Design principles in housing for people with complex physical and cognitive disability: towards an integrated framework for practice

Courtney J. Wright [1, *, 2]

Phone +61 7 3382 1112

Email Courtney.wright@griffith.edu.au

Heidi Zeeman [1, 2]

Phone +61 7 3382 1229

Email h.zeeman@griffith.edu.au

Jennifer A. Whitty [3, 4]

Phone +61 7 3346 1978

Email j.whitty@uq.edu.au

[1]School of Human Services and Social Work, Menzies Health Institute Queensland, Griffith University, University Drive, Meadowbrook, 4131 QLD, Australia

[2]RECOVER Injury Research Centre, Griffith University, University Drive, Meadowbrook, QLD, 4131 Australia

[3]School of Medicine, Menzies Health Institute Queensland, Griffith University, University Drive, Meadowbrook, 4131 QLD, Australia

[4]School of Pharmacy, Pharmacy Australia Centre of Excellence, The University of Queensland, Cornwall Street, Woolloongabba, QLD, 4102 Australia

Affiliation of research conducted: Menzies Health Institute Queensland, Griffith University

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Abstract

Purpose: To develop a research-based *environmental* framework to guide the design and construction of suitable residential dwellings for individuals with complex disability. An environmental approach to housing design and development recognises that there are physical, psychological and social components relating to housing design, dwelling location and the neighbourhood context, and that these elements interact to affect the physical, psychological, and social wellness of individuals.

Principle results: Following theoretical review and synthesis, a comprehensive set of design features that are conducive to residents' wellness and quality of life are described. It is clear that housing design and development for people with complex disability ought to consider the physical, social, natural, symbolic, and care environment in relation to housing design, dwelling location, *and* the neighbourhood context for improved housing outcomes.

Major conclusions: An integrated housing design and development framework is presented. It is hoped this practical matrix/evaluative tool will inform future inclusive housing design and development decisions in Australia and internationally. The application of this framework is especially relevant to political climates striving to achieve design innovation to increase housing choice for people with complex disability.

Keywords: High care needs; housing design; housing policy; neurological disability; disability housing; social housing.

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1. Introduction

The complex needs associated with complex physical and cognitive disabilities often necessitate daily management, resulting in the need for appropriate residential environments to facilitate high levels of care and support (Nalder et al., 2012; Piccenna et al., 2016). Housing design features for people with complex disability (e.g., brain injury; spinal injury; Multiple Sclerosis; Cerebral Palsy) differ to mainstream housing (private sector) by the inclusion of deliberate physical access for wheelchairs, walking frames, and hoists, for example, and larger spaces for two-person personal care tasks. Indeed, these specialised housing features are not habitually incorporated into mainstream housing, and this context applies internationally (Ahmed, 2013; Bostock and Gleeson, 2004; Saugeres, 2011; Wiesel and Fincher, 2009). The result of this, in combination with several personal and systemic contributing factors (see Table 1), means that many Australians with profound physical and cognitive disability are forced to either:

1. Live with family in a modified dwelling (although this often increases pressure on families and may not be the person's preferred option) (Beer and Faulkner, 2009; Harrell et al., 2011); or
2. Rely on social housing and support services to fulfil their housing needs (Australian Institute of Health and Welfare [AIHW], 2014, 2015).

Interestingly, as at 30 June 2013, almost half (40%) of all social housing dwellings provided to individuals in greatest need were occupied by at least one person with a disability (nearly 159,000 households across Australia) (AIHW, 2014). In addition, people with disability living in social housing as at 30 June 2014 were less likely to live in a dwelling of an

acceptable standard (AIHW, 2015). This research demonstrates the high dependence on social housing for individuals with disability, and the necessity to ensure social housing supply adequately addresses the needs of residents.

Table 1 Personal and systemic contributing factors toward housing outcome for people with complex disability

Personal Contributing Factors		Systemic Contributing Factors
Pre-Existing or Pre-Morbid	Post-Injury	
Pre-existing financial and health status	Low income (i.e., limited or no participation in work or education)	Lack of physically accessible dwellings (private market)
Potentially low amounts of savings	High housing costs associated with their disability (i.e., housing modifications)	High (and often unaffordable) cost of purchasing and then modifying private housing to ensure suitability
Debts associated with higher education	Dependency on income support (e.g., the Australian Disability Support Pension)	Shortage in funding for services to support people with complex disability to live in their own home
Little or no private rental tenancy history		Physically inaccessible nature of most private rental properties

Sources: South Australian Department for Families and Communities & South Australian Department of the Premier and Cabinet (n.d.); Saugeres (2011); Winkler et al. (2010).

In most social housing settings for people with complex disability (otherwise termed inclusive or supportive housing), the person's functional needs (i.e., physical accessibility) are typically addressed, with less emphasis placed on design features that enhance the person's social and psychological wellbeing (e.g., the incorporation of a guest bedroom to accommodate visitors overnight). Similarly, the location of inclusive housing and its neighbourhood context is generally not considered (or is considered too difficult to address) in terms of its psychosocial impact on residents. For example, Australian social housing developments have traditionally been located in poorer neighbourhoods and on the outskirts of a community (Jackson, 2008; Wiesel, 2011). With research to suggest that community participation and social integration improves quality of life (Lee et al., 2015; McGarrigle and Layte, 2015), a small number of social housing dwellings have recently been constructed in more central locations. However, being physically located within a community does not necessarily result in community participation, given that "relationships are not always spontaneously formed" (Winkler et al., 2011, p. 161). Taken together, a significant number of people with complex disability rely on the provision of appropriately designed (and positioned) inclusive housing, but come to reside in residential environments that do not properly consider broader psychosocial aspects important to wellness. This is despite the recognition of health as not just the absence of illness, but the presence of overall wellbeing (World Health Organisation [WHO], 2003) and an increasing emphasis in the literature regarding the role of the built environment in promoting general wellness and quality of life (Carlson et al., 2012; Grant et al., 2014; Orrell et al., 2013).

Indeed, the current approach to a minimum standard of housing for people with complex disability centres on 'universal housing design' principles to guide the production of more physically accessible dwellings in the private sector. The aptly named Livable Housing Design Initiative aims for all new residential dwellings across Australia to be of an agreed

Livable Housing Design standard by 2020. While the reported benefits of the Livable Housing Design Initiative are vast (see Australian Government Department of Families, Housing, Community Services and Indigenous Affairs, 2010; Landcom, 2008; Livable Housing Australia, 2012), the initiative has had minimal impact in boosting the number of inclusive housing dwellings due to its voluntary nature and a perceived lack of consumer demand (Author's Own, 2015; Australian Network for Universal Housing Design and RI Australia, 2014). While an increase in physically accessible private housing stock is greatly needed and indeed long overdue, the Livable Housing Design guidelines may be criticised for: (a) its primary focus on the functional (i.e., physical accessibility) characteristics of the dwelling without deliberate and equal consideration of features that address additional psychosocial, symbolic, and emotional constituents of health (Jonas and Chez, 2004; Imrie, 2006); and (b) its narrow focus on design features relevant to the dwelling, to the exclusion of important location and neighbourhood considerations (Dyck et al., 2005; Schulz and Northridge, 2004). That is, the current approach to a minimum standard of housing for people with complex disability epitomises the problem currently faced by the social housing sector. Given that there is currently no minimum standard of housing design and development (or redevelopment) for Australians with complex disability that purposefully and equally considers important physical, psychological and social aspects of wellness and quality of life, there is a need to develop an all-inclusive *environmental* conceptual framework to guide the appropriate design and construction of future housing for individuals with high care and support needs (Author's Own, 2015).

An environmental approach to housing design and (re)development recognises that there are physical, psychological and social components relating to the dwelling (housing design), its location, and neighbourhood context (Hempel and Tucker Jr, 1979; Lindberg et al., 1988) and that these elements interact to affect the biological, psychological, and social

(often termed ‘biopsychosocial’) wellness of individuals (Wister, 2005). Within an environmental design paradigm, considerations for physical accessibility form part of, rather than the whole, of the residential design and development picture. Such an approach would improve residents’ biopsychosocial wellness, and quality of life (Kyle and Dunn, 2008; Lawrence, 2011). Any development of a framework however, must be based on sound research. Evidence-based design (EBD), while originally developed within a hospital setting, provides research-based environmental descriptors that ought to be considered when developing built environments conducive to wellness.

The current article applies EBD principles to the inclusive housing context to produce a theoretically-based *environmental* conceptual framework. The paper is divided into five sections. The first section introduces and explains two prominent environmental paradigms and their design principles driving EBD in primary healthcare settings. Second, the theoretical findings of these two environmental paradigms are translated across to the design of inclusive housing. Third, the housing *context* (i.e., location and neighbourhood) and its influence on wellness are discussed. The new theoretically-based environmental conceptual framework is subsequently presented. As will be shown, the Housing Design and Development (HDD) Framework outlines how the theoretical findings of the two environmental paradigms can inform housing design, location, and neighbourhood considerations to improve individuals’ wellness outcomes. It is hoped this framework will inform a contemporary minimum standard for the design and (re)development of private and social housing for people with complex disability living in Australia. Given the global context regarding housing for people with complex disability, the HDD framework may also be generalised more broadly and applied to international housing markets. The paper concludes by discussing the need to investigate and further develop a more exhaustive list of housing features relevant to each “cell” of the HDD Framework, and test the importance of

each feature amongst specific consumer populations with disability. The usefulness of the HDD Framework, and of future research in the area, is further discussed in relation to current Australian policy and the recent introduction of the *National Disability Insurance Scheme* (NDIS) and the *National Injury Insurance Scheme* (NIIS).

2. An Environmental Approach to Wellbeing: Findings from Evidence-Based Design

People with complex disabilities require daily personal care and support to live full and optimal lives. The nature of personal care required often includes ongoing medical and ancillary treatment, including access to respirators, catheter support, and wound and dressing care, for example (Colantonio et al., 2015; Craig et al., 2015; Last et al., 2016). Healthcare in the home is therefore a fundamental element underlying the personal care and support of people with complex physical and cognitive disability. Hence, it is important in developing any housing design framework for people with complex disabilities, that approaches that consider healthcare and wellbeing are recognised as much as the housing design.

EBD is a recognised approach to environmental design that uses research evidence from multiple reliable sources to guide the design and development of buildings (Carr et al., 2011; Stichler, 2007). Two prominent paradigms drive EBD in healthcare environments: the Theory of Supportive Design (Ulrich, 1991, 1997, 1999, 2000) and the Therapeutic Environment Framework (Gesler, 1992, 1993, 1996; Gesler et al., 2004). Indeed, both theoretical frameworks emphasize the need for lived environments to promote wellness and healing (Wister, 2005). Given their influential standing in the built environment/health field, and specific focus on the biopsychosocial person/environment interaction, these two environmental theoretical frameworks have informed the current research.

2.1 The Theory of Supportive Design

The Theory of Supportive Design, developed by Ulrich (1991, 1997, 1999, 2000), describes the potential for care environments to facilitate stress coping and restoration to improve the

wellbeing of patients, their visitors, as well as hospital staff. According to Ulrich (2006), supportive design removes environmental characteristics that are stressful and includes environmental features that research suggests can calm individuals, visitors, and staff, and strengthen their coping resources. As individuals with high care and support needs, their family carers, and non-family paid carers may experience stress within their / the person's dwelling (Plank et al., 2012; Rhode et al., 2012), it is clear that hospitals and residential care settings more generally, should be designed in ways that support people in their coping with stress.

The three design elements promoted by the Theory of Supportive Design emphasize the importance of considering the physical, social, and natural environments in designing and constructing supportive surroundings. According to Ulrich (1991, 1997, 1999, 2000), the physical environment of hospital facilities ought to promote a sense of control in patients and access to privacy to improve wellness outcomes. In addition, designing the environment to foster patient access to social support (i.e., emotional support or physical assistance) while not compromising patient privacy further contributes to reducing patient stress and accelerating their recovery. Further, the incorporation of visual and physical access to nature for hospitalised patients, staff, and visitors results in numerous physiological, psychological, and emotional health benefits. Such benefits include faster recovery, reduced anxiety and pain, lower blood pressure, and less need for pain medication for patients (Ulrich, 2006); reduced stress and anxiety, improved concentration and productivity, and increased job satisfaction for hospital staff (Salonen et al., 2012); and reduced stress and anxiety and improved mood and emotional wellbeing for families and visitors (Salonen et al., 2013). Given the numerous health benefits of well-designed physical, social, and natural environments within a hospital setting, the Theory of Supportive Design has strong potential to guide future research and practice in the inclusive housing context.

2.2 Therapeutic Environment Framework

Gesler and colleagues (Gesler, 1992, 1993, 1996; Gesler et al., 2004) further broadened our understanding of a healing environment to guide health design. Gesler and colleagues emphasize the potential of place to influence wellbeing by: (a) introducing the importance of a symbolic environmental dynamic; and (b) adopting an *interactional* approach to design. Indeed, it is the meaning and sense of place that is created through symbolization that influences a person's wellness (for more information regarding symbolic interpretations, see Gesler 1992, 1993, 1996; Gesler et al., 2004). The interactional approach to environmental design is represented by a matrix that relates four primary healthcare setting design goals to the four dimensions of therapeutic environments[1] identified in the literature; physical, social, natural, and symbolic. The authors contend that, "while designed as an exploratory framework rather than a prescriptive instrument, each cell of the matrix [see Figure 1] is intended to encourage exploration of design features that represent 'intersections' between specific design intentions and types of therapeutic space" (Gesler et al., 2004, p. 125). As this matrix has been developed specifically for hospital design considerations, the specific design features presented in Figure 1 are not directly relevant to inclusive residential design. The interactional component however, adds to our understanding that multiple dimensions of place influence a person's physical, psychological, social and emotional wellness.

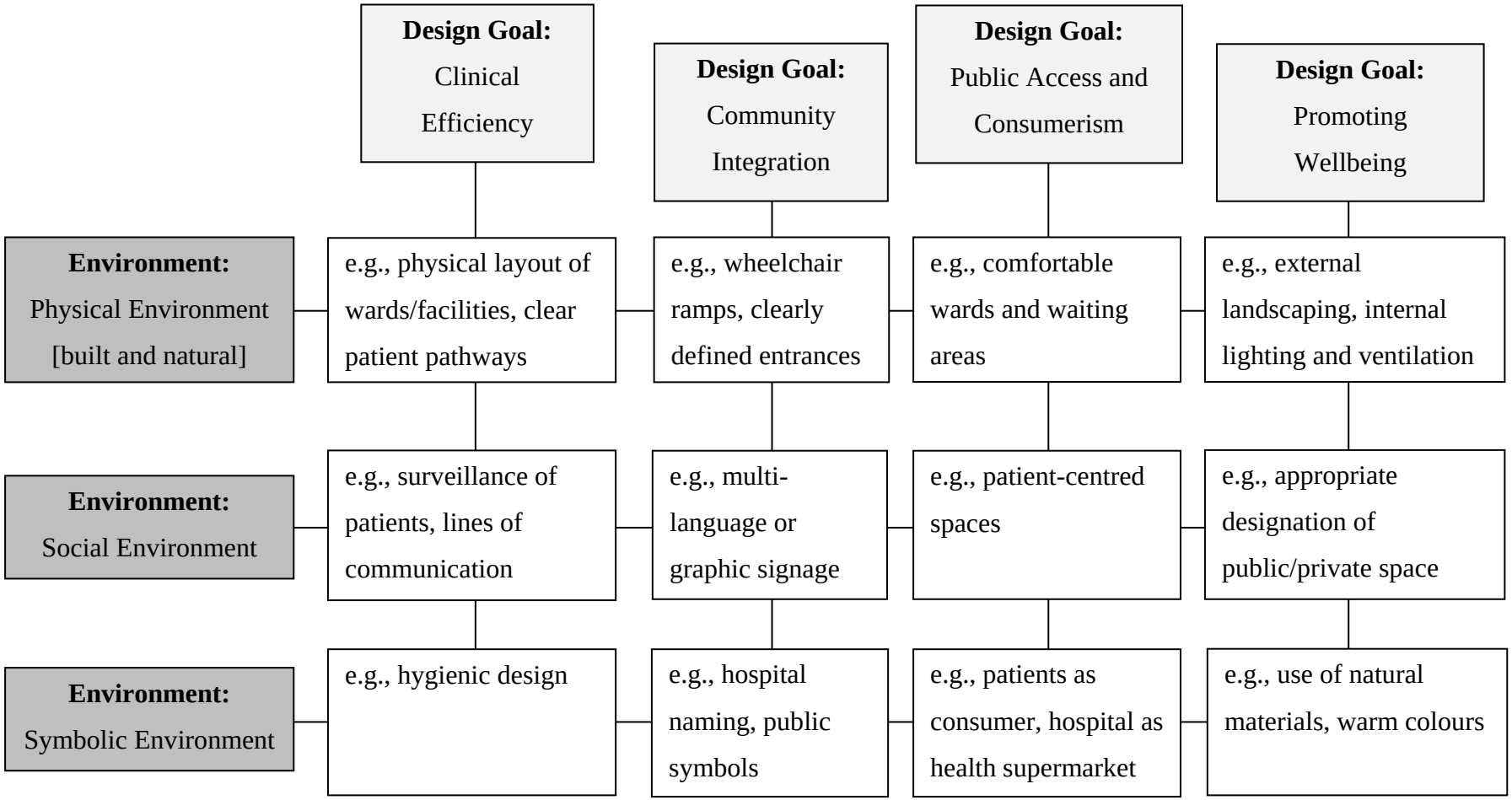

Fig. 1 Therapeutic environments/design goal matrix. Source: Adapted from Gesler et al. (2004)

3. Environmental Design in Inclusive Housing

The average population spends 50% or more of their time inside their homes (Centers for Disease Control and Prevention and U.S. Department of Housing and Urban Development, 2006; Jacobson, 2012; Lawrence, 2011; Matz et al., 2014). Individuals with high care needs spend even more time indoors (Dyck et al., 2005). Currently, people with significant disabilities have greater potential to be excluded, rather than included, by the very homes and communities they live in. Thus, residential environments ought to be designed in a way that optimises physical, psychological, social, symbolic, and emotional wellness; particularly for populations who may otherwise be isolated from society because of their disability. Given that Ulrich and Gesler's research emphasize the need for *lived environments* to promote wellness and healing, the current research applies the theoretical findings of Ulrich and Gesler to the inclusive housing context. The information below highlights how considerations for the physical, social, natural, and symbolic environment may be translated across to the design of inclusive housing for people with complex disability.

3.1 Physical Environment

Derived from Ulrich's Theory of Supportive Design, two environmental design indicators that ought to inform inclusive housing design in relation to the physical environment are: (a) physical accessibility to foster a sense of control in individuals; and (b) access to privacy. First, physical accessibility throughout the dwelling promotes a sense of control by encouraging independence and autonomy (i.e., individuals are able to navigate the physical environment with minimal or no assistance) (Heywood, 2005; Imrie, 2004; Livable Housing Australia, 2012) as well as user safety (i.e., individuals are able to find and reach items easily and safely; minimise risk of falls) (Livable Housing Australia, 2012; Ward and Franz, 2015). Housing design features conducive to accessibility needs can include a clear, well-defined level path from the road to a ground floor level entry; a spacious toilet suitable for people

with limited mobility on the ground floor; wider hallways and doorways; sufficient circulation space throughout the dwelling to accommodate a manual or powered wheelchair; drawers installed in lieu of cupboards; and reinforced bathroom walls so that grab rails can be fitted easily and economically if or when they are needed (Livable Housing Australia, 2012; Saugeres, 2011; Ward and Franz, 2015). Likewise, occupants' access to privacy within the dwelling must be considered for improved wellness outcomes (Clark and Kearns, 2012; Heywood, 2005). Housing design features that promote access to privacy for residents include one-bed rooms in place of shared rooms, a private ensuite, or a two-person shared bathroom accessible from both residents' own private bedroom (i.e., two entry points where residents are able to access the bathroom without being seen by others).

3.2 Social Environment

Engagement with social networks, and the emotional support or caring and tangible assistance provided through that network, improves a person's psychosocial outcomes (Wagemakers et al., 2010). A residential dwelling must therefore be designed in a way that not only provides a resident access to their social network, but also encourages active participation and engagement of that person within their community. Housing design features that can facilitate active social interaction include a shared lounge room, dining area, and/or kitchen; a comfortable outdoor setting with seating arrangements that facilitate socializing with others; and a spare bedroom on the ground floor to accommodate guests overnight. Residential settings that do not include social design features hinder a person's access to and active involvement with their social networks (Wagemakers et al., 2010).

3.3 Natural Environment

The natural environment influences a person's wellness outcomes (McSweeney et al., 2015; Shanahan et al., 2015), yet nature has largely been excluded in inclusive design (Coutts, 2011). With individuals with higher care needs spending more time indoors than the general

population, these findings are particularly concerning given that an overabundance of artificial stimulation may lead to “a loss of vitality and health” (Maller et al., 2005, p. 46). The incorporation of natural elements such as a fireplace indoors; flowers, plants, and water features inside and outside the dwelling; views of natural scenes from windows; views of realistic (natural) art hanging from walls inside; a physically accessible garden in the backyard; and physically entering the backyard rather than simply viewing it are often described as therapeutic (Curtis et al., 2007; Imrie, 2004) and may be easily incorporated into inclusive housing design.

3.4 Symbolic Environment

The symbolic environment is also important to consider in the design of residential dwellings for people with disability, given that the built environment must practically accommodate healthcare functionality as well as reflect a person’s real meaning of home (Author’s Own, 2012; Carr et al., 2011). A symbolic environment may be characterized as incorporating: (a) a homely feel (i.e., a relaxed, warm atmosphere and soft furnishings) (van de Ven et al., 2005; Wister, 2005); (b) opportunities for self-expression; a place of personalisation (i.e., a cabinet displaying the person’s favourite figurines) (Clark and Kearns, 2012; Curtis et al., 2007); (c) a sense of place (i.e., value and meaning associated with personal objects around the home) (Gesler, 1993; Kyle and Dunn, 2008); and (d) restorative spaces providing a sense of escape (i.e., personal space) (Clark and Kearns, 2012; Imrie, 2004). Housing design that is facilitative of these aspects is likely to act as subtle, yet influential, factors to improve wellness outcomes for residents (Stokols, 1992).

The design principles outlined above can be applied to inclusive housing to broadly categorise housing features conducive to wellness and overall quality of life. However, given the often accompanying need for potentially high levels of care and support for individuals with complex physical and cognitive disabilities, a final category – the care environment –

must be considered to reflect the specific design features that enhance care functionality and efficiency within the home (Author's Own, 2012, 2016).

3.5 Care Environment

Wellness outcomes and quality of life for a person requiring ongoing care and support services is influenced by the quality of services provided to them. The care environment therefore represents an added design category that describes housing features that promote functionality and efficiency of care provision within the dwelling, thereby supporting carers in providing quality care (Author's Own, 2012, 2016). According to Ulrich (2000), good design may also help carers cope better with workplace stress, reduce absenteeism, and lower turnover rates. Examples of design features that can enhance care functionality and efficiency within the home include high ceilings to accommodate a ceiling hoist (as opposed to a manual hoist); replacing carpet with tiling or timber floors (rather than 'hospital-like' vinyl) in frequently used areas if resident requires a wheelchair; and a spacious open plan bathroom to accommodate personal care tasks and transfers from wheelchair to shower chair as needed. As care and support services may also be provided by informal carers (i.e., family, friends, neighbours) in addition to formal support workers (i.e., paid staff), it is clear that quality housing design not only benefits the residents receiving care and support within their home, but also the paid staff and informal carers providing that support (Parker et al., 2004).

Taken together, the physical, social, natural, symbolic, and care environments of residential dwellings ought to be considered in the design of future housing for people with complex disability to optimize the wellness outcomes of residents, their visitors, and carers. The literature also suggests however, that in addition to housing design, location and neighbourhood characteristics also influence a person's wellness outcomes and must

therefore be considered in early design phases (Hempel and Tucker Jr, 1979; Lindberg et al., 1988; Schulz and Northridge, 2004).

4. The Housing Context and its Influence on Biopsychosocial Outcomes

The Social Determinants of Health and Environmental Health Promotion Framework (Schulz and Northridge, 2004) confirms the importance of multiple factors within the broader built environment when considering the physical, psychological and social health and wellbeing of individuals. In addition to important housing design considerations relevant to the dwelling, spatial segregation of poverty and wealth influence the individual's residential environment and social context (Schulz and Northridge, 2004). That is, the area or neighbourhood in which one lives, for example, determines the person's access to adequate resources necessary to improve and maintain biopsychosocial health and wellness. According to Charlton and White (1995), "higher socioeconomic position is associated with better health; and [this] relationship is positive and progressive" (p. 236). It is clear that more affluent communities have better provision of, and access to, resources. Conversely, individuals living in poorer neighbourhoods may experience increased exposure to physical, psychological and social stressors (i.e., witness to or experience of crime; fear of crime; stereotyping and discrimination) resulting in negative biopsychosocial outcomes. In addition, individuals of lower socioeconomic position likely experience reduced access to resources that may nurture wellness (i.e., well-maintained public spaces such as parks and playgrounds; affordable, accessible, and reliable public transport; social integration and social support) simply due to the neighbourhood in which they live (Schulz and Northridge, 2004). Thus, the physical environment, social and economic conditions of the area or neighbourhood in which a dwelling is located influences the *provision* and *adequacy* of resources available to community members, subsequently affecting individuals' wellness outcomes (Schulz and Northridge, 2004; Shaw, 2004).

Likewise, the location of the dwelling regarding its proximity to available community-based resources affects the wellbeing of individuals by enhancing or hindering their physical access to these resources (Dyck et al., 2005; Shaw, 2004). It is clear then, that individuals with more complex disabilities residing in dwellings located in poorer neighbourhoods and on the outskirts of a community reduces their physical access to adequate and available community-based resources conducive to wellness. It is therefore important to consider a residential environment within its social *context* when designing and constructing housing for people with complex disability. While some literature integrates location and neighbourhood characteristics into a single category (Krieger and Higgins, 2002; Megbolugbe et al., 1991), others have preserved them as separate entities (Kauko, 2006; Lindberg et al., 1988, 1989a, 1989b; Shaw, 2004). For the purpose of this article, location is defined as the 'distance to social and support networks, and local public and private facilities' (i.e., proximity to available resources). Neighbourhood, then, is defined as the 'nature of the neighbourhood and of the public and private facilities within the neighbourhood' (i.e., provision of adequate resources). In this way, location and neighbourhood housing characteristics are described as forming two separate housing domains. Table 2 presents the housing design, location and neighbourhood housing domains and preliminary indicators of each.

Table 2 Preliminary indicators of housing design, location, and neighbourhood housing domains

Housing Domain	Indicator	Supporting Research
Housing Design	• Architecture, interior design, and site landscape	(Kauko, 2006; Lindberg et al., 1988, 1989a, 1989b; Wister, 2005; Wright and Kloos, 2007)
Location	• Distance to CBD	(Lindberg et al., 1988, 1989a, 1989b; Megbolugbe et al., 1991).
	• Distance to friends and relatives (social networks)	(Lindberg et al., 1988, 1989a, 1989b; Saugeres, 2001)
	• Distance to recreation / leisure (i.e., countryside, open space, sports facilities, shopping areas etc.)	(Easterlow et al., 2000; Krieger and Higgins, 2002; Lawrence, 2011; Lindberg et al., 1988, 1989a, 1989b; Megbolugbe et al., 1991; Saugeres, 2011; Shaw, 2004).
	• Distance to food/grocery stores	(Easterlow et al., 2000; Shaw, 2004)
	• Distance to schools/preschools/universities	(Harrison, 2004; Krieger and Higgins, 2002; Lawrence, 2011; Lindberg et al., 1988, 1989a, 1989b; Megbolugbe et al., 1991; Shaw, 2004)
	• Distance to work	(Kauko, 2006; Krieger and Higgins, 2002; Lawrence, 2011; Lindberg et al., 1988, 1989a, 1989b; Megbolugbe et al., 1991)
	• Distance to public transportation	(Harrison, 2004; Megbolugbe et al., 1991)
	• Distance to public and private health services	(Easterlow et al., 2000; Harrison, 2004; Kauko, 2006; Lawrence, 2011; Shaw, 2004)

Neighbourhood	• Neighbourhood facilities (i.e., types/range of shops, public and private services etc. available)	(Harrison, 2004; Kauko, 2006; Lindberg et al., 1988, 1989a, 1989b; Shaw, 2004)
	• Noise level	(Harrison, 2004; Lindberg et al., 1988, 1989a, 1989b; Shaw, 2004; Ulrich, 2000)
	• Reputation (i.e., physical or perceived safety; risks of being robbed or assaulted [crime and associated fears etc.])	(Harrison, 2004; Kauko, 2006; Lindberg et al., 1988, 1989a, 1989b; Lorenc et al., 2012; Shaw, 2004; Wright and Kloos, 2007)
	• Public transportation (i.e., adequacy of bus/train schedules and routes etc.)	(Harrison, 2004; Lindberg et al., 1988, 1989a, 1989b; Wright and Kloos, 2007)
	• Physically accessible neighbourhoods	(Megbolugbe et al., 1991; Saugeres, 2001)
	• Local government jurisdiction in which the dwelling is located	(Megbolugbe et al., 1991)
	• Socio-economic status of the neighbourhood	(Kauko, 2006)
	• Sense of community (i.e., forging relationships with neighbours; feeling a sense of belonging; acceptance) and community empowerment	(Harrison, 2004; Imrie, 2004; Shaw, 2004; Wright and Kloos, 2007)

5. An Integrated Environmental Approach to Inclusive Housing

An interactional environmental approach recognises that the five interrelated residential therapeutic environments (i.e., physical, social, natural, symbolic, and care environments) *and* the three housing domains identified (i.e., housing design, location, and neighbourhood domains; Hempel and Tucker Jr, 1979; Lindberg et al., 1988) collectively encompass physical, psychological and social characteristics that influence the wellness and overall quality of life of individuals. The research-based theoretical findings of Ulrich and Gesler and colleagues, and the specific housing design indicators tailored to inclusive design, may be further generalised across additional location and neighbourhood housing domains to provide a framework that fully conceptualizes how individuals' wellness outcomes may be optimized within the housing context. Examples of how each therapeutic environment might inform important (re)development decisions regarding the location of the dwelling and its neighbourhood are presented below.

5.1 Physical Environment in relation to Location and Neighbourhood

Analogous to the environmental indicators that inform inclusive housing design in relation to the physical environment, physical accessibility and access to privacy must also be considered in the (re)development of residential environments for people with complex disability. Indeed, living within walking or wheeling distance to physically accessible and affordable public transport provides individuals with limited mobility the opportunity to easily access and therefore participate in their broader community (Saugeres, 2011). Likewise, living in housing located away from main roads (foot and street traffic) provides a sense of privacy that will likely improve subjective wellbeing and residential satisfaction (Kennedy et al., 2005; Mann, 2014). However, the physical environment and neighbourhood dynamic must also be carefully considered.

Considerations of neighbourhood in terms of the physical environment then, ought to include the construction of housing in physically accessible neighbourhoods (physical access to community) and in an area that promotes privacy. Indeed, flat communities with available and well-maintained footpaths decrease the risk of the resident becoming confined to their dwelling while also promoting physical activity (Giles-Corti et al., 2013; Villanueva et al., 2013). Privacy within the neighbourhood may be enhanced by living on a cul-de-sac street, for example (Hochschild Jr., 2015; Marzbali et al., 2015). Interestingly, while promoting a sense of privacy from through traffic, different types of cul-de-sac designs (i.e., "bulb" versus "dead-end" cul-de-sacs) affect neighbourly connectedness in different ways. Research conducted by Hochschild Jr. (2015) suggests that the "bulb" cul-de-sac design promotes a higher degree of social cohesion between residents living on the street than the "dead-end" design; however, both cul-de-sac designs provide more social cohesion between neighbours than "through streets". It is therefore clear that deliberate consideration of the physical environment in terms of location and neighbourhood characteristics will likely promote improved wellness outcomes for people with complex disability.

5.2 Social Environment in relation to Location and Neighbourhood

According to Mahar and Fraser (2012), many individuals who acquire complex physical and cognitive impairments engage in fewer community outings and are less integrated than their able-bodied peers. Specifically, people with complex disabilities report significantly fewer meaningful friendships and social networks than the general population (Mahar and Fraser, 2012) and the prejudicial beliefs of some local community members regarding the nature of disability facilities and the people who use them have resulted in some neighbourhoods opposing inclusive housing in their area (Bostock and Gleeson, 2004; Wiesel and Fincher, 2009). In terms of the social environment then, the location of a person's dwelling and the

neighbourhood the dwelling is built in influences the degree of connectedness a person with disability experiences (Wagemakers et al., 2010).

For example, in-depth interviews conducted with 20 individuals with disability in 2007 revealed that those participants who were not afforded real choice in where they lived typically resided in areas that were located far from friends and/or family members and support services (i.e., their support networks) (Saugeres, 2011). Indeed, their isolation (and likely associated depression symptoms [Wagemakers et al., 2010]) were reinforced when the person was unable to drive (Saugeres, 2011). It is likely however, that living close to friends, family and support services would increase the number of occasions a resident interacts with their network. That is, rather than the person with disability relying solely on their friends, relatives and support services to visit them at home; the person would be more likely to also visit and engage with their support networks in the community. The location of a dwelling in terms of its centrality is therefore an important consideration in the (re)development of residential environments for people with disability. However, the neighbourhood where the dwelling is constructed, in terms of the social environment, must also be considered. Examples of an ideal neighbourhood considerate of the social environment is one that is free from discrimination, has positive perceptions of neighbourhood friendliness, and occupants feel safe and a sense of belonging (De Jesus et al., 2010; Kelaher et al., 2010). After all, research has shown that people with strong social ties to both personal and community networks are less anxious, more relaxed, and generally healthier than individuals who feel socially isolated (Wagemakers et al., 2010).

5.3 Natural Environment in relation to Location and Neighbourhood

In terms of the residential context and the natural environment, Kuo and Sullivan (2001b) suggest that contact with ‘nearby nature’ (i.e., natural public recreation spaces such as forests, community parks and duck ponds) is not only important to people but also reduces stress,

anxiety, and depression symptoms, increases mood and emotional wellbeing, and provides the potential for individuals to engage in physical exercise (Jongeneel-Grimen et al., 2014; Reese and Myers, 2012). The location of the dwelling in terms of its distance (and subsequent ease of physical access) to public natural recreational spaces is therefore a necessary consideration in housing (re)development; especially given that people living nearer to natural settings are more likely to encompass greater wellbeing (Coutts, 2011; Reese and Myers, 2012). However, the way in which the natural environment is presented within a neighbourhood must also be carefully considered.

Research has shown that dense vegetation reduces visibility resulting in increased fear of crime and crime occurrence within neighbourhoods. For example, Kuo and Sullivan (2001a, 2001b) and Reese and Myers (2012) contend that large shrubs, bushes, and dense woodlands may provide potential cover for criminal activities to take place. However, the same studies have also shown that it is not vegetation itself that promotes unsafe environments, but the *type* of vegetation used. Natural areas that incorporate well-maintained grassy areas, widely spaced mature trees with high canopies, and flowers and low-growing plants for example, typically do not reduce visibility or provide potential cover for criminal activity. Rather, these vegetation types were shown to reduce fear of crime and crime occurrence, and instead promote therapeutic benefits such as decreased aggression and violence in individuals and increased civility and neighbourliness within communities (Kuo and Sullivan, 2001a, 2001b; Reese and Myers, 2012). With so many therapeutic benefits to human-nature interactions, it seems clear that housing for people with complex disability ought to be constructed in a neighbourhood with well-maintained, appropriate vegetation. In sum, the natural environment has been shown to not only improve the wellness of individuals (McSweeney et al., 2015; Shanahan et al., 2015), but also enhance community connectedness if incorporated well (Reese and Myers, 2012).

5.4 Symbolic Environment in relation to Location and Neighbourhood

According to Imrie (2004), "a burgeoning literature has, in various ways, explored the social, health and psychological effects of the home" (p. 746). However, there is mounting scientific research suggesting that the symbolic environment ought to be considered beyond the dwelling, and incorporate additional location and neighbourhood considerations. The four indicators that ought to inform inclusive housing design in relation to the symbolic environment (i.e., a homely feel; opportunities for self-expression; a sense of place - value and meaning; and restorative spaces providing a sense of escape) may be further generalised and applied to the location and neighbourhood housing domains.

For example, housing (re)development considerate of the symbolic environment in relation to the location of the dwelling would include a short distance to: (a) local grocery shops (homely feel indicator) (Páez and Farber, 2012; Saugeres, 2011); (b) local clubs and interest groups (self-expression indicator) (Páez and Farber, 2012); (c) spiritual or religious havens (i.e., Church; Mosque) (value and meaning indicator) (Johnstone et al., 2007; Shogren and Rye, 2005); and (d) restorative facilities such as a day spa or a health clinic (restorative indicator) (Cole and Burt, 2011). Purchasing groceries, participating in local groups of interest, visiting nearby spiritual or religious havens, and being able to easily access relaxing and rejuvenating therapeutic environments such as a day spa are activities that collectively enhance the physical, psychological, emotional, social and spiritual health of individuals. In addition, engaging with these facilities and services likely further enhances residents' wellness outcomes by symbolically representing 'leading an ordinary life'. To individuals with complex physical and cognitive impairments, the symbolization of living an 'ordinary life' is therapeutic in itself (Balandin, 2011; Wolfensberger, 1998; Wolfensberger and Thomas, 2007). The location of the dwelling in terms of its distance to these key facilities and services must therefore be carefully considered when contemplating the (re)development

of inclusive housing. However, broader neighbourhood characteristics in relation to the symbolic environment must also be considered.

Similar consideration of the symbolic environment must also be afforded to the neighbourhood a dwelling might be constructed in given that the "[neighbourhood] environment affects how people view themselves and their social position relative to others" (Clark and Kearns, 2012, p. 918). Considerations of neighbourhood characteristics should therefore include: (a) the extent to which the person's dwelling is able to 'blend in' with other dwellings in the neighbourhood and not label the resident as 'different' (Harry, a participant, and Carol, a participant, cited in Imrie, 2004; Author's Own, 2016) (homely feel indicator); (b) whether there is opportunity for the resident to engage with their local council and make suggestions toward the development of their community (Balandin, 2011; Radermacher et al., 2010) (self-expression indicator); (c) for the resident, whether he/she would feel a sense of pride to live in the neighbourhood (Heywood, 2005; Kelaher et al., 2010) (value and meaning indicator); and (d) the capacity of the neighbourhood to provide quality accessible and affordable restorative facilities for soothing and reflective experiences (i.e., a day spa) (Cole and Burt, 2011) (restorative indicator). Deliberate incorporation of these features will likely enhance residents' wellness outcomes (Clark and Kearns, 2012; Wolfensberger, 1998; Wolfensberger and Thomas, 2007).

5.5 Care Environment in relation to Location and Neighbourhood

In addition to the assistance with personal care tasks and activities of daily living often provided by formal (paid) and informal (friends, family, neighbours) carers within the person's home, the complex nature of physical and cognitive disability often necessitates ongoing or lifelong medical treatment and prescriptions, health check-ups and/or engagement in rehabilitation programs over the recovery course. As these health services are typically accessed within the community, consideration of the care environment must therefore include

a deliberate focus regarding the location of the person's dwelling and its distance to local hospitals, pharmacies, General Practice (GP) settings and rehabilitation centres (Kauko, 2006; Lawrence, 2011). Frequent hardship in accessing these services impacts on the person's life tremendously. Indeed, even more so when the person resides in areas outside of the metropolitan district and they are forced to schedule back-to-back appointments while they are in town (Saugeres, 2011). While the care environment-location of the dwelling dynamic must be considered in housing (re)development, similar considerations should also be afforded to the care environment in relation to neighbourhood perceptions of disability.

Social imagery and image transfer has powerful implications for individuals with complex disabilities living in the community. Indeed, research has shown that all human beings are influenced both consciously and unconsciously by numerous 'image juxtapositions' to which they are subjected to during their day (Wolfensberger, 1998; Wolfensberger and Thomas, 2007). Specifically, the simple act of viewing something or someone (social imagery) can lead to the generation of assumptions (image transfer) that associate that object or person with either positively valued characteristics or negatively valued characteristics. According to Wolfensberger and Thomas (2007, p. 47),

> People who are associated with positively valued characteristics will tend to become valued themselves, and people associated with negative characteristics will tend to either become devalued, or at least … more likely to become devalued than other people to whom those negative associations are not attached.

A branded carer's car belonging to a paid support worker or personal care assistant parked outside the front of a person's dwelling is an example of how social imagery and image transfer may increase the potential for stereotyping within a neighbourhood. For instance, if a local community member with conscious or unconscious socially constructed negative perceptions of disability (i.e., they knowingly or implicitly view the person with disability as

'in need', 'different') were to view the parked car, they would likely associate the resident with disability as belonging to a low status role rather than a valued one (Wolfensberger, 1998; Wolfensberger and Thomas, 2007). Consequently, the community member would likely overlook or disregard the person with disability, rather than actively involve and engage the person in conversation or community activities (Wolfensberger and Thomas, 2007). Much research has demonstrated the negative physical, psychological, behavioural and emotional health effects of social exclusion (Honey et al., 2011; Kelaher et al., 2010; Rook, 2014), suggesting that the nature of the human race may be characterized by a fundamental need to belong (Kurzban and Leary, 2001). Thus, the construction of the dwelling ought to include a covered parking area for carers to park their car, so that the resident is not labelled by their disability. It is clear then, that deliberate consideration of the care environment in relation to the location of the dwelling and neighbourhood perceptions of disability will likely promote improved wellness outcomes for people with complex disability.

5.6 A New Housing Design and Development (HDD) Framework

Research therefore suggests that the design and (re)development of inclusive housing ought to consider the physical, social, natural, symbolic, and care environments in relation to the intrinsic design, location and neighbourhood housing domains. The Housing Design and Development (HDD) Framework presented in Table 3 provides a visual representation and contemporary *environmental* conceptual framework that incorporates this interactional dynamic. Each cell within the HDD Framework is intended to encourage exploration of residential design or development features that represent 'intersections' between the five therapeutic residential environments and the three housing domains conducive to wellness. Although there is much research to support the separate components of the HDD Framework, the inclusion of features representative of every component rarely translates into practice.

Interestingly, recent efforts towards innovative housing design for people with complex disability in Melbourne, Victoria managed to partly incorporate a number of the proposed housing features. Research conducted to evaluate the development was generally positive (Tregloan et al., 2014), demonstrating the potential impact the HDD Framework could have on improving resident outcomes. The usefulness of the HDD Framework is therefore twofold: the framework may serve as (a) a practical matrix to guide future residential design and (re)development for people with complex disability; and (b) an evaluative tool to appraise existing or proposed dwellings. The HDD Framework clearly demonstrates that housing is a multi-dimensional issue and influences the wellbeing of people with complex disability.

Table 3 The Housing Design and Development (HDD) Framework: A proposed minimum standard to guide residential design and (re)development for people with complex disability

Environments Conducive to Health and Wellness		**Housing Domains Conducive to Health and Wellness**		
Environment Type	**Indicator**	**Housing Design**	**Location**	**Neighbourhood**
Physical Environment	Physical accessibility (control)	E.g., Wider hallways and doorways	E.g., Distance to affordable and accessible public transport	E.g., Flat landscape; available and well-maintained footpaths
	Privacy	E.g., Bathroom accessible from own bedroom	E.g., Distance to main roads (foot and street traffic)	E.g., Living on a cul-de-sac street
Social Environment	Social aspects	E.g., Spare bedroom to accommodate guests overnight	E.g., Distance to friends, family and support services	E.g., Free from discrimination; occupiers feel safe
Natural Environment	Nature	E.g., Fish tank, flowers and/or plants inside.	E.g., Distance to public natural recreational spaces (forests; community parks; duck ponds etc.)	E.g., Appropriate vegetation in public areas (reduces fear of crime and crime occurrence; and increases civility and neighbourliness)
Symbolic Environment	Homely feel	E.g., A relaxed, warm atmosphere and soft furnishings	E.g., Distance to local shops	E.g., Dwelling is a 'good neighbour' (normalization)
	Self-expression	E.g., A cabinet displaying the person's favourite figurines	E.g., Distance to local clubs / interest groups	E.g., Opportunity to engage with local council and make suggestions for community development
	A Sense of Place (value and meaning)	E.g., Photographs around the home	E.g., Distance to spiritual or religious havens (Church; Mosque)	E.g., Feeling proud to live in the neighbourhood
	Restoration	E.g., Personal space	E.g., Distance to restorative facilities (i.e., day spa, health clinics)	E.g., Neighbourhood offers good quality and affordable restorative facilities (i.e., day spa)
Care Environment	Care aspects	E.g., High ceilings to accommodate a ceiling hoist if needed	E.g., Distance to hospitals, pharmacies, GP settings, rehabilitation centres	E.g., A carer's branded car parked outside the dwelling (potential for stereotyping within the community)

The need for an environmental approach to housing design and (re)development in Australia is heightened by the recent introduction of a Commonwealth-funded *National Disability Insurance Scheme* (NDIS) and a separate state-based no-fault scheme to provide lifetime care and support to Australians who have experienced a catastrophic injury (i.e., the *National Injury Insurance Scheme* [NIIS]). The NDIS and the NIIS will see Australians with disability secure individualised funding packages to support them to live in the home of their choice. This means that, by the time the NDIS and the NIIS schemes are rolled out in full (estimated end of 2019), approximately 83,000–122,000 people with disability will require housing that adequately meets their needs (Wiesel et al., 2016). This massive boost in expected demand for appropriately designed housing is significant in that there is potential for additional funds to become available to support an increased supply of housing for people with disability. If the HDD Framework were used to inform any future housing developments for people with complex disability, it is likely that the available dwellings would not only promote wellness (rather than simply address physical accessibility issues) but also improve residents' quality of life.

The authors acknowledge however, that housing design and (re)development is often a compromise regarding the features (current and potential) listed in Table 3. It is not the authors' intention to suggest that if housing for people with complex disability does not meet all of these criteria, the dwelling should not be constructed. Rather, the HDD Framework presented in this review provides policy-makers, architects, designers, builders, and other stakeholders detailed information (with example features) to consider in the design and (re)development of future housing for people with complex disability. In doing so, the HDD Framework provides a synthesis of findings (with theoretical justification) to assist stakeholders in marketing any new developments that address each environment type (physical; social; natural; symbolic; and care) across the three housing domains (housing

design; location; and neighbourhood) as conducive to wellness and overall quality of life. This application is especially relevant to the current political climate in Australia, given the push for design innovation to increase housing choice for people with complex disability (Australian Government Department of Families, Housing, Community Services and Indigenous Affairs, 2013; Queensland Government, 2015).

6. Conclusion

Increasing scientific research suggests that housing influences biopsychosocial health and wellness (Helle et al., 2011; Howden-Chapman et al., 2007; Ulrich et al., 2008; Veitch, 2008). While physical disability remains the most commonly reported disability among people aged less than 65 years (Australian Government Department of Families, Housing, Community Services and Indigenous Affairs, 2010), it is clear that housing for individuals with complex disabilities must move beyond narrow considerations of physical health to embrace a broader biopsychosocial environmental approach to residential design and development. That is, equal consideration of physical, psychological and social (WHO, 2003) wellness aspects must be included in housing design and (re)development decisions for improved outcomes for individuals with complex disability. As a result, physical accessibility ought to be conceptualized as forming part of, rather than the whole, of the residential development picture.

The current research is significant in that it has presented a theoretical rationale for a contemporary environmental conceptual framework to inform a minimum standard of residential design and (re)development for people with complex disability. Although originally intended for use in Australia, this environmental framework may be generalised more broadly and applied to the design of any residential development for individuals with complex physical and cognitive disability. This interactional understanding of the housing context and its influence on individuals' wellness outcomes extends our basic understanding

of housing as shelter and confirms housing as a social determinant of health (Schulz and Northridge, 2004; The WHOQOL Group, 1998). Future research could investigate and further develop a more exhaustive list of housing features relevant to each 'cell' of the HDD Framework, and test the importance of each feature amongst specific consumer populations (i.e., investigate consumer preferences). Future research ought to also investigate any additional costs associated with the provision of dwellings that reflect the HDD Framework in its entirety.

Endnote

[1]The term 'therapeutic environment' (including 'therapeutic space') is used consistently in this article to reflect salutogenic or supportive spaces. Antonovsky (1996) developed the term 'salutogenesis' to describe an approach that focuses on factors that support health and wellbeing, rather than on factors that cause disease.

References

Ahmed, N. (2013). Paralympics 2012 legacy: Accessible housing and disability equality or inequality? *Disability & Society, 28*(1), 129-133. doi:10.1080/09687599.2012.739367

Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health Promotion International, 11*(1), 11-18. doi:10.1093/heapro/11.1.11

Australian Government Department of Families, Housing, Community Services and Indigenous Affairs. (2010). *National dialogue on universal housing design: Strategic plan*. Retrieved from http://www.fahcsia.gov.au/sites/default/files/documents/05_2012/national_dialogue_strategic_plan.pdf

Australian Government Department of Families, Housing, Community Services and Indigenous Affairs. (2013). *Fact sheet: Supported accommodation innovation fund (SAIF)*. Retrieved from https://www.dss.gov.au/sites/default/files/documents/07_2013/saif_factsheet_2013.pdf

Australian Institute of Health and Welfare (AIHW) (2014). *Housing assistance in Australia 2014* (Cat no. HOU 275). Canberra, Australia: AIHW.

Australian Institute of Health and Welfare (AIHW) (2015). *Housing assistance in Australia 2015.* Retrieved from http://www.aihw.gov.au/housing-assistance/haa/2015/social-housing-dwellings/

Australian Network for Universal Housing Design and RI Australia. (2014). *Report on the progress of the national dialogue on universal housing design 2010-2014.* Place of publication unknown: Authors.

Balandin, S. (2011). Participation by adults with lifelong disability: More than a trip to the bowling alley. *International Journal of Speech-Language Pathology, 13*(3), 207-217. doi:10.3109/17549507.2011.549569

Beer, A., & Faulkner, D. (2009). *The housing careers of people with a disability and carers of people with a disability.* Australian Housing and Urban Research Institute Research Report. Melbourne, Victoria: AHURI.

Bostock, L., & Gleeson, B. (2004). Contested housing landscapes? Social inclusion, deinstitutionalisation and housing policy in Australia. *Australian Journal of Social Issues, 39*(1), 41-62.

Carlson, C., Aytur, S., Gardner, K., & Rogers, S. (2012). Complexity in built environment, health, and destination walking: A neighborhood-scale analysis. *Journal of Urban*

Health: Bulletin of the New York Academy of Medicine, 89(2), 270-284. doi:10.1007/s11524-011-9652-8

Carr, V. L., Sangiorgi, D., Büscher, M., Junginger, S., & Cooper, R. (2011). Integrating evidence-based design and experience-based approaches in healthcare service design. *Health Environments Research & Design Journal, 4*(4), 12-33.

Centers for Disease Control and Prevention & U.S. Department of Housing and Urban Development. (2006). *Healthy housing reference manual*. Atlanta: U.S. Department of Health and Human Services.

Charlton, B. G., & White, M. (1995). Living on the margin: A salutogenic model for socio-economic differentials in health. *Public Health, 109*(4), 235-243. doi:10.1016/S0033-3506(95)80200-2

Clark, J., & Kearns, A. (2012). Housing improvements, perceived housing quality and psychosocial benefits from the home. *Housing Studies, 27*(7), 915-939. doi:10.1080/02673037.2012.725829

Colantonio, A., Hsueh, J., Petgrave, J., Hirdes, J. P., & Berg, K. (2015). A profile of patients with traumatic brain injury within home care, long-term care, complex continuing care, and institutional mental health settings in a publicly insured population. *Journal of Head Trauma Rehabilitation, 30*(6), E18-E29. doi:10.1097/HTR.0000000000000112

Cole, C., & Burt, J. (2011). Delivering aromatherapy and massage in a day centre. *Learning Disability Practice, 14*(1), 25-29.

Coutts, C. J. (2011). Putting the capital “E” environment into ecological models of health. *Journal of Environmental Health, 74*(4), 26-29.

Craig, A., Nicholson Perry, K., Guest, R., Tran, Y., & Middleton, J. (2015). Adjustment following chronic spinal cord injury: Determining factors that contribute to social

participation. *British Journal of Health Psychology, 20*(4), 807-823. doi:10.1111/bjhp.12143

Curtis, S., Gesler, W., Fabian, K., Francis, S., & Priebe, S. (2007). Therapeutic landscapes in hospital design: A qualitative assessment by staff and service users of the design of a new mental health inpatient unit. *Environment and Planning C: Government and Policy, 25*(4), 591-610. doi:10.1068/c1312r

De Jesus, M., Puleo, E., Shelton, R. C., & Emmons, K. M. (2010). Associations between perceived social environment and neighborhood safety: Health implications. *Health & Place, 16*(5), 1007-1013. doi:10.1016/j.healthplace.2010.06.005

Dyck, I., Kontos, P., Angus, J., & McKeever, P. (2005). The home as a site for long-term care: Meanings and management of bodies and spaces. *Health & Place, 11*(2), 173-185. doi:10.1016/j.healthplace.2004.06.001

Easterlow, D., Smith, S. J., & Mallinson, S. (2000). Housing for health: The role of owner occupation. *Housing Studies, 15*(3), 367-386. doi:10.1080/02673030050009230

Gesler, W. M. (1992). Therapeutic landscapes: Medical issues in light of the new cultural geography. *Social Science & Medicine, 34*(7), 735-746. doi:10.1016/0277-9536(92)90360-3

Gesler, W. M. (1993). Therapeutic landscapes: Theory and a case study of Epidauros. Greece, *Environment and Planning D: Society and Space, 11*(2), 171-189. doi:10.1068/d110171

Gesler, W. M. (1996). Lourdes: Healing in a place of pilgrimage. *Health & Place, 2*(2), 95-105. doi:10.1016/1353-8292(96)00004-4

Gesler, W., Bell, M., Curtis, S., Hubbard, P., & Francis, S. (2004). Therapy by design: Evaluating the UK hospital building program. *Health & Place, 10*(2), 117-128. doi:10.1016/S1353-8292(03)00052-2

Giles-Corti, B., Bull, F., Knuiman, M., McCormack, G., Van Niel, K., Timperio, A., … Boruff, B. (2013). The influence of urban design on neighbourhood walking following residential relocation: Longitudinal results from the RESIDE study. *Social Science & Medicine, 77*, 20-30. doi:10.1016/j.socscimed.2012.10.016

Grant, E., Chong, A., Zillante, G., Beer, A., & Srivastava, A. (2014). The NDIS, housing and Indigenous Australians living with a disability. *Parity*, *27*(5), 25-26.

Harrell, R., Kassner, E., & Figueiredo, C. (2011). *Multigenerational households are increasing*. AARP Public Policy Institute Fact Sheet. Washington, DC: AARP Public Policy Institute.

Harrison, M. (2004). Defining housing quality and environment: Disability, standards and social factors. *Housing Studies, 19*(5), 691-708. doi:10.1080/0267303042000249152

Helle, T., Brandt, A., Slaug, B., & Iwarsson, S. (2011). Lack of research-based standards for accessible housing: Problematization and exemplification of consequences. *International Journal of Public Health, 56*(6), 635-644. doi:10.1007/s00038-011-0290-4

Hempel, D. J., & Tucker Jr, L. R. (1979). Citizen preferences for housing as community social indicators. *Environment and Behavior, 11*(3), 399-428. doi:10.1177/0013916579113005

Heywood, F. (2005). Adaptation: Altering the house to restore the home. *Housing Studies, 20*(4), 531-547. doi:10.1080/02673030500114409

Honey, A., Emerson, E., & Llewellyn, G. (2011). The mental health of young people with disabilities: Impact of social conditions. *The International Journal for Research in Social and Genetic Epidemiology and Mental Health Services, 46*(1), 1-10. doi:10.1007/s00127-009-0161-y

Hochschild Jr., T. R. (2015). The cul-de-sac effect: Relationship between street design and residential social cohesion. *Journal of Urban Planning and Development, 141*(1). doi:10.1061/(ASCE)UP.1943-5444.0000192

Howden-Chapman, P., Matheson, A., Crane, J., Viggers, H., Cunningham, M., Blakely, T., … Davie, G. (2007). Effect of insulating existing houses on health inequality: Cluster randomised study in the community. *BMJ, 334*(7591), 460. doi:10.1136/bmj.39070.573032.80

Imrie, R. (2004). Disability, embodiment and the meaning of the home. *Housing Studies, 19*(5), 745-763. doi:10.1080/0267303042000249189

Imrie, R. (2006). Independent lives and relevance of lifetime homes. Disability & Society, 21(4), 359-374. doi:10.1080/09687590600680152

Jackson, B. (2008, Issue 40). Segregation and congregation and the gaining of a real home. Crucial Times newsletter. Brisbane, Queensland: Community Resource Unit Inc. Retrieved from http://www.cru.org.au/

Jacobson, M. Z. (2012). *Air Pollution and Global Warming: History, Science, and Solutions* (2nd ed.). New York, NY: Cambridge University Press.

Johnstone, B., Glass, B. A., & Oliver, R. E. (2007). Religion and disability: Clinical, research and training considerations for rehabilitation professionals. *Disability & Rehabilitation, 29*(15), 1153-1163. doi:10.1080/09638280600955693

Jonas, W. B., & Chez, R. A. (2004). Toward optimal healing environments in health care. *The Journal of Alternative and Complimentary Medicine, 10*(S1), S1-S6. doi:10.1089/1075553042245818

Jongeneel-Grimen, B., Droomers, M., van Oers, H., Stronks, K., & Kunst, A.E. (2014). The relationship between physical activity and the living environment: A multi-level

analyses focusing on changes over time in environmental factors. *Health & Place, 26*, 149-160. doi:10.1016/j.healthplace.2013.12.003

Kauko, T. (2006). What makes a location attractive for the housing consumer? Preliminary findings from metropolitan Helsinki and Randstad Holland using the analytical hierarchy process. *Journal of Housing and the Built Environment, 21*(2), 159-176. doi:10.1007/s10901-006-9040-y

Kelaher, M., Warr, D. J., Feldman, P., & Tacticos, T. (2010). Living in 'Birdsville': Exploring the impact of neighbourhood stigma on health. *Health & Place, 16*(2), 281-388. doi:10.1016/j.healthplace.2009.11.010

Kennedy, R., Buys, L., & Miller, E. (2005). Residents' experiences of privacy and comfort in multi-storey apartment dwellings in subtropical Brisbane. *Sustainability, 7*(6), 7741-7761. doi: 10.3390/su7067741

Krieger, J., & Higgins, D. L. (2002). Housing and health: Time again for public health action. *American Journal of Public Health, 92*(5), 758-768. doi:10.2105/AJPH.92.5.758

Kuo, F. E., & Sullivan, W. C. (2001a). Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment & Behavior, 33*(4), 543-571. doi:10.1177/00139160121973124

Kuo, F. E., & Sullivan, W. C. (2001b). Environment and crime in the inner city: Does vegetation reduce crime? *Environment & Behavior, 33*(3), 343-367. doi:10.1177/0013916501333002

Kurzban, R., & Leary, M. R. (2001). Evolutionary origins of stigmatization: The functions of social exclusion. *Psychological Bulletin, 127*(2), 187-208. doi:10.1037//0033-2909.127.2.187

Kyle, T., & Dunn, J. R. (2008). Effects of housing circumstances on health, quality of life and healthcare use for people with severe mental illness: A review. *Health and Social Care in the Community, 16*(1), 1-15. doi:10.1111/j.1365-2524.2007.00723x

Landcom. (2008). *Universal housing design guidelines.* New South Wales, Australia: Landcom.

Last, M., Schuldberg, J., & Merchant, K. (2016). Long-term care continuum. In: R. Perley (Ed.), *Managing the Long-Term Care Facility: Practical Approaches to Providing Quality Care.* San Francisco, CA: John Wiley & Sons, Inc.

Lawrence, R. J. (2011). Housing for health promotion. *International Journal of Public Health, 56*(6), 577-578. doi:10.1007/s00038-011-0307-z

Lee, H., Lee, Y., Choi, H., & Pyun, S.-B. (2015). Community integration and quality of life in aphasia after stroke. *Yonsei Medical Journal, 56*(6), 1694-1702. doi:10.3349/ymj.2015.56.6.1694

Lindberg, E., Gärling, T., & Montgomery, H. (1988). People's beliefs and values as determinants of housing preferences and simulated choices. *Scandinavian Housing and Planning Research, 5*(3), 181-197. doi:10.1080/02815738808730162

Lindberg, E., Gärling, T., & Montgomery, H., (1989a). Belief-value structures as determinants of consumer behaviour: A study of housing preferences and choices. *Journal of Consumer Policy, 12*(2), 119-137.

Lindberg, E., Gärling, T., & Montgomery, H. (1989b). Differential predictability of preferences and choices. *Journal of Behavioral Decision Making, 2*(4), 205-219. doi:10.1002/bdm.3960020402

Livable Housing Australia. (2012). *Livable housing design guidelines* (2nd ed), New South Wales, Australia: Livable Housing Australia.

Lorenc, T., Clayton, S., Neary, D., Whitehead, M., Petticrew, M., Thomson, H., ... Renton, A. (2012). Crime, fear of crime, environment, and mental health and wellbeing: Mapping review of theories and causal pathways. *Health & Place, 18*, 757-765. doi:10.1016/j.healthplace.2012.04.001

Mahar, C., & Fraser, K. (2012). Strategies to facilitate successful community reintegration following acquired brain injury (ABI). *International Journal of Disability Management, 6*(1), 68-78. doi:10.1375/jdmr.6.1.68

Maller, C., Townsend, M., Pryor, A., Brown, P., & St Leger, L. (2005). Healthy nature healthy people: 'Contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International, 21*(1), 89-96. doi:10.1093/heapro/dai032

Mann, M. L. (2014). *The liveable superblock* (Unpublished Masters dissertation). Unitec Institute of Technology, New Zealand.

Marzbali, M. H., Abdullah, A., & Tilaki, M. J. M. (2015). The effectiveness of interventions in the built environment for improving health by addressing fear of crime. *International Journal of Law, Crime and Justice*, e-pub doi:10.1016/j.ijlcj.2015.12.002

Matz, C. J., Stieb, D. M., Davis, K., Egyed, M., Rose, A., Chou, B., & Brion, O. (2014). Effects of age, season, gender and urban-rural status on time-activity: Canadian human activity pattern survey 2 (CHAPS 2). *International Journal of Environmental Research and Public Health, 11*(2), 2108-2124. doi 10.3390/ijerph110202108

McGarrigle,C. A., & Layte, R. (2015). The role of social support and the importance of the quality of the relationship in reducing depression, loneliness and reduced quality of life with disability in older ages; evidence from the Irish longitudinal study on ageing.

Journal of Epidemiology & Community Health, 69(1), A29. doi:10.1136/jech-2015-206256.45

McSweeney, J., Rainham, D., Johnson, A., Sherry, S. B., & Singleton, J. (2015). Indoor nature exposure (INE): A health-promotion framework. *Health Promotion International, 30*(1), 126-139. doi:10.1093/heapro/dau081

Megbolugbe, I. F., Marks, A. P., & Schwartz, M. B. (1991). The economic theory of housing demand: A critical review. *The Journal of Real Estate Research, 6*(3), 381-393.

Muenchberger, H., Ehrlich, C., Kendall, E., & Vit. M. (2012). Experience of place for young adults under 65 years with complex disabilities moving into purpose-built residential care. Social Science & Medicine, 75(12), 2151–2159. doi:10.1016/j.socscimed.2012.08.002

Nalder, E., Fleming, J., Foster, M., Cornwell, P., Shields, C., & Khan, A. (2012). Identifying factors associated with perceived success in the transition from hospital to home after brain injury. *The Journal of Head Trauma Rehabilitation, 27*(2): 143-153. doi:10.1097/HTR.0b013e3182168fb1

Orrell, A., McKee, K., Torrington, J., Barnes, S., Darton, R., Netten, A., & Lewis, A. (2013). The relationship between building design and residents' quality of life in extra care housing schemes. *Health & Place, 21*, 52-64. doi:10.1016/j.healthplace.2012.12.004

Páez, A., & Farber, S. (2012). Participation and desire: Leisure activities among Canadian adults with disabilities. *Transportation, 39*(6), 1055-1078. doi:10.1007/s11116-012-9385-x

Parker, C., Barnes, S., McKee, K., Morgan, K., Torrington, J., & Tregenza, P. (2004). Quality of life and building design in residential and nursing homes for older people. *Ageing and Society, 24*(6), 941-962. doi:10.1017/S0144686.X04002387

Piccenna, L., Lannin, N. A., Scott, K., Bragge, P., & Gruen, R. (2016). Guidance for community-based caregivers in assisting people with moderate to severe traumatic brain injury with transfers and manual handling: Evidence and key stakeholder perspectives. *Health and Social Care in the Community,* e-pub before print. doi:10.1111/hsc.12327

Plank, A., Mazzoni, V., & Cavada, L. (2012). Becoming a caregiver: New family carers' experience during the transition from hospital to home. *Journal of Clinical Nursing, 21*(13-14), 2072-2082. doi:10.1111/j.1365-2702.2011.04025.x

Queensland Government. (2015). *$3M for new disability housing projects across Queensland* [Press release]. Retrieved from http://statements.qld.gov.au/Statement/2015/10/17/3m-for-new-disability-housing-projects-across-queensland

Radermacher, H., Sonn, C., Keys, C., & Duckett, P. (2010). Disability and participation: It's about us but still without us! *Journal of Community & Applied Social Psychology, 20*(5), 333-346. doi:10.1002/casp.1039

Reese, R. F., & Myers, J. E. (2012). EcoWellness: The missing factor in holistic wellness models. *Journal of Counseling and Development, 90*(4), 400-407. doi:10.1002/j.1556-6676.2012.00050.x

Rhode, P. C., Froehlich-Grobe, K., Hockemeyer, J. R., Carlson, J. A., & Lee, J. (2012). Assessing stress in disability: Developing and piloting the Disability Related Stress Scale. *Disability and Health Journal, 5*(3), 168-176. doi:10.1016/j.dhjo.2012.03.002

Rook, K. S. (2014). The health effects of negative social exchanges in later life. *Generations, 38*(1), 15-23.

Salonen, H., Lahtinen, M., Lappalainen, S., Nevala, N., Knibbs, L., D., Morawska, L., & Reijula, K. (2012). Positive impacts of environmental characteristics on health and

wellbeing in health-care facilities: A review. Paper presented at the Healthy Buildings 2012, 10th International Conference, Official Conference of the International Society of Indoor Air Quality and Climate conference, Brisbane, Queensland, Australia, 8-12 July 2012.

Salonen, H., Lahtinen, M., Lappalainen, S., Nevala, N., Knibbs, L. D., Morawska, L., & Reijula, K. (2013). Physical characteristics of the indoor environment that affect health and wellbeing in healthcare facilities: A review. *Intelligent Buildings International, 5*(1), 3-25. doi:10.1080/17508975.2013.764838

Saugeres, L. (2011). (Un)accommodating disabilities: Housing, marginalization and dependency in Australia. *Journal of Housing and the Built Environment, 26*(1), 1-15. doi:10.1007/s10901-010-9201-x

Schulz, A., & Northridge, M. E. (2004). Social determinants of health: Implications for environmental health promotion. *Health Education & Behavior, 31*(4), 455-471. doi:10.1177/1090198104265598

Shanahan, D. F., Lin, B. B., Bush, R., Gaston, K. J., Dean, J. H., Barber, E., & Fuller, R. A. (2015). Toward improved public health outcomes from urban nature. *American Journal of Public Health, 105*(3), 470-477.

Shaw, M. (2004). Housing and public health. *Annual Review of Public Health, 25*(1), 397-418. doi:10.1146/annurev.publhealth.25.101802.123036

Shogren, K. A., & Rye, M. S. (2005). Religion and individuals with intellectual disabilities. *Journal of Religion, Disability & Health, 9*(1), 29-53. doi:10.1300/J095v09n01_03

South Australian Department for Families and Communities & South Australian Department of the Premier and Cabinet (n.d.). *Housing strategy for South Australia: Green paper* (Dewey Number 353.55099423). Retrieved from saplan.org.au/documents/HousingStrategyforSA-GreenPaper.pdf

Stichler, J. F. (2007). Using evidence-based design to improve outcomes. *The Journal of Nursing Administration, 37*(1), 1-4. doi:10.1097/00005110-200701000-00001

Stokols, D. (1992). Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist, 47*(1), 6-22. doi:10.1037/0003-066X.47.1.6

Tregloan, K., Callaway, L., Meyer, B., Wood, R., & Iannello, N. (2014). *RIPL project one: Post-occupancy built and technology design evaluation.* Victoria: Monash University.

Ulrich, R. S. (1991). Effects of interior design on wellness: Theory and recent scientific research. *Journal of Healthcare Design, 3*, 97-109.

Ulrich, R. S. (1997). A theory of supportive design for healthcare facilities. *Journal of Healthcare Design, 9*(3-7), 21-24.

Ulrich, R. S. (1999). Effects of gardens on health outcomes: Theory and research. In: C. Cooper-Marcus, & M. Barnes (Eds), *Healing gardens: Therapeutic benefits and Design recommendations* (pp. 27-86). New York, NY: John Wiley.

Ulrich, R. S. (2000). Evidence based environmental design for improving medical outcomes. Paper presented at the Healing by Design: Building for Healthcare in the 21st Century National Conference, McGill University Health Center, Montreal, Canada, September 2000.

Ulrich, R. S. (2006). Essay: Evidence-based health-care architecture. *The Lancet, 368*(1), S38-S39. doi:10.1016/S0140-6736(06)69921-2

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H.-B., Choi, Y.-S., … Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *Health Environments Research & Design Journal, 1*(3), 61-125.

van de Ven, L., Post, M., de Witte, L., & van den Heuvel, W. (2005). It takes two to tango: The integration of people with disabilities into society. *Disability & Society, 20*(3), 311-329. doi:10.1080/09687590500060778

Veitch, J. A. (2008). Investigating and influencing how buildings affect health: Interdisciplinary endeavours. *Canadian Psychology, 49*(4), 281-288. doi:10.1037/a0013567

Villanueva, K., Knuiman, M., Koohsari, M. J., Hickey, S., Foster, S., Badland, H., … Giles-Corti, B. (2013). People living in hilly residential areas in metropolitan Perth have less diabetes: Spurious association or important environmental determinant? *International Journal of Health Geographics, 12*(1), 59-70. doi:10.1186/1476-072X-12-59

Wagemakers, A., Vaandrager, L., Koelen, M. A., Saan, H., & Leeuwis, C. (2010). Community health promotion: A framework to facilitate and evaluate supportive social environments for health. *Evaluation and Program Planning, 33*(4), 428-435. doi:10.1016/j.evalprogplan.2009.12.008

Ward, M., & Franz, J. (2015). The provision of visitable housing in Australia: Down to the detail. *Social Inclusion, 3*(2), 31-43. doi:10.17645/xi.v3i2.57

The WHOQOL Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine, 28*(3), 551-558. doi:10.1017/S0033291798006667

Wiesel, I. (2011). Allocating homes for people with intellectual disability: Needs, mix and choice. *Social Policy & Administration, 45*(3), 280-298. doi:10.1111/j.1467-9515.2011.00769.x

Wiesel, I., & Fincher, R. (2009). The choice agenda in disability housing provision. *Housing Studies, 24*(5), 611-627. doi:10.1080/02673030903086790

Wiesel, I., Gendera, S., Fisher, K. R., Hill, T., Shaw, W., Bridge, C., ... Finch, K. (2016). *Addressing the housing needs of participants is critical to NDIS success.* Australian Housing and Urban Research Institute [AHURI] Research and Policy Bulletin (Issue 205). Melbourne, Victoria: AHURI.

Winkler, D., Farnworth, L., Sloan, S., Brown, T., & Callaway, L. (2010). Comparison of people with ABI living in two accommodation settings: Shared supported accommodation and residential aged care. *Brain Impairment, 11*(3), 313-325. doi:10.1375/brim.11.3.313

Winkler, D., Farnworth, L., Sloan, S., & Brown, T. (2011). Moving from aged care faciltiies to community-based accommodation: Outcomes and environmental factors. *Brain Injury, 25*(2), 153-168. doi: 10.3109/02699052.2010.541403

Wister, A. V. (2005). The built environment, health, and longevity. *Journal of Housing for the Elderly*, *19*(2), 49-70. doi:10.1300/J081v19n02_04

Wolfensberger, W. (1998). *A brief introduction to social role valorization: A high-order concept for addressing the plight of societally devalued people, and for structuring human services.* (New York: Training Institute for Human Service Planning, Leadership and Change Agentry, Syracuse University).

Wolfensberger, W., & Thomas, S. (2007). *Passing: A tool for analysing service quality according to social role valorization criteria. ratings manual,* 3rd ed. (New York: Training Institute for Human Service Planning, Leadership & Change Agentry, Syracuse University).

World Health Organization. (2003). *The world health report 2003: Shaping the future*. Geneva: World Health Organization.

Wright, C. J., Muenchberger, H., & Whitty, J. A. (2015). The choice agenda in the Australian supported housing context: A timely reflection. Disability & Society, 30(6), 834-848. doi:10.1080/09687599.2015.1038336

Wright, P. A., & Kloos, B. (2007). Housing environment and mental health outcomes: A levels of analysis perspective. *Journal of Environmental Psychology, 27*, 79-89. doi:10.1016/j.jenvp.2006.12.001

Zeeman, H., Wright, C. J., & Hellyer, T. (2016). Developing design guidelines for inclusive housing: A multi-stakeholder approach using a Delphi method. Journal of Housing and the Built Environment. doi:10.1007/s10901-016-9499-0