

# Design of Modular Housing Suitable for the Elderly

Zeqin Wu<sup>1</sup>, Richard G. Sober<sup>2</sup>

<sup>1</sup>Student, Advanced Home Futures, MIMA School of Art and Design, Teesside University, Middlesbrough, UK

<sup>2</sup>Professor, Dept. of Art and Design, Teesside University, Middlesbrough, UK

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**Abstract:** This article mainly discusses how modular housing can meet the needs of the elderly. Improved life expectancy has led to a gradual growth of the elderly population in today's society making this group and increasingly important consideration and focus. More products especially produced for the elderly market segment continue to appear. The design and construction industry is similarly recognising and paying more attention to the activity needs of the elderly in the building space. At present, there is still a shortage of housing for the elderly in towns such as Middlesbrough, UK. The design proposals considered here will discuss the concept for an elderly residential area in the Middlesbrough area in Northern England, met by flexible modular buildings, developed to meet the varying needs levels of the elderly.

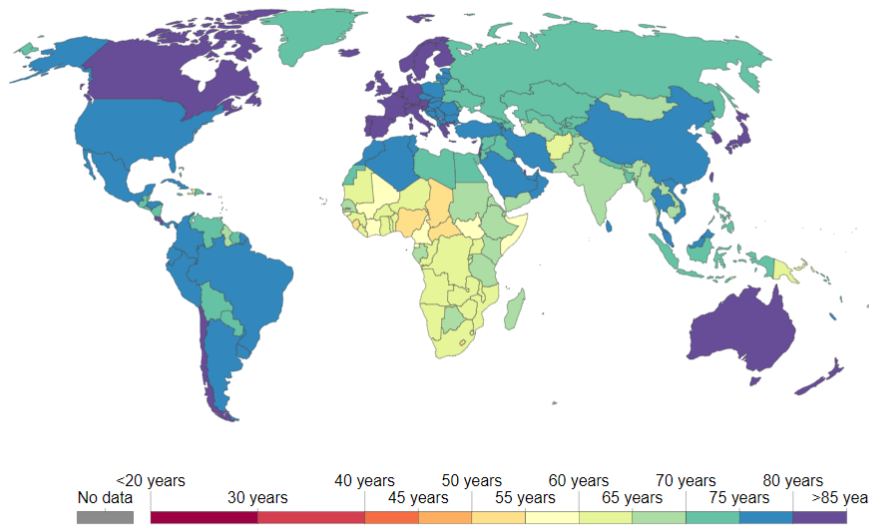
## 1、 Introduction

A commonly used method of construction in the contemporary market is modular housing. This method involves the division of the various composite parts of the house structure into specific 'modules', deploying standardised, modular production techniques to construct via factory manufacturing processes. The erection of the house can be conducted on the actual site of location, and the whole procedure is time-effective and pollution-reducing (this pertains to both noise and debris). This method of building a house is a radical alternative to conventional building, which is conducted in a sporadic way. The fact that the house can be assembled and taken apart with ease serves to boost the flexibility of the construction, it makes movement of the house achievable, it makes demolition a smooth procedure, and it deploys functionalist, scientific thinking to develop buildings that are congruent with the natural environment around them. Both contemporary and more traditional methods of design can be incorporated into such buildings. Modular houses can be conceived and developed to suit elderly residents – known as 'age-appropriate modular housing' – and the buildings can hereby be made to be efficient with space and energy use (and also environmentally sustainable or 'green').

## 2、 Life Expectancy

The average duration of a life is known as 'life expectancy'. Life expectancy varies significantly from country to country. In advanced economies with well-developed healthcare and infrastructure, it is often in excess of 80 years. Life expectancy stood at 80-85 years in Europe, the USA, Australia and Japan in 2019 (Roser, Ortiz-Ospina and Ritchie, 2013). In certain underdeveloped states, with poor sanitation, little healthcare and challenging conditions, life expectancy can be as low as 50-60. The Central African Republic has the lowest life expectancy globally, standing at 50-55 years (Roser, Ortiz-Ospina and Ritchie, 2013). In developed countries, a range of lifestyle factors and medical innovations have meant that life expectancy has significantly grown.

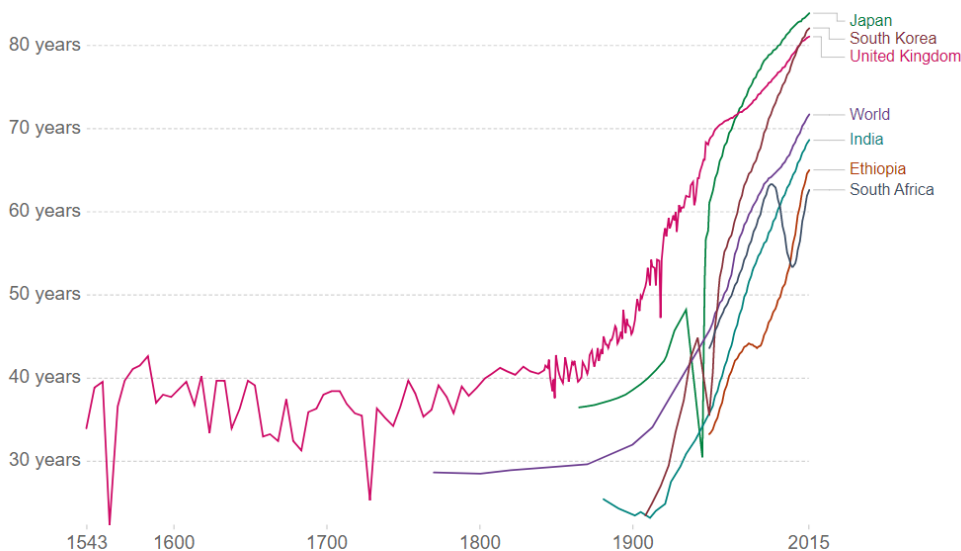
Life expectancy, 2019



Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019) OurWorldInData.org/life-expectancy • CC BY  
 Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.

Life expectancy has risen as a global trend over the previous two centuries, largely due to improvements in healthcare, sanitation and water purity. The UK figure is twice what it was 200 years ago. Japan’s life expectancy is even higher (and has been since the 1960s) than the UK’s thanks to much improved health in the population. South Korea boasts the quickest growth in life expectancy, and it has now gone above the UK figure (Roser, Ortiz-Ospina and Ritchie, 2013).

Life expectancy, 1543 to 2015

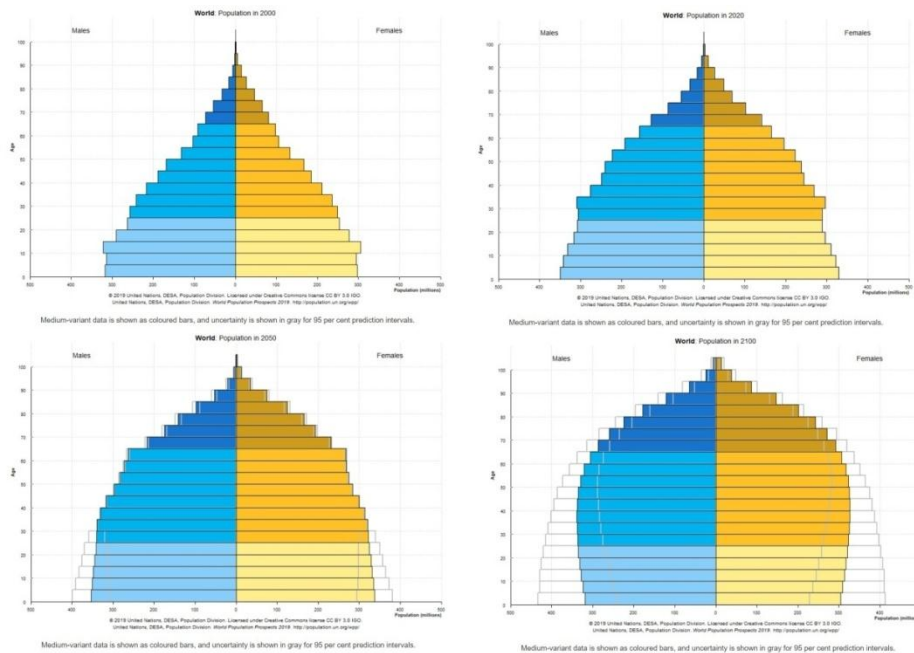


Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019) OurWorldInData.org/life-expectancy • CC BY  
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### 3、 Silver Economy

Those sectors and market actors who supply products and services to elderly consumers are known as the ‘silver economy’. The global pattern of ageing populations in developed countries has spurred the growth of elderly consumer markets, with the silver economy becoming a highly significant consumer sector in the global economy. Despite the prevalence of 0-30-year olds in the existing global populace, between 2050 and 2100 an increasingly aged population looks set to emerge, with the overall shape of population age groups assuming the shape of a pear (World Population Prospects, 2019). The silver economy is a relatively new arena of market activity, because this ageing trend is novel. The

silver economy is being grown and innovated to respond to the challenges of the time, and it is able to meet elderly people's demands and needs, boost the economy and address the challenges of ageing.



Addressing the demands emerging from an ageing population has also become a priority in construction. Increased life expectancy means that adults have even greater time to consume goods and services. Developing elderly-sensitive buildings is thus imperative. Architectural solutions must be developed which address the unique physiological and psychological needs of older people. A key study led by Holt-Lunstad et al. (2015) found that those residing alone in relatively isolated environments are at risk of early death as an indirect result. The US Public Health Department has even placed isolation in the list of public health risks in the USA. The experience of loneliness is intricately linked to a person's social environment, with the nature of a person's relationships and the nature of societal communication being key factors. The prevalence of social media and online networks in contemporary society has meant that many elderly people are excluded from participation in a major media of communication. The generation of older adults who have retired and seek to live out their lives as retirees are often, though not inalienably, subject to an intrinsic sense of loss and loneliness. This, coupled with exclusion from social media, has been worsened by the COVID-19 pandemic in 2020. Loneliness and isolation have been exacerbated by the lockdown conditions. This growing crisis among elderly citizens has spurred innovation in building designs as well as in a range of other sectors.

#### 4、 Middlehaven Area

Middlehaven – referred to also as 'over the border' – is located in Middlesbrough, an industrial city in Northeast England near the River Tees. The city is industrially intensive, with the local economy predominated by fertiliser production, chemical production, iron ore industries and the steel industry. The site is a vital transport and logistics hub, based in the industrial area, and it has been used for waste disposal to date. It now comprises the location of a major regenerative initiative. The area is located close to the Riverside Stadium and to the Middlesbrough College. A nearby 'snow centre' project is currently undergoing planning and development.



(Come From: Google Map)

### 5、 Project Location

The site is accessible via a range of public transport and private vehicles. It is close to the railway station and next to a large car park. The local police station is also close and accessible, serving to assure residents of enhanced safety. It is nearby the river, making it a site abundant with scenes of natural beauty, although there is an increased risk of floods as a result.



(Come From: Google Map)

### 6、 Key Aspects of the Project

This development, coined 'elderly co-housing', is designed to enable the older residents to feel accompanied and to resist and manage experiences of loneliness. The design accordingly covers both the exterior architecture and the interiors. The building must be made such that it can meet the multiple needs of the residents, and it is accordingly an example of silver economy activity in the construction sector. The building is, as above, situated in the Middlehaven area (an ex-wasteland left over following partial deindustrialisation). The concepts and practices of modular building and green building dominated the selection of designs and the allocation of resources. Reducing pollution in the form of noise, chemical waste, gaseous emissions and dust waste is a core objective of the construction process.



( Architectural Rendering )

The critical goal of eliminating loneliness is at the core of the overall design and construction. 'Co-housing' constitutes a Danish concept, introduced in the latter part of the 20<sup>th</sup> Century. According to this idea, the design of buildings can enable people to experience a closer sense of togetherness with their neighbours. Residents do have private residencies, yet they also have access to expansive areas, both out of doors and inside, that are publicly owned and managed. For elderly residents in this specific plot, this mode of building will help to ensure they can gather, communicate and support each other, minimising loneliness and boosting a sense of personal and collective value.

The system distinguishes between three stages of ageing and accordingly designs different sections of the building differently. The aim is to achieve integrated residential services, including personal care services, nurse staff, other forms of personal support and a range of activities for improving the health and independence of the residents. The intention behind having different designs to fit different stages of ageing is to ensure that residents remain in the same location regardless of their physical needs. The three sections are as follows:

a) Independent Living

Residents hereby occupy private spaces and are able to support and care for themselves. The community in the building nevertheless offers a means for the residents to access catering services, cleaning facilities, laundry facilities and medical care and support.

b) Assisted Living

At this stage residents are deemed to require support in their normal functioning lives, so the buildings enable the residents to move to an assisted nursing setting. In this section, residents are personally cared for insofar as eating, dressing, cleaning, washing and medical care are concerned.

c) 24-Hour Nursing Care

This section provides round the clock personal and medical care to the residents, who have been deemed incapable of looking after themselves even in the presence of in-home care. Residents are accordingly placed into a facility, based on site, where they can benefit from professional nursing.



(Architectural Rendering)

## 7、 Types of Residence: Further Details

### (1) Independent Living Housing

Because the residents are able to move freely and to look after themselves, the housekeeping services are minimal though supportive, and the major function of the building is to provide public spaces in which residents can meet and engage with each other. Each residence also has a garage, so that residents can freely come and go and can retain their independence.



### (2) Assisted Living Housing

This living section is for elderly people for whom self-care and independent living are challenging or impossible. These residents often struggle to eat, dress, move around, go to the toilet, engage in recreational activities indoors or bathe. Nursing staff are accordingly allocated to support the residents in doing so.



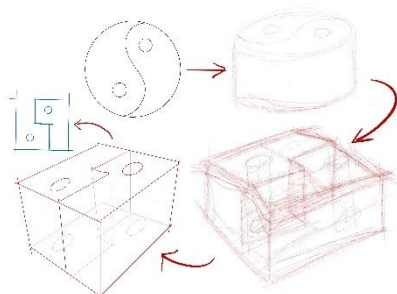
(3) 24-Hour Nursing Care Housing

Residents in this type of residence require round the clock care and consistent company. The nursing staff base is increased in this section, and therefore additional staff areas are placed into the medical service area.

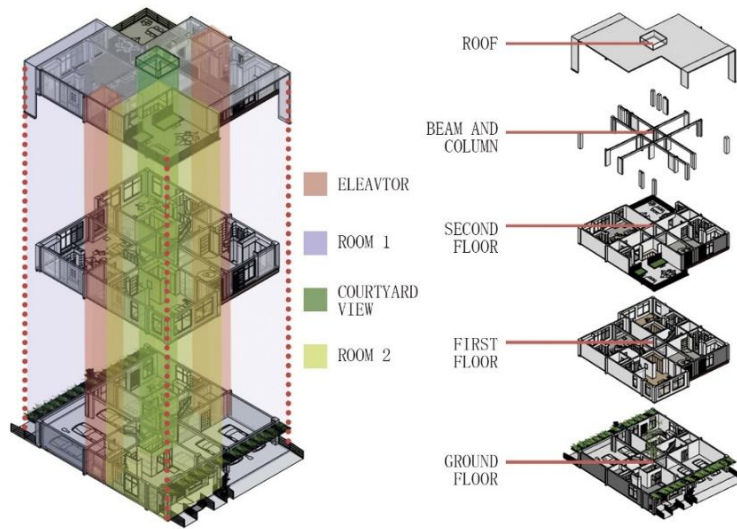


8、 Residential Modular Structure

The Chinese symbol of Yin and Yang – in the form of a fish – comprises the template of the building design. The overall shape seeks to incorporate the notions of unity, opposition and reciprocity. The modules split to the right and the left constitute the smaller composites of the building, with the building as a whole being made from their conjoining. These two subsections are separate units, but they are connected via the atrium, wherein the residents can enjoy exchanges of support and dialogue. The atrium forms a core base from which life in the specific units derives its sense of connectedness and centrality.



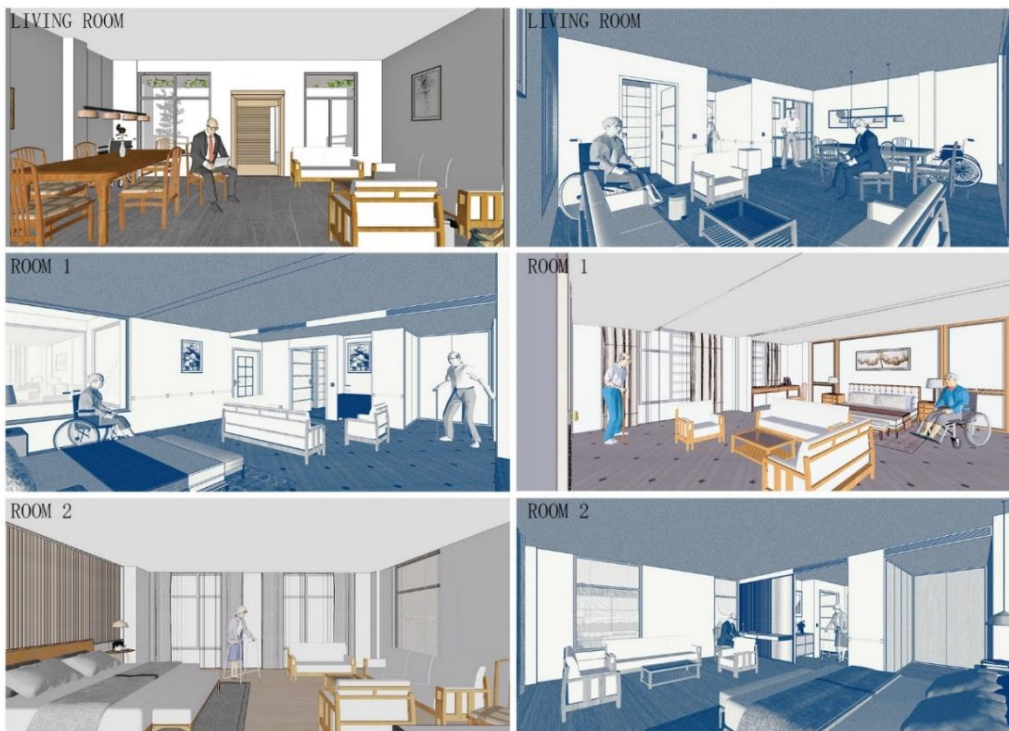
(Model Sketch)



( Building Analysis )

### 9、 Interior Design Suitable for Elderly Residents

Modular houses such as these, when targeted at elderly people, draw lessons from older style homes. The critical issue is elderly people’s mobility and independence. Ageing can impair physical ability, degrade motor function, damage sensory skills, and negatively affect sight and hearing. The interiors of these residences are therefore built to ensure that all facilities which can assist and enable elderly people can be integrated into the living space.



( Interior Renderings )



## 10、 Conclusion

The market for modular housing aimed at older residents is undergoing rapid development and the modular housing design sector looks set to continue innovating and growing. An ageing population trend has emerged in many countries, and this creates both challenges and opportunities in terms of the economy. It is thus imperative that enterprises, policymakers, designers and other professionals address precisely how to produce modular designs that are fit to meet the needs of elderly residents. The modular housing for elderly people initiative is nascent, and it comprises an application of Chinese concepts and practices in contemporary design. It seeks to create living spaces for elderly people that are creative, beautiful, functional, innovative and appropriately designed to support those needing assistances in later life.



( Architectural Rendering )

## References

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