

The impact of housing modification: Discussion

**Reflections on Cross-Cultural Comparison of the Impact of Housing  
Modification/Adaptation<sup>1</sup> for Supporting Older People at Home: A Discussion**

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<sup>1</sup>Both 'modification' and 'adaptation' are used across this special issue. The term 'home modification' is used in USA, Australia, and Sweden and 'home adaptation' in the UK and Spain with papers from Sweden using both terms.

**Abstract**

Home modification or adaptation is an important global issue, especially for older people living with disabilities in ordinary housing of varying ages, and pre-dating concerns about accessibility in design. Comparisons of research from five developed nations identify common themes: variation in integrated service development; public and private financial investment; deferred health costs; workforce expansion and training; and the value of the user perspective. Further discussion identifies the importance of retrofitting alongside new build, and argues for sustainable housing that recognizes population aging but also issues of climate change and the need for more inclusive design of housing for all ages.

(100 words)

**Keywords**

Home modification/adaptation; global issue; coordinated services; financial impact; sustainable housing; workforce development

## **Introduction**

The six articles in this special issue provide the basis for cross-cultural discussion of housing modification in developed nations with an aging population that presents a unique synthesis of issues regarding person-environment interaction. Here, attention is drawn to a number of questions essential to future development:

- How is home modification/adaptation in later life directed by the quality and design of the building stock? Do variations between nations in their housing stock have an impact on accessibility?
- Who is receiving home modification? How does public and private financial investment in relation to disability influence service development?
- How do different countries approach service development for home modification? Is this a widespread or fragmented system? What do service users know about home modification? How available is information?
- What is the workforce needed to support home modification? How do professionals from occupational therapy operationalize the process of modification/adaptation? What skills development is needed?
- How is the building profession involved in the process of environmental change? Do they draw upon building regulations to assist design?
- What is the evidence base that demonstrates how adaptation is beneficial for older people, all people with disabilities, their families and their carers (informal and formal)? What, and how are, outcomes measured?
- What are the barriers to home modifications/adaptations? Does home modification focus on the client or produce standardized interventions? Does

home modification focus on specific outcomes (e.g. falls prevention) or  
broader issues (e.g. age-inclusive design or bespoke design)?

### **Housing stock and accessibility: The context of home modification**

The five western developed nations (Spain, USA, UK, Sweden, Australia) represented in this special issue illustrate global diversity of size and shape in terms of population, land mass and density. The demography of populations 60 years and over indicates the aged nature of these countries, ranging from 21% to 26% (see Table 1). Throughout this discussion the impact of unique urban/rural geography and industrial development on housing history, and expansion over time, is acknowledged. For example, particular cultural circumstances affect design and tenure, as seen in the distribution of rented or owner-occupied single and multi-family dwellings. Material from the USA, Australia and the UK indicates that a majority of older people are homeowners living in single-family homes, commonly detached houses in Australia, where in all cases many have lived for some time and wish to remain living. However, housing stock varies enormously across the USA, where the Northeast has older housing. The oldest housing stock in the European Union (EU) was found in the UK, where 38% dates from before 1946 (Nicol, Roys, Ormandy, & Ezratty, 2016); while Spain has the highest proportion of people living in multi-family housing – flats/apartments – in the EU. Changes in future population projections will see some countries aging more rapidly without appropriate housing being developed to meet people's changing needs.

[Insert Table 1 about here]

Across the 20th century, there are similarities and differences in the history of housing development, even if detailed comparison is not possible here. Single-family dwellings are more common in rural areas and multi-family dwellings – apartments/flats, both rented and self-owned – in urban locations. The growth of different types of housing stock reflects the varied roles of public and private housing providers, with the public sector – municipalities in Sweden; local authorities in the UK; states/districts in the USA – meeting more urgent housing needs for those with particular health concerns and limited financial resources. Central and local government policy has greater control over provision for these groups, and building development is more commonly directed by building regulations and standards. However, although issues of accessibility are particularly important for people with disabilities, such considerations have not been common in housing design across these countries, while new building is seen as slow to develop.

Slaug, Granbom, and Iwarsson (2020) comment on how certain forms of public sector housing in Sweden may demonstrate similar accessibility problems to private housing in terms of environmental barriers, while Aplin, Hoyle, Fiechtner, Bailey, and Ainsworth (2020) indicate that currently there is no mandatory building code to require universal design features in new dwellings in Australia. It has only been in recent years that standards regarding accessibility have begun to be discussed and incorporated in new housing design. Alonso-López (2020) discusses the Spanish 2010 Technical Building Code, which established criteria for new build, concerning design, construction and maintenance of buildings, with accessibility being influential

in legislation at the level of autonomous communities (regional/cultural) since 1990. In the UK, the 1997–2010 government adopted Lifetime Homes Standards for new public sector funded housing, with the aspiration that all new homes would be built to these standards by 2013 (Department for Communities and Local Government [DCLG], Department of Health [DH], & Department for Work and Pensions [DWP], 2008). However, the subsequent government specified a lower mandatory level of accessibility, with optional requirements for higher levels of accessibility, broadly in line with Lifetime Homes Standards, or for wheelchair users, dependent on specific planning conditions (DCLG, 2015). In London, housing policy has retained the requirement that all new housing should be built to the higher standards of accessibility (Mayor of London, 2015), although few London boroughs meet the stipulated levels of compliance (Mayor of London, 2018).

In all these articles, research indicates that older people are most likely to live in older housing stock that was not designed to accommodate accessibility features. Commonly, across all housing types, stepped entry, narrow doors and hallways, stairs, inaccessible toilets and bathrooms, inaccessible baths and showers with hob (stepped) entries, and poor design regarding insulation and access to power and water supplies are noted. However, differences do exist between single and multi-family dwellings. In particular, Slaug et al. (2020) indicate a wide range of environmental barriers: indoors, at entrances, and in the immediate surroundings. They note differences between single-family houses in Sweden, which have lower accessibility problems, and multi-family accommodation, where issues relating to entrances needing automatic door construction and elevators can cause difficulties. Alonso-López (2020), focusing on apartment living in Spain, discusses accessibility

issues in relation to stairs, bathrooms and entrances. These buildings also often do not have elevators. There are a number of generic trends throughout these commentaries showing that the housing infrastructure is not adding life to years, especially when the oldest old are most likely to be living alone in all housing types. As Aplin et al. (2020) state, 'The majority of housing stock in Australia is therefore inaccessible' (p \*\*). Keglovits and Stark (2020) comment that: 'Only 1% of the housing in the US has five basic accessibility features: no-step entry, single-floor living, wide doorways and halls, accessible electrical controls and switches, and lever-style door and faucet handles' (p.\*\*\*). In England, only 7% of homes in 2014 had all four accessibility features (level access, flush threshold, sufficiently wide doorways and circulation space, and an entrance level toilet) that provide visitability to most people, including wheelchair users (DCLG, 2016a). Consequently, home modification may be needed in different types of housing for people of all ages, alongside the need for more inclusive design in new build.

### **Recipients of home modification: Clients and funders**

The need for home modification leads to the question of 'who are the current recipients?' and 'how have existing systems of provision developed over time and operate currently?'. During the 20th century, there has been gradual recognition in developed countries of the need for greater environmental access for people of all ages living with mobility issues due to physical disability (Goldsmith, 1967, 1997, 2000). Disability discrimination legislation has prompted some material change in community and housing infrastructure – from the dropped curb and changes to road

crossings, accessible toilets, to stairlifts, walk-in bathrooms and step-free access – recognized as a human rights issue (Imrie, 1996; Peace, Katz, Holland, & Jones, 2019; World Health Organization [WHO], 2018). Over time, services set up primarily for younger people with a disability have been embraced by older people. However, as noted in the UK, the main beneficiaries of state supported modification in the home environment are the most vulnerable older and disabled people with low incomes and often living alone (Mackintosh et al., 2018). The work of Aplin et al. (2020) in Australia indicates that the proportion of people of all ages with a recognized disability receiving home modifications is small; while Alonso-López (2020) comments that home modification is not part of the Spanish autonomy and care legislation for people seen as particularly vulnerable, and that funding for this is very low. The modification of bathrooms is mentioned here alongside problems that exist in adapting communal areas such as entrances to apartment buildings to facilitate access.

As seen in Table 2, population aging leads to a higher incidence of physical disability in later life ranging from 50-70% across these nations. Yet many older people may not initially see themselves as disabled, rather experiencing a gradual recognition that changes to their physical and mental health make their environment less enabling when carrying out everyday activities (WHO, 2011; Age UK, 2019). In addition, this does not mean that people are routinely informed about, or offered, access to home modification services. With the exception of Sweden, only a minority of people would be identified as eligible for public sector home modification services, primarily due to health needs. Homeowners may be seen, and see themselves, as self-funders. In England and Wales the means test for major adaptations involves

assessing the household's ability to meet the costs of a loan, although recommendations have been made to widen the definition of income to include housing equity (DCLG, 2011). It was argued that this would increase the funding available, while not affecting the current income of the person concerned, since a charge would be placed on the property, to be repaid on sale or transfer (DCLG, 2011). However, households in London and the South East of England hold a disproportionate amount of housing wealth, whereas areas with lower levels of wealth have higher rates of disability (Mackintosh et al., 2018).

[Insert Table 2 about here]

Access to service provision varies from those dependent on referral through health and social care services to occupational therapy leading to environmental assessment and planned adaptation to those responsible for organizing their own personal home improvement. At one extreme, in Sweden, Slaug et al. (2020) report that 'Individually-tailored housing ... adaptations ... [are available to all] ... based on functional needs, regardless of age' (p...). The annual expenditure on this tax-funded service is substantial, the majority of users are 70 years and older, and data from 2016 show that 74,000 housing adaptations are granted each year. This inclusive service is currently making the environment more accessible, yet in times of financial austerity policy makers have reduced the requirement for accessible housing in terms of new build and adaptations in order to lower costs and increase production (more for less). In contrast, Mackintosh (2020) considers the development of the Disabled Facilities Grant (DFG), introduced in the UK by the 1989 Local Government and Housing Act, which helps people on low incomes access modifications to their

homes. To date the majority (65%) goes to people aged 60 years and over (Mackintosh et al., 2018). Although the on-going debate in the UK over the future funding of social care does identify the central role of housing in the necessary reforms (Jarrett, 2019), this tends to be expressed in general terms rather than specifically focusing on the role of accessible housing. Nevertheless, this system funded through central government is seen to have greater focus on home modification than the Australia National Disability Insurance Scheme (NDIS) currently being rolled out across the country for people aged under 65 (see Aplin et al, 2020). Here the aim is to provide those with 'a permanent and significant disability, aged under 65, with the reasonable and necessary supports they need, to live an ordinary life' (p \*\*). While this scheme may introduce lifetime planning, for those 65 years and over Aplin et al. consider that the aged care system appears more focused on residential care and home care packages.

### **Service development**

National strategic decisions regarding home modification are generated within particular political economies with impact at local government level. This relates to how home modification is seen as either a public service, or a private initiative, or a combination of both. The public systems outlined here highlight diversity in terms of levels of management, operational control, integration with other services - particularly health and social care, and workforce identification and partnership, which will all impact on the experience of service users. Of the examples given, the Swedish system for their publically funded home adaptation program has a particular

process at municipality level, where approval is granted after a needs assessment and certification given by a health professional, usually a registered occupational therapist. Certification is required by law and focuses on the capacity of the individual and their individual needs alongside an assessment of the physical environment. The organization(s) that direct and undertake building works is not identified here.

Variations across nations are also seen within nations, which is not surprising given the variation in funding arrangements. Keglovits and Stark (2020) indicate the diversity of programs operated in the USA at national and state levels. This influences how older people may acquire financial support for home modification, for example from the *Home Improvements and Structural Alterations* grant for Veterans to the *Section 504 home repairs* program for rural elders to those that relate to public assistance housing and *Waiver programs* for people accessing Medicaid. They note that the scope covered by these grants put limits on the type of modification available. For example, low-cost solutions such as 'automatic nightlights' may not be covered. A link is seen here with evidence regarding financing a range of modifications noted in the UK and Australia. In the UK, a distinction is made between minor and major adaptations. Disabled Facilities Grants (DFGs) are available up to a maximum of £30,000 in England and £36,000 in Wales, depending on a means test while grants for minor adaptations, such as handrails and ramps, and costing less than £1,000, are available without charge for people with assessed health and care needs (DCLG, 2009). Different funding arrangements apply in Scotland (Wilson & Fears, 2016). Most DFGs are used to install level-access showers, and to provide stairlifts and ramps, and the average cost is just under £9,000 (Mackintosh et al.,

2018). However, there is considerable regional variation in costs, with those in London being significantly higher, and Mackintosh et al. recommended that the maximum should be increased in line with inflation.

In Australia, information concerning access to home modification is seen to be part of a 'complex patchwork' of agencies and services. The need to bring together various sources of funding with different planning and operational bodies is also seen in the USA, where an example from the Housing Department of the Philadelphia Corporation for Aging demonstrates how the Area Agency on Aging is working with occupational therapists, home repair and modification programs. The need for co-ordination of multi-professional working across place is a topic seen throughout this special issue for both public and private service users. Through an evidence review involving practitioners, service users, and national and local stakeholders within the UK, Mackintosh and her colleagues demonstrate the current complexity in developing publically supported programs (Mackintosh et al., 2018).

Alonso-López (2020) describes through initiatives in Barcelona, how some public programs have developed in Spain via various levels of central and local government interaction. However, financial restraints over the past decade have limited expansion. Nevertheless, demand still exists and, given the dominance of apartment living, he comments on the importance of accessibility to communal areas – entrances, storage rooms, waste disposal – that are separate from home modification but also need to be taken into account. To date he considers information concerning home improvement as limited with the emphasis having been placed on bathroom improvement.

To extend the debate, Alonso-López (2020) raises the importance of private initiatives where individuals, living alone or with others, who experience problems with their daily activities, may self-fund home modifications. To address this relationship which involves individual/household capital, he develops a bivariate logit model concerning the association between adaptive expenditure and different explanatory co-variables utilizing data based on individuals with disabilities from the Spanish Survey of Disabilities, Personal Autonomy and Dependency, EDAD2008 (Instituto Nacional de Estadística [INE], 2010). Based on survey data concerning expenditure by households with disabilities, he develops a composite variable EXPENDAD relating to supportive technologies, adaptations, household equipment and household supplies. While over half of the sample recognize environmental barriers, only a third have made some kind of adaptation.

The findings indicate a range of factors as influencing who are the self-funders defined by EXPENDAD and a 2000 Euro spending threshold. In this analysis they include: city-based households within richer parts of the country where members officially registered with severe disabilities may have a limited lifestyle, as well as those living in larger dwellings who recognize the difficulties in their own environment both within the home and in terms of access to public areas. Predictably, those least likely to be self-funders have limited incomes and yet live in circumstances where they have an apartment with a bathtub rather than a shower and where accessibility to their housing block may be difficult. The combined socio-economic and disability status of self-funders is unsurprising. Yet it appears that accessibility to apartment buildings for all due to the lack of an elevator is a key issue in many Spanish urban

dwellings, impacting particularly on the lives of people with disabilities. Nevertheless, Alonso-López is able to show how some households are able to modify their housing outside public funding, as people with capital and motivation are able to address their own needs. This is an important research issue. In developed countries there are examples of people designing their home to suit their anticipated future needs, but there is also a disconnect between the awareness of issues and a willingness to act. Mallaband, Haines, and Mitchell (2013) discuss this in relation to retrofitting to improve energy efficiency. In the UK, Powell et al. refer to a lack of evidence about people using their own resources (2017, p.15), and Mackintosh et al. indicate that, although there were regional differences, in general, fewer owners than tenants go ahead with adaptations (2018, p. 37).

This discussion indicates that home modification/adaptation services have arisen through public sector support for people of all ages living with functional disabilities. This provision is now increasingly accessed by a growing number of older people alongside younger disabled people. However, the increasing recognition of the incidence of cognitive impairment in later life and the potential for dementia-friendly home modification is not specifically addressed in these papers (see Struckmeyer & Pickens, 2016; WHO, 2017) although acknowledged by Slaug et al.. In addition to poor housing standards that disempower people with mobility and other sensory disabilities, environmental barriers are also seen at building entrances and in the wider surroundings of neighborhood and community. At present, service development is complex, and for the service user information and understanding regarding access to home improvement is limited. There is a need for integration

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between housing, health and social care services, and the development of services has implications for an integrated and multi-professional workforce.

In England, flats and apartments form an increasing proportion of new homes (DCLG, 2016b). Over one-third of the flats with common areas or shared facilities are in London, however there is limited information available about the extent to which improvements are needed to the accessibility of common entrances, stairs and corridors (Mackintosh et al., 2018). In view of the difficulties in estimating the demand for improvements to common areas, it has been recommended that a strategic approach by landlords should be adopted rather than using the means-tested Disabled Facilities Grant system which is described above (DCLG, 2011).

### **Workforce issues**

The production of this special issue began with a call from colleagues within and allied to the British Royal College of Occupational Therapists [RCOT]. In the countries contributing to this discussion occupational therapy is seen as a profession that is gained through a science degree based in health and social care that: *'takes a "whole-person approach" to both mental and physical health and wellbeing and enables individuals to achieve their full potential'* (RCOT, 2019b).

The term 'occupational' is allied to enabling people to live independently, maintain their self-identity and carry out activities of daily living with or without personal support. Occupational therapists can work through a wide range of organizations and

situations. They may be part of the health service or social services, or be schools related. They may be members of teams within these institutions or they may be independent practitioners operating freelance. In the UK, occupational therapists should be registered with the Health and Care Professions Council and be members of the British Association of Occupational Therapists (BAOT), which has a number of Specialist Sections such as Housing (RCOT, July 2019). While we comment specifically on the UK system here, registration and support is also found in the other countries, for example the Swedish Association of Occupational Therapists and the Occupational Therapy Board of Australia. Also, there is a World Federation of Occupational Therapists (WFOT), which in 2019 reported 101 member organizations representing 550,000 occupational therapists (WFOT, 2019).

As noted across these articles, the size and capacity of the workforce varies within and between nations in relation to population size. For example, Mackintosh (2020) reports that in the UK 48,000 occupational therapists cater for a population of 66 million, where 11 million people over the age of 60 years have a disability. Alonso-López (2020) indicates the limited involvement of occupational therapists in Spain, where he reports that social workers and physiotherapists undertake a majority of needs assessments for home/housing modifications. In contrast, the Swedish population of approximately 10 million has an occupational therapy workforce of 10,000, indicating more generous provision and consequent implications for services. Issues relating to practice are also important. In the USA, although there can be variation between states in terms of workforce, Keglovits and Stark (2020) report that this is managed through a standardized approach to assessment and delivery that guides the efficiency of trained occupational therapists. Finally, Slaug et

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al. (2020) show how methodological innovation through academic research can be used in occupational therapy practice; for example, the Housing Enabler instrument being developed through the Enable-Age Study (Iwarsson & Slaug, 2010; Iwarsson, Haak, & Slaug, 2012).

Through comparison of the situation in these developed nations we highlight some of the important issues that will influence the effectiveness of home modification now, and in the future, and influence the 'complex customer pathways' already seen:

- Workforce organization – public sector employees v independent consultants.
- Variation in forms of assessment procedures, from bespoke to standardized systems.
- Different access to levels of financial resources – central and local government funding v self-funding; funding for minor and major modifications.
- Home modifications becoming marketized and purchased privately primarily by people with health needs and financial resources.
- Levels of communication between occupational therapists, building and construction workers.
- Lack of information for clients and consumers.
- Lack of specific training about accessibility and home modification issues addressed to housing design, construction specialists and building professionals.
- Recognition that accessibility issues relate both to the inside and the outside of all types of housing.

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For minor modifications, housing providers may rely on skilled handypersons or technicians to undertake the work (Adams, 2018; College of Occupational Therapists and Housing Corporation, 2006). However, a wider range of skills is likely to be required for more complex modifications, for example where electrical or plumbing work is needed, such as in kitchens and bathrooms, or where additional work is undertaken, and a shortage of contractors can lead to significant bottlenecks between assessment and installation (Bailey, Hodgson, Aitken, & Wilson, 2018). Aplin et al. (2020) discuss the importance of service delivery factors, including workmanship and the time taken to complete the works, to client satisfaction and the outcomes of home modification. Despite this, studies of home modification often do not discuss the role of the building and construction industry and, in these articles, only Aplin et al. (2020) mention the relationship between builders and the client. However, drawing on a protocol developed for the design and construction industry in the UK, Russell, Ormerod, and Newton (2018) describe the development of a comprehensive protocol to support the home modification process for occupational therapists that includes working with building professionals and liaising between clients and builders. There is a major skills gap in the UK for more comprehensive modifications, for example to improve energy efficiency (Morgan, 2013; Committee on Climate Change, 2019). In addition, developments in building technology may require specific support and training for the occupants, for example to help them adapt their behavior to live in a Passivhaus dwelling with mechanical ventilation and heat recovery (Lewis, 2015). In recognition of the issue of delays in the delivery of adaptations, the Royal College of Occupational Therapists has developed a new approach to adaptations. This is based on the complexity of the intervention, and is designed to simplify the method of providing more straightforward adaptations

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utilizing workers with different skills enabling occupational therapists to focus on complex cases (RCOT, 2019a).

### **The outcome and impact of home modification**

Finally, consideration is given to the need to hear the views of the service user or customer concerning their experience of home modification and how it has affected their ability to maintain their independence and live with a degree of autonomy. What is the evidence base demonstrating how home adaptation is beneficial for older people, and their families and carers, both formal and informal? In addition, what and how are outcomes being measured? In this edition, empirical consumer research is central to the work of Thordardottir, Malmgren Fänge, Chiatti, and Ekstam (2019) from Sweden as well as Aplin et al. from Australia. For this discussion we also draw on research from the USA by Stark, Keglovits, Arbesman, and Lieberman (2017); work by Ainsworth, Aplin, Gustafsson, and de Jonge (2017), and further UK material from Powell et al. (2017) and Bailey et al. (2018).

Research methodology varies and a British evidence review (Powell et al., 2017) reports that some of the best work has been conducted in New Zealand and North America, where health and insurance records enabled researchers to link housing interventions to health outcomes (Charles, 2017). Powell et al. highlight issues that are reflected across this work. There was strong evidence that minor home adaptations such as handrails were an effective and cost-effective means of preventing falls and injuries, enhancing performance of everyday activities as well as

mental health, and were particularly effective in improving outcomes and reducing risk when combined with other home improvements, such as upgrading lighting and removing trip and fall hazards. The evidence also indicated that the greatest outcomes were achieved when individuals, families and carers were closely involved in the decision-making process, focusing on individual goals and what a person wants to achieve in their home.

Although less evidence has been obtained about the impact of major adaptations, there is confirmation that these could help to support people in achieving positive outcomes in some circumstances. The research of Whitehead et al. (2018), who carried out the first randomized controlled trial (RCT) of major housing adaptations in the UK, is relevant here. This feasibility trial was undertaken with 60 participants, 65 years and over, who were referred to a city local authority adaptations service for an accessible flush-floor shower, the most common type of major housing adaptation. The participants were randomized into two groups: those receiving adaptations in the usual waiting time of 3–4 months; and those who received immediate adaptations (no wait). Outcomes were assessed at 3, 6, and 9 months post-randomization and covered: perceived physical and mental wellbeing; health and social care related quality of life; personal activities of daily living; bathing performance and perceived difficulty in bathing; frequency and perceived risk of falling; and receipt of health and social care services. All outcome measures improved from baseline to each follow-up following the adaptation, whereas for the waiting list group there was little change or a slight worsening at 3 months (before the adaptation). The authors concluded that the study had demonstrated the feasibility of undertaking a powered RCT to

evaluate the impact on quality of life and the impact of waiting times on functional outcomes and health and care resource use.

To develop this further, it is interesting to compare the findings of Aplin et al.'s work in this issue and the study undertaken by Thordardottir et al. (2019). Aplin et al. undertook a Post-Modification Survey for people who had modification work in the past two years (N=31 across housing types); while Thordardottir et al. undertook a qualitative longitudinal 'before and after' study, in which in-depth interviews were undertaken before the modification and then at 3 and 12 months after completion (N=11 living in urban apartments and single-family homes). Although these are small scale studies with very different methodologies, and findings that are not generalizable, they contribute to the evidence concerning home modification. The Australian survey indicated how aspects of service delivery can influence degrees of satisfaction, with structural issues such as more limited opportunities available to those living in social housing having potential to reduce satisfaction. Variations in health and wellbeing associated with home modification are addressed by Thordardottir et al. The Swedish study is important in identifying changing experiences over time. Through detailed narratives, they show how people can continue to struggle with aspects of everyday life, and the way in which housing adaptation can solve some issues and open up others. They discuss how the ability to perform activities can be a 'moving target', changing as a person's health may vary. However, they also indicate how positive changes within the home environment may enable new routines and coping strategies that may lead to greater participation outside the home (Ainsworth et al., 2017). The dynamics of this interface between personal and environmental change needs to be explored through further

longitudinal research, such as that by Whitehead and Golding-Day (2019), which built on the RCT of bathroom adaptations (Whitehead et al., 2018).

In the UK, there is a growing demand for research that quantifies the impact of adaptations on health and care costs (Garrett, Roys, Burriss, & Nicol, 2016). The review by Powell et al. (2017) identified studies of the economic benefits of home adaptations outside the UK, some of which were not exclusive to older households. A separate study of the economic benefits of home adaptations for older people in the UK was commissioned for the review, using data relating to hazards from the English Housing Survey (Garrett & Roys, 2017). The size of the sample was sufficiently large for the data to be considered reliable for five hazards (falls on stairs, falls on the level, falls between levels, fire, and hot surfaces); among these, the best return on investment (ROI) was achieved for mitigating falls on stairs. The costs of mitigating the hazards and the benefits to society were estimated as £290 million and £470 million, respectively, representing a 61.7% ROI and a payback period of 0.62 years, or less than eight months. However, including the costs of assessing the hazards would reduce the ROI and the payback period, even for small values of these costs.

Powell et al. (2017) only identified a few studies that examined the effectiveness of larger-scale, major adaptations. Even though larger-scale improvements to home environments are seen as having a positive effect on people's health and well-being, the diversity of health and housing conditions and the type and scale of interventions means that the effects of changes to the built environment can be difficult to measure. There is no clear evidence of the relationship between the design of the

built environment and health outcomes and reductions in expenditure (Cairncross & Porteus, 2017). Furthermore, there are substantial variations in the costs of each type of intervention (Curtis & Beecham, 2018; Garrett & Roys, 2017; Mackintosh et al., 2018), adding to the uncertainty over the estimates of costs. Curtis and Beecham quote mean costs whereas Garrett and Roys used median values to estimate the total costs of adaptations.

There can be a reluctance to plan for future needs for care or assistance or for home modifications (Beach, 2016; Ipsos MORI, 2015; Renaut, Ogg, Petite, & Chamahian, 2015) and it has been noted that people may change their ways of coping with or without environmental modification (Mackenzie, Currer, & Byles, 2015; Thordardottir et al., 2019). In this special issue, long-term planning is noted for younger people with disabilities in Australia (see Aplin et al., 2020), whereas supportive housing and care homes are viewed as more important in later life. Delays in installing adaptations can be for aesthetic reasons, due to their clinical appearance and a desire to avoid 'medicalizing' the home, as well as negative associations with vulnerability and loss of independence (Ainsworth et al., 2017; Aplin, de Jonge, & Gustafsson, 2013; Bailey et al., 2018; Powell et al., 2017). In addition, older people and their families may not wish to agree to adaptations due to a lack of information on what is available; apprehension over the costs of installing adaptations in the absence of public funding, and, in some cases, concerns about the effect on resale values (Adams & Hodges, 2018; Bailey et al., 2018; Centre for Ageing Better, 2019). Consequently, any people who are not eligible for financial support for adaptations could benefit from better information, advice and guidance (RCOT, 2019a).

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The importance of timing and information are essential points to emerge from these studies. Adaptations are most useful as a preventative measure (RCOT, 2019a), but decisions to adapt the home are often made when the person is already struggling and delays in installing adaptations until a time of crisis or as a last resort reduces their effectiveness (Powell et al., 2017). Nevertheless, as Ainsworth et al. (2017) report, knowledge about people's lives before and after home adaptation indicated that, before adaptation, people experienced a lack of safety, privacy and dignity, and the physical barriers affected their physical and emotional wellbeing, while after adaptation people felt that they had a life and could plan for the future. People need support to plan ahead, so-called 'future-proofing' accommodation before developing significant care and support needs (Beach, 2016; Commission on Funding of Care and Support, 2011; Mackintosh, 2020; Preston, Drydakis, Forwood, Ellen-Hughes, & Burch, 2018). In his paper, Alonso-López (2020) discusses the role of private funding of home modifications, while Mackintosh (2020) notes the importance of encouraging people who are not eligible for state support to improve their homes. However, in the UK, Powell et al. identified differences between policy and practice in different types of housing tenure, and noted that very little research had been conducted into changes made without statutory help. This is not just an issue for wealthier homeowners. Aplin et al. (2020) make the point that more research needs to be conducted on home modifications for non-homeowners, particularly in the context of a greater focus on consumer-directed care.

## **Conclusions**

The Strategic Review of Health Inequalities in England Post-2010 identified six policy objectives, including to 'create and develop healthy and sustainable places and communities' (Marmot, 2010, p. 126). While the focus was on improving home quality to help maintain independence, the review acknowledged that 'poor housing standards and design issues have substantial impacts on health inequalities' (p. 133). We would argue that home modification/adaptation can play an important public health role and that evidence is seen to emerge from the articles in this special issue (see also Nicol, Roys, & Grant. 2015). While the review was able to evidence a gradient of area deprivation across localities, with associated health inequalities, we do not know if home modification/adaptation has a role here. In the UK, the importance of housing as a public health issue continues to be voiced alongside the housing needs of older people (House of Commons, 2018; House of Lords, 2013; National Health Service, 2017; Public Health England, 2018), and age-friendly housing is a part of the on-going concern regarding age-friendly cities and communities (Buffel, Handler, & Phillipson, 2019; WHO, 2007).

We are living in a time of global population aging where in developed countries, a third or more of the population will be over 60 years of age by 2050. We have already recognized that a greater number of older people will be living longer with a physical disability that will impede their mobility and performance of daily activities. In addition, the growth of cognitive impairment and its impact on aspects of home modification needs to be acknowledged (see Gitlin & Corcoran, 1996). These changes in levels of vulnerability can be more intense for those with the least social

and financial capital, and further influenced by aspects of intersectionality that reflect diversity in age, gender, ethnicity and culture. Yet globally, many people will continue to live in ordinary housing in age-integrated communities and the rhetoric and value of aging in place continues. While different forms of housing with care are being developed, at present alternatives are limited and initiatives such as co-housing are not options chosen by many older people (see Park & Porteus, 2018; Peace, forthcoming). For these reasons, changes to our environment through home modification or adaptation may become a more common experience in later life, especially given the condition of the existing housing stock.

This situation raises wider issues for future new build that recognizes population aging. While we have seen that building regulations in some countries consider what in the UK have been called 'lifetime home' criteria regarding accessibility and visitability (DCLG, DH, & DWP, 2008), these elements are still seen as necessary for special groups, rather than for the population more generally. Issues of inclusive/universal design need wider discussion, incorporating flexibility that allows for change across the life course (Goldsmith, 2000; Imrie & Hall, 2001). This also addresses what Thordardottir et al. (2019) saw as an issue for on-going home modification. The ergonomics of mainstream housing need further examination, and the evidence base developing in home modification research needs to be incorporated into guidance for new build of domestic housing for all ages. Inclusive design is intended to enable everyone to participate equally (CABE, 2006). Here the occupational therapy profession needs to be involved in architectural and interior design initiatives that are not just seen as medicalizing the housing environment. Only through inclusive design features, such as wider doorways and level entrances,

being normalized, or wider acceptance of devices such as stairlifts and lifts, will the attitudes of all age groups begin to change. Is this too much to expect?

These changes prompted by population aging come at a time when other global issues such as climate change need to be considered. There is a need for future design to develop resilient sustainable housing that would take on board radical changes in energy sources, air conditioning, flood proofing, and insulation. Although these can be in-built in new building, most accommodation has already been built. Thus, retrofitting has to sit alongside new build, and this is another reason why home modification is so important. By combining our understanding of global trends such as population aging, climate change, urbanization and technological development the question becomes 'can a more powerful argument be made for the sustainability of our accommodation and for wider acceptance of an outcome that is non-ageist?' (Powell et al., 2017; Peace, forthcoming). At present, the focus of home modification is relatively narrow and targeted on individual health issues, rather than on more global societal issues. While the need for multi-purpose improvements has been recognized (see Powell et al., 2017), we would argue that a more radical approach is required, especially given the financial investment that will need to be made.

The papers presented here begin to demonstrate the impact that home modification/adaptation is having on the ability of people in later life to remain living independently at home. As noted earlier, Heywood and Awang (2011), in addressing professionals from occupational therapy, commented on the gaps and variation in evidence. We would argue that, almost a decade later, this special issue, which identifies and references publications from across the world, demonstrates a stronger body of

complimentary evidence that is more systematic and indicates the growing strength of academic research through occupational therapy alongside that of other stakeholders. These researchers from developed nations are providing valuable, comparable data across a range of key issues that make the case for greater evidence based practice that can lead to sustainable housing through home modification/adaptation. We recognize that there are still areas that are under-researched. For example, a focus on occupational therapy may be too narrow to capture the broader picture of future accommodation and care needs in later life where an understanding of multi-professional working between therapists, architects, builders, needs to come together with the experience of older people, informal and formal carers.

Rigorous research needs to continue so that the global complexity of population aging and occupation of the current housing stock is understood, particularly the relationship of housing to health and social care, and the financial underpinning of maintaining a life of quality in everyday housing that is recognized across generations. This requires collection of good quality data utilizing tested measures, the triangulation of quantitative and qualitative methods, and the assessment of impact over time. However, progress on measuring outcomes is variable and how realistic this would be across countries is debatable. We have indicated that this growing body of work has to be used to influence future interactions between the person, their accommodation, and access to the wider locality across their lives. To date, it provides a baseline for extending the research to other developed and developing nations and for future innovative work that goes on improving our evidence base.

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**Table 1.** Population demographics.

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	% Population 60 years and over	
	2017	2050 (projections)
Australia	21.0	28.3
USA	21.5	27.8
UK	23.9	31.5
Spain	25.3	41.9
Sweden	25.5	30.4

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Source: United Nations. (2017). *World Population Ageing, 2017*. New York: United Nations, pp. 106-107.

**Table 2.** Disability in later life.

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USA	Only 31% of adults aged 65 years and older can independently complete self-care and mobility tasks independently (Freedman et al., 2014)
Spain	Data from the Spanish statistics agency INE (2010) indicates slightly under three-fifths (57.9%) of the 3.8 million population are people 65 years and over having one or more disabilities
Sweden	Approximately 30% aged 65-74; 70% aged 75-84 have mobility problems (Slaug, 2012)
Australia	50.7% of the 3.5 million people 65 years and older in Australia were reported as having a disability in 2016 (Australian Bureau of Statistics, 2016)
UK	13.9 million people (1 in 5 of the population) are disabled, including 45% of adults over state pension age (DWP, 2018; Scope, 2019)

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Source: Statistics reported in articles, with the exception of the UK (see separate references).