INVESTIGATING THE INFLUENCE OF FACILITIES MANAGEMENT FACTORS IN COMMUNITY AREA ON QUALITY OF LIFE OF THE ELDERLY

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The decline in fertility and mortality makes aging a global problem. Elderly accommodation has become the most important place to ensure the satisfaction of the elderly in their later life, as aging in place is the choice of majority of elderly in China and many countries /districts. The facilities management (FM) for elderly includes indoor, common area and community, while it is still largely remained unknown how the FM factors in community area affects the quality of life (QoL) of elderly. This paper aims to reveal the effect of FM factors in community area on elderly's QoL. A theoretical model of FM-QoL interactions for elderly in community area is proposed based on a solid literature review. Empirical data were collected through questionnaire survey, and subjected to a series of statistical analyses, including reliability test, correlation and regression analysis. The final results show that: 1) the elderly's psychological QoL were positively predicted by distance and ventilation in the community; 2) distance in the community had positive impact on social QoL of elderly; and 3) it was interesting to find that no FM components in community area could affect the elderly's physical QoL. Based on this result, suggestions were proposed to improve the FM in community area for elderly, such as reduction of distance between residential buildings and public facilities, creating fresh air by planting more trees and regularly emptying rubbish cans, and so on. This paper contributes to reveal the influence of FM factors in community area on the QoL of elderly, and its research findings should be helpful for the policy makers, facilities managers and academics to effectively improve FM in community area for better QoL of elderly.

Keywords: aging in place; community environment; elderly; FM; quality of life

INTRODUCTION

The increase of life expectancy and the decline of death rate made aging society become a global issue (Harper 2019). The United Nation defines a country/region become an aging society when its people aged over 60 (65) years old accounts for more than 10% (7%) of total population. According to the latest statistic in 2019, elderly over 60 in China is 25,388 million accounting for 16.6% of its total population (National Bureau of Statistics 2020), which indicated that China has already become an aging country. It is predicted that people over 60 years old in China will increase to 32.8% in 2050.

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Aging in place is the inevitable result of China's social and economic development. Built environment consists of indoor, common area and community. Although it is identified that indoor and common area FM factors can affect the elderly's QoL (Leung *et al.,* 2019; Ma et al.2018), there is short of research studying the relationship between FM in the community and elderly's QoL. In fact, elderly spent certain time in the community, as community activities, including shopping and taking exercise, are essential for their daily life. It should be noticed that the role of individual unit flat, common areas and community are different for elderly, as FM in the community is complex and changeable which is more difficult for the elderly to control. In addition, the impact range of FM in the community is larger, which can affect more elderly's QoL.

To uncover the impact of the FM factors in community area on elderly's QoL from the FM perspectives, current pilot study aims to establish a model for the complicated relationship among the elderly's QoL and related FM factors in community area. On the basis of previous studies (Leung and Liang 2019), the FM factors in community areas were divided into space management (distance, privacy et al.), building services (ventilation, security et al.) and supporting facilities (finishes, hygiene et al.). A questionnaire survey was administered among over 40 elderly and the collected data were subjected to a series of statistical analyses, including reliability test, correlation and regression analysis. The integrated model was developed based on the congruence of the results of all statistical analyses.

LITERATURE REVIEW

Quality of Life of the Elderly

With the improvement of living standard, attention to elderly's well-being has gradually shift from material requirements to broad aspects, such as subjective psychological and social satisfaction. It is of great significance to focus on QoL, which is a comprehensive reflection of individuals' well-being and life satisfaction (Leung and Liang 2019). The most widely used definition of QoL is proposed by the World Health Organization (WHO) as individuals' perceptions of their status in the context of the culture and value system in which they live and in relation to their goals, expectation and concerns.

The three important aspects of elderly's QoL are physical, psychological and social QoL. Physical QoL refers to an individual's perception of his own health, such as pain, sleep disorder, mobility, etc. (Leung and Liang 2019); psychological QoL is used to measure the mental health of the elderly, including their feelings, emotions, and moods etc. (Leung *et al.,* 2020); and social QoL mainly refers to the interpersonal relationship between the elderly and others (including family members, neighbours, friends, etc.).

With aging, elderly generally has declined physical functions, such as decreased sensory ability, inflexible body, and slow response. It has been claimed that the elderly are more likely to have poor psychological QoL. Lack of social participation will lead to a decrease in cognitive function (Levasseur *et al.,* 2015), and even increase the death rate (Machielse and Duyndam 2020). In addition, as a vulnerable group, the QoL of elderly is subjected to influence of built environment (Zhang *et al.,* 2020). With the decline of body function, the elderly's requirements for environment (such as distance, security etc.) will improved a lot. Thus, it is important to continuously monitor and adjust the relationship between elderly and FM factors.

Facilities Management (FM) Factors At Community Levels

In recent several years, aging in place has been repeatedly emphasized by the national policy in China (Todd *et al.,* 2016). FM factors can significantly affect individual's well-being, especially for elderly residents (Cheng *et al.,* 2019). FM refers to the practices of organizing environment, assets and people within it to meet the needs (e.g., well-being and satisfaction) of the people; it often includes three groups of factors: space management, building services and supporting facilities (Leung *et al.,* 2020).

Space management refers to the management of available resources, including the number of the users, the requirements of the space, etc. (Leung and Liang 2019). Distance and privacy are important FM factors in the community area of space management. Distance to green spaces, health care and public transportation service are all related to residential satisfaction of elderly (Jelokhani-Niaraki *et al.,* 2019). While it is common to be exposed to the open environment in community (e.g., filmed by CCTV on street), feeling of privacy is likely to restrain negative emotions of elderly (Fleming *et al.,* 2014).

Building services refers to a set of technical systems which can meet certain building function requirements, and typical building services factors include ventilation, security and so on. A polluted environment is bad for elderly's health, especially in the community, as bacteria would breed rapidly. Fresh air is the primary consideration to improve the elderly QoL. In the community, security should be one of the major concerns of elderly, and it has been claimed that poor security may harm for elderly's QoL.

Supporting facilities in the community also play a significant role in elderly's daily life. Finishes with bright color and good aesthetic would encourage elderly staying in the community, prompting social interactions among elderly. Hygiene in the community, which concerns community cleanliness and residents' attitude toward environment, determine the willingness of elderly to stay in the community, and poor Hygiene Can Also Increase the Safety Risk of Elderly (Kwan *Et Al.,* 2016).

Conceptual Model

On the basis of literature review, a theoretical model displayed the interactions between FM factors in community area and QoL of elderly were established (see Fig 1). It hypothesized that three groups of FM factors in community areas, including space management, building services and supporting facilities, could affect QoL of elderly (e.g., physical, psychological and social QoL).

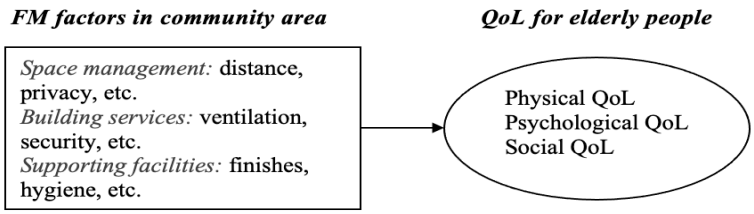

Fig 1: Conceptual FM-QoL model for elderly in community area

METHODOLOGY

A questionnaire survey was administered among the elderly living in urban and rural areas in southwestern China to collect data for testing the conceptual model.

Questionnaire survey has been regarded as an appropriate method to examine the relationship between FM and QoL for elderly (Leung and Liang 2019; Yu *et al.,* 2017). The questionnaire was designed based on valid scales of previous studies, and mainly included three parts: (1) the demographic information of elderly (such as age, gender, education etc.); (2) the elderly' QoL level, covering physical QoL (e.g., concerned about physical health etc.), psychological QoL (e.g., being fun everyday etc.) and social QoL (e.g., not having enough company etc.); and (3) the satisfaction with FM components in community, including space management (distance, privacy etc.), building services (ventilation, security etc.) and supporting facilities factors (finishes, hygiene etc.). The elderly's satisfaction with FM components in community area and their QoL level were valued by a five-point Likert scale ranging from **1(**very unsatisfied/strongly disagree) to 5 (very satisfied/ strongly agree). Studies have proved that use of five-point Likert is appropriate for elderly to indicate their opinion (Leung *et al.,* 2016; Zhang and Li 2019).

To ensure the quality of the data collection, a purposive sampling technique was applied (Cooper and Schindler 2006). Only the elderly who met the following criteria were invited to complete the questionnaire: (1) aged 60 and over (i.e., definition of elderly by United Nations) (United Nations 2018); (2) has lived in current residence for more than 3 months (to minimize the impact of relocation adjustment) (Bekhet *et al.,* 2011); and (3) possesses adequate cognition to comprehend and respond to the questions (Baltes 1987). A face-to-face interview with elderly was conducted by the elderly's family members. Finally, over 40 valid questionnaires were obtained. Of the respondents, 31.7% were male, while 68.3% were female. The number of elderly aged 60-69, 70-79 and 80 or above was 65.9%, 24.4% and 9.8% respectively. Their overall education level is not high (51.2% elderly only had primary school education level). Most of them (over 90%) have lived in current residence for more than two years.

After the data collection, a series of statistical techniques, including reliability test, correlation analysis and regression analysis, were applied to examine the relationship between FM factors in community area and elderly's QoL. The interior consistency of the related FM components in community and QoL factors were tested by reliability analysis; the strength and direction of relationships between two variables were measured by correlation analysis; and regression analysis showed the individual impact of FM in community on elderly's QoL by establishing models about the relationship between a set of independent variables (i.e., several FM components in community) and dependent variable (i.e., one QoL factor).

RESULTS

Reliability Test

A reliability test was conducted to examine the degree of freedom from random error between the QoL and FM factors in community. Cronbach's alpha value at 0.60 set as the benchmark for the inclusion of factors. During the reliability test, it was found that the Cronbach's alpha value of ventilation(F3) was increased significantly from 0.292 to 0.714 after reversing two questions of it (i.e., this is a polluted neighbourhood and residents' health is threatened by pollution in this neighbourhood). Finally, all FM components in community and QoL factors had a high alpha value, ranging from lowest at 0.693 for physical QoL(Q1) to the highest at 0.871 for privacy(F2).

Correlation Analysis

A Pearson correlation analysis was used to explore the strength and direction of the relationship between FM in community area and QoL of elderly. The results showed that: 1) psychological QoL (Q2) was positively correlated with distance (F1: 0.394; P ＜0.05), privacy (F2: 0.333; P＜0.05), ventilation (F3: 0.391; P＜0.05), security (F4: 0.342; P＜0.05) and hygiene (F6: 0.336; P＜0.05); 2) social QoL (Q3) had a significant and positive correlation with distance (F1: 0.380; P＜0.05); and 3) it was interesting to find that physical QoL (Q1) had no significant relation with all FM factors in the community.

Regression Analysis

To examine the unique influence of each FM factor in community area on QoL of elderly, a standard regression analysis was applied in the study. Studies claimed that demographic factors can influence the QoL of the elderly (Kim 2016; Qin *et al.,* 2020). Thus, the effect of demographic factors should be controlled in the regression analysis. In the regression models of current study, one of QoL (e.g., physical, psychological, social QoL) was entered to the model as dependent factor, while demographic factors (including age, education and gender) and all FM factors were respectively entered into the first block and second block of independent factors in the model. A total of two regression models were established (Table 1). The Model 1 shows that Psychological QoL (Q2) was positively predicted by distance (F1) and ventilation (F3), and this model accounted for 32% of the variance. As shown in Model 2, distance (F1) positively affected Social QoL (Q3), and a total of 14.4% variance was explained by the model.

Table 1: Regression model for FM components in community area and QoL factors of the elderly

								ANOVA	
Model	B	S.E.	Sig.	VIF	R	R2	ΔR2	F	Sig.
1. Psychological QoL	←		FM Components in community area						
(Constant)	0.963	0.654	0.150	-	0.584	0.341	0.247	3.618	0.010
F1 - Distance	0.363	0.125	0.006	1.008					
F4 - Ventilation	0.380	0.125	0.004	1.024					
2. Social QoL	←		FM Components in community area						
(Constant)	0.794	0.708	0.269	-	0.398	0.159	0.065	1.697	0.172
F1 - Distance	0.411	0.167	0.019	1.007					

Notes: ΔR2 = increased R squared; Dependent V = Dependent Variables; Independent Vs = Independent variables; S.E. = Standard Error; VIF = Variance Inflation Factor

DISCUSSION

To ensure the reliability of the results, final conclusions of this paper were only made based on the congruence of the results of all statistical methods (i.e., the reliability test, correlation analysis and regression analysis) (Table 2). A FM-QoL model for elderly in community area was established (see Fig 2). The model showed that: 1) one of space management factors (i.e., distance) could positively predicted the elderly's psychological and social QoL; 2) ventilation, as building services factor in the community, imposed positive impact on psychological QoL of elderly; and 3) it was

interesting to find that no supporting facilities components could affect the elderly's QoL.

Table 2: Correlation and regression results for FM components in community area and QoL factors of elderly

	Physical QoL		Psychological QoL		Social QoL	
	correlation	regression	correlation	regression	correlation	regression
F1-Distance	-0.142	0.135	.394*	0.041*	0.380*	0.050*
F2-Privacy	0.111	0.283	.333*	0.178	-0.009	0.301
F3-Ventilation	0.001	0.812	.391*	0.014*	-0.002	0.648
F4-Security	-0.152	0.110	.342*	0.510	0.132	0.389
F5-Finishes	-0.157	0.275	0.276	0.481	0.285	0.258
F6-Hygiene	0.063	0.046*	.336*	0.486	0.302	0.316

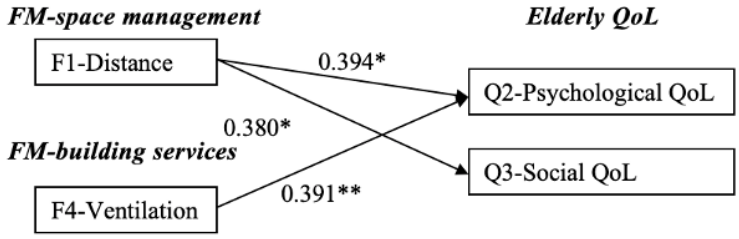

Fig 2: A FM - QoL model for elderly in community area

→ Represents a positive relationship revealed in correlation and regression analysis

Space Management and QoL

The final results showed that distance had a positive effect on psychological and social QoL of elderly respectively. The distance factor in the community was concerned with the distance to various public facilities nearby, including the distance to nearest shopping mall, to nearest park/square, and to nearest gym/sports centre. In fact, distance to public facilities is essential for elderly's daily life, as it determined whether elderly's daily needs are easily satisfied. Thus, it is unsurprised to find the connection between distance and psychological QoL. Furthermore, with the decline of mobility (Iancu and Iancu 2020), appropriate distances in community encourage the elderly from participating in social activities and would lead to improved social QoL.

Considering congruence between correlation and regression analysis, no relationship between QoL and privacy in community was confirmed in this study. This finding is different from those of previous study (i.e. privacy restrictions may lead to negative emotions of elderly) (Leung *et al.,* 2017). Perhaps, elderly knows that community is a public open space, and thus, being photographed by security cameras in the community will not make them feel uncomfortable. They may also have already perceived it is hard and insignificant to protect privacy in the community.

Building Services and QoL

It was found that there existed a positive interaction between ventilation in community and psychological QoL of elderly. This finding is consistent with those of previous research that claimed ventilation in individual unit flat and common area could

positively affect elderly's social QoL (Leung *et al.,* 2017; Leung and Liang 2019). A dirty environment with polluted air would cause bacteria breed and spread rapidly, which is harm for the elderly's health. In fact, most of Chinese elderly think it is good to stay in environment with clean air, and when they breath fresh air in the community, they may feel pleasant. Therefore, it is reasonable to found high satisfaction with ventilation in the community led to high psychological QoL of elderly.

The security in the community was concerned with low crime rate, and safe neighbourhood etc. Good security can ensure that the residential environment under control and was safe for elderly. The previous research indicated that security of common area could affect elderly's psychological and social QoL (Leung and Liang 2019). However, no relationship was found between security and the elderly's QoL in this study. Criminal rate against elderly in Chinese city is usually not high, and most of elderly mainly come out in the daytime. The elderly also does not stay in community for very long time, and thus, they may gradually regard that safety is not a significant issue in the community.

Supporting Facilities and QoL

It was interesting to find there exist no direct interaction between supporting facilities and the elderly's QoL. The finishes in the community were concerned with materials and building details and so on. Different areas with different materials and detail design may not be noticed by elderly, because of their slow response and poor visual function. In addition, not all of them are construction practitioners, there is no need for them to pay attention to the building material and detail design. Thus, it reasonable to find no direct between finishes and the elderly's QoL

Hygiene in the community concerning cleanliness of streets, and residents' attitude or behaviours (such as respecting environment, avoiding dirtying the place in the community etc.). A clean and pleasant environment is one of the most important needs for elderly (Yung et al.2016). Study has shown that hygiene in common area affected elderly's QoL (Leung and Liang 2019). However, no direct interaction between hygiene in community area and QoL of elderly was found in this study. Perhaps, elderly generally stay in a private space (i.e. individual unit flat and common area) for longer time than in public one (i.e. community area). Elderly are normally able to control the hygiene in individual unit flat and common area (by frequently cleaning and emptying rubbish cans). However, in the community, it is not easy for elderly to keep cleanliness, as elderly can't control other residents' behaviour and attitude related to hygiene. In this regard, elderly may consider the community hygiene as unimportant factors that imposed no effect on their QoL.

Recommendations

Practical Recommendations

The finding of this study has indicated a significant relationship between FM in the community and the elderly's QoL. Thus, some effective suggestions for appropriate design and management of related FM components in community area are proposed to developer, designers, facilities managers, and other related groups, so as to improve elderly's QoL and well-being.

Unlike individual unit flat and common area, elderly often need to travel longer between residential buildings and public facilities, and thus, effective measures should be taken to shorten the related distance. For example, a sufficient number of benches

should be arranged beside the road so as to compensate the decline of elderly's body function. Furthermore, the elderly's travel behaviour in the community should also be observed in order to set more suitable spatial arrangement between residential buildings, and markets, parks and other public facilities. Attention should also be paid to ventilation in the community. In order to ensure the elderly to keep good emotion, it is recommended that streets should be frequently cleaned, and rubbish cans should also be emptied frequently. More trees should also be planted to filter polluted air and create fresh air for elderly in the community.

Research Limitations and Future Research

Although this research may involve potential biases, some remedial actions have been taken to ensure the reliability of the final results: 1) the extensive literature review about FM and QoL was taken to ensure the theoretical basis of current study; 2) the questions in the questionnaire are adapted from previous validated scales; and 3) the high alpha values for all factors indicated the high degree of internal consistence. It is reasonable to infer the current results have certain reliability.

Current study conducted a questionnaire survey to collect data from 41 elderly. Although there is no sample size requirement for reliability test and correlation analysis, the sample size of current study may not be sufficient for regression analysis. Indeed, insufficient sample size may cause issues like generalisability and bias in the results (Pallant *et al.,* 2016). However, it should be noted that all the elderly were selected based on strict criteria, which should have ensured certain level of representativeness to the total population of Chinese elderly. In addition, the final conclusion of the study was made based on the results confirmed by both correlation and regression analyses. Adoption of the within-method triangulation should also be helpful to ensure the reliability of the final results (Berg 2001).

The current research adopted a quantitative method (i.e., questionnaire survey) to investigate the effect of FM components in community area on three important aspect of elderly's QoL. According to between-method triangulation, case study using qualitative research methods (such as focus group and interview methods) for specific community are recommended to cross-check with current quantitative research results.

It was interesting to find that there were no FM factors in community area could affect the elderly's physical QoL and no supporting facilities could impose effect on QoL of elderly. As the current pilot study only studied the direct effects of some representative FM factors in community area on the elderly's QoL, future research is recommended to incorporate more possible influencing factors and investigate the complex mediating and/or moderating effects between FM factors and QoL of elderly. This will enhance our understanding of the interactions between FM and QoL of elderly.

CONCLUSIONS

The current study set out to examine the influence of FM in community area on the QoL of elderly. Based on the congruence of multiple analyses, the final findings show: 1) the elderly's psychological QoL can be positively affected by distance and ventilation in the community; 2) distance in community imposed positive impact on social QoL of elderly; and 3) no relationship was found between FM in community area and physical QoL of elderly. Practical recommendations were made to improve the existing FM in community area, including reduction of the distance between residential buildings and public facilities by arranging enough benches on the

roadside; frequently emptying rubbish cans and planting more trees to create fresh air, and so on. This study was able to confirm that FM in the community can significantly affect QoL of elderly, which enhance our understanding of the relationship between FM and QoL of elderly.

REFERENCE

Baltes, P B (1987) Theoretical propositions of life-span developmental psychology: on the dynamics between growth and decline, *Developmental Psychology*, **23**(5), 611-626.

Bekhet, A K, Fouad, R and Zauszniewski, J A (2011) The role of positive cognitions in Egyptian elders' relocation adjustment, *Western Journal of Nursing Research*, **33**(1), 121-135.

Berg, B L (2001) *Qualitative Research Methods for the Social Sciences 4th Edition*, Boston: Allyn and Bacon.

Cheng, L, De Vos, J, Shi, K, Yang, M, Chen, X and Witlox, F (2019) Do residential location effects on travel behaviour differ between the elderly and younger adults? *Transportation Research Part D: Transport and Environment*, **73**, 367-380.

Cooper, D R and Schindler, P S (2006) *Business Research Methods 9th Edition*, New York: The McGraw-Hill.

Gao, M, Ahern, J and Koshland, C P (2016) Perceived built environment and health-related quality of life in four types of neighbourhoods in Xi'an, *China Health and Place*, **39**, 110-115.

Harper, S (2019) Living longer within ageing societies, *Journal of Population Ageing*, **12**, 133-136.

Iancu, I and Iancu, B (2020) Designing mobile technology for elderly A theoretical overview, *Technological Forecasting and Social Change*, **155**, 119977.

Jelokhani-Niaraki, M, Hajiloo, F and Samany, N N (2019) A Web-based Public Participation GIS for assessing the age-friendliness of cities: A case study in Tehran, *Iran Cities*, **95**, 102471.

Kim, D (2016) Correlation between physical function, cognitive function and health-related quality of life in elderly persons, *Journal of Physical Therapy Science*, **28**(6), 1844-1848.

Kwan, E, Straus, S and Holroyd-Leduc, J (2016) Risk factors for falls in the elderly, *In*: A Huang and L Mallet (Eds) *Medication-Related Falls in Older People*, Cham: Aldis: 91-101.

Leung, M Y, Famakin, I O and Olomolaiye, P (2017) Effect of facilities management components on the quality of life of Chinese elderly in care and attention homes, *Facilities*, **35**(5/6), 270-285.

Leung, M and Liang, Q (2019) Developing structural facilities management-quality of life models for the elderly in the common areas of public and subsidized housings, *Habitat International*, **94**, 102067.

Leung, M Y, Wang, C and Wei, X (2020) Structural model for the relationships between indoor built environment and behaviours of residents with dementia in care and attention homes, *Building and Environment*, **169**, 106532.

Leung, M, Wang, C and Chan, I (2019) A qualitative and quantitative investigation of effects of indoor built environment for people with dementia in care and attention homes, *Building and Environment*, **157**, 89-100.

Leung, M, Yu, J and Chow, H (2016) Impact of indoor facilities management on the quality of life of the elderly in public housing, *Facilities*, **34**(9/10), 564-579.

Levasseur, M, Généreux, M, Bruneau, J, Bruneau, J, Vanasse, A, Chabot, E, Beaulac, C and Bédard, M (2015) Importance of proximity to resources, social support, transportation and neighbourhood security for mobility and social participation in older adults: results from a scoping study, *BMC Public Health*, **15**, 503.

Li, N and Liang, K (2016) Research on lighting standards of the elderly residential buildings china, *Illuminating Engineering Journal*, **27**(01), 60-64.

Ma, J, Dong, G, Chen, Y and Zhang, W (2018) Does satisfactory neighbourhood environment lead to a satisfying life? An investigation of the association between neighbourhood environment and life satisfaction in Beijing, *Cities*, **74**, 229-239.

Machielse, A and Duyndam, J (2020) Strategies of socially isolated older adults: mechanisms of emergence and persistence, *Journal of Aging Studies*, **53**, 100852.

National Bureau of Statistics (2020) *Statistical Bulletin of the People's Republic of China on National Economic and Social Development in 2019*, Available from: http://www.stats.gov.cn/tjsj/zxfb/202002/t20200228_1728913.html [Accessed 23 October 2020].

Pallant, J (2016) *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS 6th Edition*, London: Open University Press.

Qin, F Y, Lv, Z Q, Wang, D N, Hu, B and Wu, C (2020) Health status prediction for the elderly based on machine learning, *Archives of Gerontology and Geriatrics*, **90**, 104121.

Todd, M, Adams, M A, Kurka, J, Conway, T L, Cain, K L, Buman, M P and King, A C (2016) GIS-measured walkability, transit and recreation environments in relation to older Adults' physical activity: A latent profile analysis, *Preventive Medicine*, **93**, 57-63.

United Nations (2018) *Health Inequalities in Old Age*, Available from: https://www.un.org/development/desa/ageing/news/2018/04/health-inequalities-in-old-age/ [accessed 3 February 2021].

Yang, B and Olofsson, T (2016) A questionnaire survey on sleep environment conditioned by different cooling modes in multistorey residential buildings of Singapore, *Indoor and Built Environment*, **26**(1), 21-31.

Yu, J, Ma, G and Jiang, X (2017) Impact of the built environment and care services within rural nursing homes in China on quality of life for elderly residents, *Engineering, Construction and Architectural Management*, **24**(6), 1170-1183.

Yung, E, Conejos, S and Chan, E (2016) Social needs of the elderly and active aging in public open spaces in urban renewal, *Cities*, 52, 114-122.

Yung, E, Ho, W and Chan, E (2017) Elderly satisfaction with planning and design of public parks in high density old districts: An ordered logit model, *Landscape and Urban Planning*, **165**, 39-53.

Zhang, F and Li, D (2019) Multiple linear regression-structural equation modelling based development of the integrated model of perceived neighbourhood environment and quality of life of community-dwelling older adults: A cross-sectional study in Nanjing, China, *International Journal of Environmental Research and Public Health*, **16**(24), 4933.

Zhang, F, Li, D, Ahrentzen, S and Feng, H (2020) Exploring the inner relationship among neighbourhood environmental factors affecting quality of life of older adults based on SLR-ISM method, *Journal of Housing and the Built Environment*, **35**(1), 215-242.