris, Revised OECD Paper. Available at https://www.oecd.org/dev/pgd/46837621.pdf.

Feng Z, Jones K and Wang W (2015) An exploratory discrete-time multilevel analysis of the effect of social support on the survival of elderly people in China. *Social Science & Medicine* **130**, 181–189.

Feng Z, Phillips DR and Jones K (2018) A geographical multivariable multilevel analysis of social exclusion among older people in China: evidence from the China Longitudinal Aging Social Survey ageing study. *Geographical Journal* **184**, 413–428.

Feng Z, Jones K and Phillips DR (2019) Social exclusion, self-rated health and depression among older people in China: evidence from a national survey of older persons. *Archives of Gerontology and Geriatrics* **82**, 238–244.

Gao YL, Wei YB, Shen YD, Tang YY and Yang JR (2014) China's empty nest elderly need better care. *Journal of the American Geriatrics Society* **62**, 1821–1822.

Gao M, Li Y, Zhang S, Gu L, Zhang J, Li Z, Zhang W and Tian D (2017) Does an empty nest affect elders' health? Empirical evidence from China. *International Journal of Environmental Research and Public Health* **14**, 463.

Glaser K, Tomassini C and Grundy E (2004) Revisiting convergence and divergence: support for older people in Europe. *European Journal of Ageing* **1**, 64–72.

Grover N and Dang P (2013) Empty nest syndrome vs empty nest trigger: psychotherapy formulation based on systemic approach – a descriptive case study. *Psychological Studies* **58**, 285–288.

Grundy E (2000) Co-residence of mid-life children with their elderly parents in England and Wales: changes between 1981 and 1991. *Population Studies* **54**, 193–206.

Guo YQ, Zhang CC, Huang H, Zheng X, Pan XJ and Zheng JZ (2016) Mental health and related influencing factors among the empty-nest elderly and the non-empty-nest elderly in Taiyuan, China: a cross-sectional study. *Public Health* **141**, 210–217.

Helpage International (2015) *Pension Watch. China.* Available at http://www.pension-watch.net/country-fact-file/china.

Hu Z and Peng X (2015) Household changes in contemporary China: an analysis based on the four recent censuses. *Journal of Chinese Sociology* **2**, 1–20.

Huang LJ, Du WT, Liu YC, Guo LN, Zhang JJ, Qin MM and Liu K (2019) Loneliness, stress, and depressive symptoms among the Chinese rural empty nest elderly: a moderated mediation analysis. *Issues in Mental Health Nursing* **40**, 73–78.

Hughes ME and Waite LJ (2002) Health in household context: living arrangements and health in late middle age. *Journal of Health and Social Behavior* **43**, 1–21.

Johar M and Maruyama S (2014) Does coresidence improve an elderly parent's health? *Journal of Applied Econometrics* **29**, 965–983.

Kneale D (2012) *Is Social Exclusion Still Important for Older People?* London: Age UK and International Longevity Center.

Li LW, Zhang J and Liang J (2009) Health among the oldest old in China: which living arrangements make a difference? *Social Science & Medicine* **68**, 220–227.

Liu JE, Tian JY, Yue P, Wang YL, Du XP and Chen SQ (2015) Living experience and care needs of Chinese empty-nest elderly people in urban communities in Beijing, China: a qualitative study. *International Journal of Nursing Sciences* **2**, 15–22.

Manzoli L, Villari P, Prirone GM and Boccia A (2007) Marital status and mortality in the elderly: a systematic review and meta-analysis. *Social Science & Medicine* **64**, 77–94.

Maruyama S (2015) The effect of coresidence on parental health in Japan. *Journal of the Japanese and International Economies* **35**, 1–22.

Meng X and Luo C (2008) What determines living arrangements of the elderly in urban China? In Gustafsson BA, Li S and Sicular T (eds), *Inequality and Public Policy in China*. Cambridge: Cambridge University Press, pp. 267–286.

Michael RT, Fuchs VR and Sharon RS (1980) Changes in the propensity to live alone: 1950–1976. *Demography* **17**, 39–56.

Mitchell BA and Wister AV (2015) Midlife challenge or welcome departure? Cultural and family-related expectations of empty nest transitions. *International Journal of Aging and Human Development* **81**, 260–280.

Phillips DR and Cheng K (2012) The impact of changing value systems on social inclusion: an Asia-Pacific perspective. In Scharf T and Keating NC (eds), *From Exclusion to Inclusion in Old Age*. Bristol, UK: Policy Press, pp. 109–124.

Phillips DR and Feng Z (2018) Demographics and aging. In Wu W and Frazier M (eds), *SAGE Handbook on Contemporary China*. London: Sage, pp. 1049–1071.

Scharf T and Keating N (2012) *From Exclusion to Inclusion in Old Age: A Global Challenge*. Bristol, UK: Policy Press.

Sereny M (2011) Living arrangements of older adults in China: the interplay among preferences, realities, and health. *Research on Aging* **33**, 172–204.

Su D, Wu XN, Zhang YX, Li HP, Wang WL, Zhang JP and Zhou LS (2012) Depression and social support between China's rural and urban empty-nest elderly. *Archives of Gerontology and Geriatrics* **55**, 564–569.

Tanis M, van der Louw M and Buijzen M (2017) From empty nest to social networking site: what happens in cyberspace when children are launched from the parental home? *Computers in Human Behavior* **68**, 56–63.

Tosi M and Grundy E (2018) Returns home by children and changes in parents' well-being in Europe. *Social Science & Medicine* **200**, 99–106.

Van Regenmortel S, Donder LD, Dury S, Smetcoren A-S, Witte ND and Verte D (2016) Social exclusion in later life: a systematic review of the literature. *Population Ageing* **9**, 315–344.

Waite LJ and Hughes ME (1999) At risk on the cusp of old age: living arrangement and functional status among Black, White and Hispanic adults. *Journals of Gerontology: Series B* **54**, S136–S144.

Wang J and Zhao X (2011) Empty nest syndrome in China. *International Journal of Social Psychiatry* **58**, 110.

Wang D, Zheng J, Kurosawa M, Inaba Y and Kato N (2009) Changes in activities of daily living (ADL) among elderly Chinese by marital status, living arrangement, and availability of healthcare over a 3-year period. *Environmental Health and Preventive Medicine* **14**, 128–141.

Wang GJ, Hu M, Xiao SY and Zhou L (2017) Loneliness and depression among rural empty-nest elderly adults in Liuyang, China: a cross-sectional study *BMJ Open* **7**, e016091.

Wu Z and Schimmele CM (2006) Psychological disposition and self-reported health among the 'oldest-old' in China. *Ageing & Society* **26**, 135–151.

Xie LQ, Zhang JP, Peng F and Jiao NN (2010) Prevalence and related influencing factors of depressive symptoms for empty-nest elderly living in the rural area of YongZhou, China. *Archives of Gerontology and Geriatrics* **50**, 24–29.

Yuan Y (2017) New rural old-age services need to be upgraded to complement the short board of old-age services. *Economic Daily*. Available at http://paper.ce.cn/jjrb/html/2017-12/23/content_352062.htm.

Yuan Z, Zheng X and Hui E (2021) Happiness under one roof? The intergenerational co-residence and subjective well-being of elders in China. *Journal of Happiness Studies* **22**, 727–765.

Zhai Y, Yi H, Shen W, Xiao Y, Fan H, He F, Li F, Wang X, Shang X and Lin J (2015) Association of empty nest with depressive symptom in a Chinese elderly population: a cross-sectional study. *Journal of Affective Disorders* **187**, 218–223.

Zhang C, Hou L, Zheng X, Zhu R, Zhao H, Lu J, Cheng J, Yang X and Yang T (2019*a*) Risk factors of mental disorders among empty and non-empty nesters in Shanxi, China: a cross-sectional study. *Health and Quality of Life Outcomes* **17**, 18.

Zhang C, Zhao H, Zhu R, Lu J, Hou L, Yang X, Yin M and Yang T (2019*b*) Improvement of social support in empty-nest elderly: results from an intervention study based on the Self-Mutual-Group model *Journal of Public Health* **41**, 830–839.

Zhou M and Qian Z (2008) Social support and self-reported quality of life of China's oldest old. In Zeng Y, Poston DL Jr, Vlosky DA and Gu D (eds), *Healthy Longevity in China* (Demographic Methods and Population Analysis, Vol. **20**). New York: Springer, pp. 357–376.