

Running Head: HOUSING NEED

Mount Saint Vincent University

Department of Family Studies and Gerontology

**The Future Housing Preferences and Expectations
of Older Adults with Unmet Housing Needs**

By

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A Thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Arts in Family Studies and Gerontology

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Dedication

Through the process of obtaining my Master of Arts in Family Studies and Gerontology many individuals have supported me in a personal and/or professional capacity. First, I would like to thank my father (Ron MacDougall), my sister (Catherine MacDougall), and my grandmother (Annie MacDougall) for motivating and inspiring me throughout this learning experience. I'd like to acknowledge my mother (Sharon MacDougall) and uncle (Alan MacDougall) for giving me strength from afar. I would like to thank Dr. Michelle Millar for her generosity of time and advice, consulting on my statistical work. I would also like to thank my three professional mentors, Dr. Donald Shiner, who provided me with the opportunity to work on the ASHRA project, and supported my professional growth through the thesis process; Dr. Lori Weeks, who gave me the opportunity and confidence to explore my interest in the field of aging; and Dr. Janice Keefe, who has provided me countless opportunities to become a better professional and researcher. Finally, I would like to thank my husband, Matthew Ogilvie, for never wavering in his support of my dreams and goals.

ABSTRACT:

**The Future Housing Preferences and Expectations
of Older Adults with Unmet Housing Needs**

The housing needs of Canadians are changing and issues such as the supply and nature of appropriate housing are especially relevant in Atlantic Canada where we boast the highest proportion of older adults in Canada. In Canada, we identify households in housing need using the Canada Mortgage and Housing Corporation's criteria of core housing need; affordability, adequacy and suitability. These criteria do not take into account the health-related gaps that can exist between a dwelling and its occupants, such as safety and accessibility. These issues could be of particular concern within the context of an aging population.

Through a secondary analysis of the Atlantic Seniors Housing Research Alliances' *Seniors' Housing and Support Services Survey*, this research examined the future housing preferences and expectations of 1614 older adults in Atlantic Canada, assessing their level of housing need and the congruence of their future housing decisions. Variables were selected for this study to be as comparable as possible to the current CMHC core housing need criteria. Results showed that both safety and accessibility issues were related to being in self-reported housing need, supporting the addition of health-related criteria to the CMHC core housing need definition. In addition it was found that suitability, as defined by CMHC, was not a significant concern for any of the three housing need groups. Results support the recommendation to expand the definition of suitability to include dwellings that are too large for their occupants.

It was found that older adults in housing need do indeed differ from those with met or limited housing needs on a number of socio-demographic characteristics, most notably health and financial status. The future housing expectations of those with met or limited housing need

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do differ from those experiencing housing need, with those in need more likely to anticipate modifications to or moves from their current dwelling. Interestingly, those in housing need do not differ greatly in their future housing preferences from those with met or limited housing need, with persons at all levels of housing need most likely to express a preference for a single family dwelling in the future. Housing decision congruence, a complex construct, seems to be most strongly related to the current dwelling type of the older adult. Self-reporting housing need, and thus awareness of a housing need, appears to have a positive impact on future housing decision congruence.

In the short-term, to address the housing needs of an aging population, it will be necessary to emphasize the importance of funding to and promotion of home modification programs. Awareness and availability of such programs, which serve to close the gap between the dwelling and the individual, may help to maintain older adults in their own homes for longer periods of time. In the long-term, it is necessary to advocate for building regulations that include universal design standards to ensure that new housing is built to be accessible for occupants of all ages. These recommendations will help to keep older adults in their own home as they age, and could offset future demand on the long term care system.

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Chapter 1: Introduction

The housing needs of Canadians are changing. It is estimated that there are 4.97 million older adults in Canada (Statistics Canada, 2011a), a number that will continue to increase with the Boomers reaching age 65 over the next 20 years. With the continuing increase in the proportion of older adults in the population, researchers, government officials, and the private sector are discussing topics related to healthy aging. Issues such as the supply and nature of appropriate housing are especially relevant in Atlantic Canada where we boast the highest proportion of older adults in Canada, (Statistics Canada, 2011a) and lower incomes for our older population than the Canadian average to cover such necessities as shelter costs (Statistics Canada, 2008). At present, three of the provinces in Atlantic Canada (Newfoundland and Labrador, New Brunswick, and Prince Edward Island) have the lowest average total incomes for older adults in the country (Statistics Canada, 2008). Such challenges will have an impact on the housing choices of older Canadians.

In Canada, we identify households in housing need using the Canada Mortgage and Housing Corporation's criteria for "core housing need." The core housing need criteria are comprised of three dwelling standards; affordability, adequacy and suitability. This definition of core housing need captures one component of the picture when determining if a dwelling meets the need of its occupant, the characteristics of the dwelling, but fails to take into account the characteristics of the occupants in relation to the dwelling. Using the current definition of core housing need, the vast majority of Canadian households in core housing need are due to failing to meet the affordability criterion (Canada Mortgage and Housing Corporation, 2010b), though for the older adult population, mobility and safety in the home may pose a greater challenge to aging in place than finances.

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An aging population necessitates financially feasible housing that meet the needs of those with changes in mobility and function. When there is a gap between these two needs, housing that is both supportive and affordable, it can create a situation where the housing needs of the individual are no longer being met. When a dwelling is no longer meeting the needs of the older adult, a housing decision must be made based on a complex assessment of available resources, and limitations (Vanderhart, 1995).

An older adult with unmet housing needs may decide to lower their housing expectations, settling for a situation that is less than ideal due to a lack of resources, or a fear of the unfamiliar. They may decide to make dwelling modifications to stay in their current home, or increase the level of formal or informal assistance they are receiving. In some instances, a move to another dwelling may be considered. The purpose of this study is to understand what dwelling, health and mobility, financial, and demographic characteristics are influencing the future housing preferences and expectations of older adults who experience, or who are at risk of experiencing unmet housing needs and which, if any, factors predict these future housing preferences and expectations.

Research Relevance

Statistics Canada projects that by the year 2031, just 20 years from now, older adults over age 65 will make up 23% of the total population in Canada, up from 14.4% in 2011 (Statistics Canada, 2011a). Currently, older adult led households account for one-quarter of the 1.27 million households in core housing need in Canada (Canada Mortgage and Housing Corporation, 2010b). Since older adults make up a large proportion of the persons in core housing need presently, in the next 20 years as Canada ages, there could be dramatic increase in the number of older adults in core housing need if changes are not made to taxation policies, building

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regulations, housing options, and dwelling modification programs.

According to Statistics Canada, the Atlantic Canadian region is the oldest region in Canada (Statistics Canada, 2011a). Nova Scotia has the highest proportion of older adults in Canada (16.5%), with 1000 people reaching the age of 65 each month in the province (Statistics Canada 2011b; White, 2011). In the coming years, there will be great demand in Nova Scotia and the other Atlantic provinces for housing that is both supportive and affordable. While there may be more impetus from an economic standpoint to gather information on preferences and expectations of those with ample resources, data needs to be gathered on every segment of the older population, including those with limited resources.

While health and health care were traditionally concepts associated with institutions such as hospitals, we are continuing to see a trend toward home care and community-based care (Canadian Healthcare Association, 2009). This shift is largely a result of older adult's desire to stay in their communities, and age in place (Canadian Homecare Association, 2009; Johnston, 1999; Shiner, 2007; Weeks, Bryanton, & Nilsson, 2005). This trend creates an inextricable linkage between housing and health. For example, factors such as mobility and accessibility can be matched to create thriving living environments, or can be so poorly matched as to require an individual to move.

In 2006, the province of Nova Scotia released its 10-year Continuing Care Strategy. The strategy re-affirmed the importance of choice in all older adults' lives, vowing to increase affordable housing options, funding to home care, and funding for home modification programs (Nova Scotia Department of Health, 2006). In addition to this dedication of resources, the Nova Scotia Seniors Secretariats' Strategy for Positive Aging in Nova Scotia (2005) listed 'Housing Options' as one of their nine key areas to address to create an atmosphere of positive aging in the

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province. The Secretariat proposed 16 goals to improve housing options in Nova Scotia and among them was the goal to, “Encourage and support ongoing research into the future housing and supportive care needs of seniors” (p. 46).

The Atlantic Seniors Housing Research Alliance (ASHRA) were a research team consisting of academics, government officials, service providers, and community members dedicated not only to the research of, but the improvement of housing options for all older adults in the Atlantic Provinces. The project, (*Projecting the Housing Needs of Aging Atlantic Canadians*) spanned six years (2005-2010), and included both qualitative and quantitative components. As one of the key components of the six-year project, survey data was gathered from over 1700 Atlantic Canadian older adults on the topic of housing and support services. For the fulfillment of a research-based Master of Arts degree, a secondary analysis of the survey data was conducted to answer the research questions, and advance the current knowledge on the future housing preferences and expectations of older adults with unmet housing needs.

Research Questions

Each of the following research questions were designed to provide a greater understanding of the current and future housing preferences and expectations of older adults who have, or may be at risk of having unmet housing needs. Below, are the three research questions that were addressed in this study.

1. How do older adults with self-reported or assessed risk of unmet housing needs compare to older adults with met/limited housing needs on demographic, dwelling, health and mobility and financial characteristics?
2. Among older adults with self-reported or assessed risk of unmet housing needs, what are the similarities and differences on demographic, dwelling, health and mobility, and

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financial characteristics between those older adults whose housing decision is congruent and those whose housing decision is incongruent?

3. Among older adults with unmet housing needs, what are the similarities and differences on demographic, dwelling, health and mobility, and financial characteristics between those older adults whose housing decision is congruent and those whose housing decision is incongruent?

The purpose of the first question was to compare older adults across the continuum of housing need, to see which, if any characteristics were associated with level of housing need: self-reported unmet housing need, assessed risk of unmet housing need, and met/limited housing need. The purpose of the second question was to examine the housing congruence of older adults with unmet housing needs, versus those assessed to be at risk of unmet housing needs, and identify characteristics of those who appeared to have congruence in their future housing decisions versus those who did not appear to have congruence in their future housing decisions. The purpose of the final question was to look at those older adults who had self-reported housing need and those at assessed risk of unmet housing needs combined, to examine what characteristics were predicative of the congruence of their housing decisions.

A lack of congruence in future housing decisions does not necessarily denote an inability of the individual to think rationally, or to make informed decisions, instead such incongruence can be due to a lack of resources to close the gap between need and reality. For this reason, it was important to look at the characteristics of individuals with incongruence in their housing decisions to see what demographic, dwelling, health and mobility, or financial characteristics were unique to these individuals so that others who are at risk of being in long-term housing need could be identified. Conversely, it was important to identify those who anticipated being

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able to close the housing need-gap to see what characteristics were enabling them to improve their circumstances.

Key Terminology

While most concepts contained within this document are described at the point they are used, a few key terms warrant an explanation that is more complete.

Older adult – While the term “senior” has been used to describe the respondents involved in the ASHRA housing study up to this point, the term “older adult” was used for this study to describe the population aged 65 and older. This terminology is consistent with the language used by the Canadian Association on Gerontology (“older Canadians”) and the International Association of Gerontology and Geriatrics (“older people”).

Dwelling – Due to its neutral tone while describing a very complex, and varied concept, the term dwelling will be used to describe the older adults’ place of living unless referring to a specific dwelling-type such as a single-family house, or apartment. The term ‘dwelling’ is frequently used in literature produced by the Canadian Housing and Mortgage Corporation (CMHC) when referring to a number of different housing types.

Core Housing Need - Core housing need is a concept constructed by CMHC to reflect a gap between the adequacy, affordability, or suitability of dwelling and its occupants. For a dwelling to be considered adequate, the occupant must confirm that it does not require any major repairs. For a dwelling to be considered suitable, it must meet the National Occupancy Standards that there is one bedroom per adult couple, and one bedroom per adult over the age of 18. Two children of the same sex under the age of 18 may share a bedroom, and children of the opposite sex may share a room until the age of five. If an individual lives alone, they may live in a bachelor apartment, which technically does not contain a separate bedroom. For a dwelling to be

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considered affordable, shelter costs must not exceed 30% of the before-tax household income¹. If the dwelling does not meet any one of these three requirements, and suitable and adequate housing in their community cannot be obtained for less than 30% of their income, the individual(s) living in the dwelling is considered to be in core housing need (Canada Mortgage and Housing Corporation, 2009a). Core housing need is not calculated for farm, band, or reserve households, or households where there is no income, or where shelter costs exceed 100% of the household income. Of 12.4 million Canadian households included in 2006 census, 600,000 were disqualified from the core housing need calculation based on the above criteria (Canada Mortgage and Housing Corporation, 2010e). Core housing need is used as an indicator of housing stock sufficiency in the country. The core housing need incidence is examined in given populations to determine the need for policies and programs to improve housing conditions for those vulnerable populations. There are concerns that the CMHC core housing need definition does not recognize the challenges faced by older adults which can put them at risk of housing need such as; accessibility, function, and safety (Weeks & LeBlanc, 2010).

Congruence/Incongruence - According to Collins dictionary, congruence is when two things are similar or fit together well. For the purpose of this study, congruence describes the seemingly logical progression of decisions regarding current housing, and future housing preferences. For example, if an individual expresses that their current housing does not meet their needs, but also reports that they plan to move or make a modification to their home then there would appear to be congruence in their future housing decision. Incongruence is described by Collins dictionary as, “conflicting, contradictory, or incompatible.” For the purpose of this study, incongruence

¹ The 30% affordability criterion does not include costs related to the maintenance, renovation, or upgrades to a dwelling (Canada Mortgage and Housing Corporation, 2010a).

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describes the seemingly illogical progression of decisions regarding current housing, and future housing preferences. For example, if an individual expresses that their current housing does not meet their needs, but reports that they have no plans to move or make modifications to their dwelling then there would appear to be incongruence in their future housing decision. There are factors, such as those related to personality, social connections, culture, and housing history that are not measured in this study which could impact housing decision congruence. Therefore, no decision was 100% verified as congruent or incongruent based on the data analyzed in this study.

Chapter 2: Theoretical Framework

Relevance of Life Course Theory to Topic

The theoretical framework used to guide this research was the life course theory. This theory was used to frame a better understanding of the future housing preferences and expectations of older adults who experience, or who are at risk of experiencing unmet housing needs. Life course theory provided the most insight into this topic because it focuses on the experience of the individual as the unit of analysis, keeping with the survey methodology while recognizing the importance of the individual's history, including their housing and family history, in the formation of the future housing preferences and expectations. Life course theory has been utilized to examine the future housing expectations of mid- to older adults in the past (Robison & Moen, 2000). This study offered insight into the way in which older adults current and future housing choices are impacted by their past. It emphasized that an older adults' housing decision is not influenced solely by their present situation, but rather is influenced by their current situation, plus all of their past lived experiences. These past lived experiences could include previous moves, their attachment to their families, or their life-long health challenges (Robison & Moen, 2000).

For many adults, housing needs occur across a continuum throughout the lifespan, ranging from independent living in earlier years, to hospitalization or institutionalization at the end of life (Robison & Moen, 2000). The space in between these two extremes is where gaps can occur between a housing need, and the ability to meet that need. The development of unmet housing needs does not generally occur suddenly, but rather develops gradually over the course of the lifespan. For example, the development of arthritis in the knees may prevent a 40 year-old from playing racquetball with a friend, but at the age of 70 the same arthritic knees may cause

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enough of a mobility challenge to prevent that individual from being able to climb the stairs to enter or exit their home, resulting in an unmet housing need. Similarly, a person may work at a job for 30 years that pays enough to cover the household expenses, but not enough to allow for sufficient retirement savings. This could result in a 75 year-old who depends upon the Canadian Pension Plan, Old Age Security, and the Guaranteed Income Supplement to cover all of their health, shelter, and day-to-day expenses. This older adult could be getting by, but be at risk of housing need if any one factor shifted that required additional financial resources. If this individual had a fall and needed to modify their home for accessibility they would not have sufficient savings to do so, resulting in an unmet housing need.

History and Assumptions of Life Course Theory

The history of the life course perspective dates back to a study on poverty at turn of the 20th century conducted by E. S. Rowntree in 1901. He used the concept of the life cycle to show how individuals and families change over a period of time (Price, McKenry, & Murphy, 2000). From its inception, life course theory has evolved into a highly respected theory used in both the fields of family studies and gerontology.

According to Bengston, Acock, Allen, Dilworth-Anderson, and Klein (2005) life course theory is based upon four central themes. The first theme emphasizes the importance of the timing of lives. This refers to social meanings we attach to various age stages and can include the timing of a transition into a more supportive form of housing. The second theme recognizes the way in which lives, and the relationships that result are linked and interdependent upon one another. Housing decisions are not made solely by one individual in a household but can take into account the health needs of partners, or upon the ability of children and other loved ones to provide care. The third theme emphasizes the role of human agency, and the importance of

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having the ability to make decisions and make things happen in one's own life. This may be choosing to maintain relationships with children, which would foster a caregiving relationship, or choosing to hire formal care workers to enable the individual to stay in their home. The fourth and final theme of the life course theory is the connection between the individual and the history of their lives, or as one life course theorist stated, "Aging must be studied in the context of the whole life" (Hareven & Adams, 1982, p. 222). An individual who has lived in the same community or same dwelling for fifty years has a historical attachment that must be recognized in order to understand or predict future housing preferences and expectations. Similarly, the historical events through which they lived will shape their views on the importance and value of various types of dwellings.

Conceptually, it is important to understand the place of roles, role configurations, and pathways when discussing life course theory. MacMillian and Coffey (2005) explain that a role refers to the part we play in the various societal institutions of which we are a part. For example, in school one generally plays the role of student. In the workforce, one might play the role of doctor, lawyer, policy analyst, or researcher. In the family, one can play the role of daughter, mother, brother, or uncle, among others. We play many roles at once in our lives, and it is the interplay between these roles that determine our role configuration. The role configuration is in essence a picture of the various roles that an individual plays at any given point in their lifetime. Each person has a different role configuration, and therefore has a unique way of seeing the world and making decisions within their own world. Finally, the concept of pathways describes the linkage between these roles and role configurations throughout a lifetime. A trajectory, or time period in an individual role is generally marked on each end by role transitions. An individual may occupy the role of labourer for thirty-five years and at the end of that role

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trajectory go through a role transition into being a retired person, yet another role, and the beginning of another role trajectory.

As individuals age, the ability to perform tasks can be impaired resulting in increased importance being placed on the ability to perform those tasks (Gilmour & Park, 2006). Tasks such as entertaining, meal preparation, and self-care within the home may become important parts of the individuals' identity, and become an integral part of the individuals' definition of their role within the family. A change in dwelling would not only mean a change in physical environment, but a shifting of the individuals feelings about self, and their value within the family unit. For this reason, it is important to acknowledge the importance of choice and options for older adults when discussing future housing preferences and expectations.

Core Housing Need as a Guiding Concept

Though not a theory unto itself, the concept and components of the core housing need definition have been used in conjunction with life-course theory to frame the analysis, and interpretation of the results. The core housing need criterion have enabled me to examine the experience of older adults in housing need, or at risk of housing need from the perspective of affordability, adequacy and suitability of their housing, while the life-course theory's focus on transitions and agency encouraged me to examine factors related to safety and accessibility of the dwelling as the individual ages and has to make decisions about their future based on those age- and health-related changes.

Chapter 3: Literature Review

Introduction

Canada is on the verge of a population age shift that will influence every industry, including the housing industry. The Boomer cohort, those born 1946-1964, begin turning age 65 in the year 2011 and will continue until the trailing Boomers reach the age of 65 in 2029. There is currently a lack of research on the future housing preferences and expectations of those older adults in housing need, and some debate exists over what characteristics should define an individual or household as being in housing need. This literature review will examine the general population of older adults (all those aged 65, and older) in Canada, looking at interconnected characteristics such as housing, health, and wealth identifying potential risk factors for housing need. These characteristics shift across the aging continuum creating housing needs in later life that differ from the housing needs in earlier years. Next, the housing preferences and expectations of the general population of Canadian older adults will be examined, determining what motivates, and facilitates older adults to make a housing decision when their current dwelling no longer meets their needs, identifying both enablers and barriers from the past, and present. Finally, Canada's parameters for identifying individuals in housing need will be examined, as defined by the Canada Mortgage and Housing Corporation, followed by a discussion of its appropriateness and applicability with an aging population.

A Picture of Canadian Older Adults

Characteristics of Canadian older adults.

In 2011, it is estimated that there are 4.97 million older adults in Canada, making up approximately 14.4% of the total population (Statistics Canada, 2011a). The distribution of older adults varies greatly across the country from a high of 16.5% in Nova Scotia, to a low of 3.2% in

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Nunavut. In the Atlantic provinces where all four provinces are above the national average for proportion of older adults, New Brunswick has the next highest proportion of older adults (16.2%), followed by Prince Edward Island and Newfoundland and Labrador (15.8%) (Statistics Canada, 2011b).

Coupled with a projected increase in proportion of older adults in the population, there is an ever-increasing life expectancy resulting in a larger proportion of older adults living longer lives. Women continue to have a longer life expectancy, though that gap between women and men is closing. In 2010, the average life expectancy of a Canadian women was 82.4 years, while a man could expect to live to 78.3 years of age (Greenberg & Normandin, 2011). An increase in the older population coupled with increasing longevity implies that there will be an expanding demand for supportive and affordable housing choice for older adults in the coming years.

The majority of older adults live as a couple, though women are more than twice as likely to be single, largely due to the loss of a spouse (Milan & Vezina, 2011). There is a proven linkage between housing tenure and relationship status in Canada. The majority of older adults, aged 65-74 are homeowners (75.4%), while 24.6% rent their dwelling (Schellenberg & Turcotte, 2007). Single older adults are far less likely to be homeowners (54%) when compared to married couples (National Advisory Council on Aging, 2006).

The health status of Canadian older adults.

While it is important to quantify the increasing life expectancy of Canadian older adults, it is equally as important to examine the impact longevity has on level and duration of dependence. Dependency can be assessed on a scale of intensity ranging from no dependency, to low, moderate or severe dependency. For men and women, the duration, and intensity in dependence at the end of life are very different. Women spend longer periods of time in all states

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of dependence (Martel & Bélanger, 2000). It is during these years of increased dependence prior to institutionalization, that issues related to housing can be amplified necessitating modifications or moves, placing women at a higher risk for such issues due to their higher number of years spent in moderate and severe dependence.

Another common measure of dependency is the older adult's level of functional mobility, or ability to perform tasks related to their health and wellbeing. Tasks that maintain independence can be categorized into two main categories, activities of daily living (ADLs) and instrumental activities of daily living (IADLs). IADLs are tasks that support independence, although many of the tasks can be completed by informal supports if an older adult is no longer able to perform them. These include such tasks as housework, meal preparation, financial management, outdoor maintenance, and transportation. The loss of the ability to perform these tasks results in a lower level of independence.

ADLs are tasks related to personal care and nutrition, such as bathing/showering, toileting, dressing, and feeding. The inability to perform these tasks results in a higher level of dependence, more often requiring formal help to complete these tasks (Nygavan, Man-Son-Hing, Mitchell, & Molnar, 2001). Among older adults aged 65 and over, just 6% of men and 7% of women are ADL-dependent. A much higher proportion of older adults experience IADL-limitations with 15% of older men, and 29% of older women considered IADL-dependent, a statistically significant difference between genders ($p < 0.05$) (Gilmour & Park, 2006). By age 85 and older, between 20% of older men and 23% of older women require assistance with ADLs, such as personal care, and between 46-65% (men and women, respectively) of older adults require assistance with IADLs, such as housework (Gilmour & Park, 2006).

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Decline in function with IADLs tends to occur first at earlier ages with tasks such as housework and shopping, followed by decline in areas of both IADLs and ADLs, such as toileting, financial management, and medication administration. The final health decline for older adults tends to cause a sharp decrease in the ability to perform ADL functions, including personal care and feeding (Nygavan, Man-Son-Hing, Mitchell, & Molnar, 2001). The likelihood of requiring assistance with both IADLs and ADLs increases with age, and with the presence of health conditions such as, stroke, Alzheimer's disease or other form of dementia, and chronic fatigue syndrome (Gilmour & Park, 2006). Demand on, and for informal caregivers to provide assistance with ADLs and IADLs is predicted to increase in the future with partners providing more care, and due to lower fertility rates, children providing less care (Keefe, Légaré, & Carrière, 2004).

Chronic health conditions have a significant impact on the well-being of older adults in Canada, particularly for those in the oldest age bracket (80 years and older). Recent research demonstrated that while 35.2% of adults aged 30-49 have no chronic health conditions, only 10% of those aged 65-79, and 6.7% of those 80 years and older experience this absence of chronic disease (Denton & Spencer, 2010). In 2006, 33% of older adults aged 65 and older experienced a mobility disability, with the number increasing to 44% for those over the age of 75 (Statistics Canada, 2009a).

Arthritis is currently the second most prevalent chronic disease among Canadian older adults (Ramage-Morin, Shields & Martel, 2010), and the most prevalent chronic disease impacting mobility. Among older adults with a disability, 80% experience some form of mobility disability (Cossette, 2002). Approximately 8% of all ADL-dependent older adults require assistance with moving around their own homes (Gilmour & Park, 2006). It is predicted that

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arthritis and rheumatism, conditions which have a serious impact on the health and mobility of older adults, will increase steadily in prevalence in the general population from 16.4% in 2005, to 20.6% in 2030 (Denton & Spencer, 2010). A loss of functional mobility can result in a decrease in independence, an increased reliance of formal and informal support networks, and a need to modify or move from a dwelling.

Older persons with partners tend to experience better health than single older adults (Prus, 2004). The ability to receive support in the home by a loved one may contribute to this improved health status. For older adults, the impacts of housing and health on the individual are inextricable. They can work together in a complicated interplay to either support or oppose the independence of the individual. This linkage provides support for the addition of a health-related criterion to the core housing need assessment process, to recognize that the interplay between the individual and the dwelling cannot be ignored when assessing the appropriateness of housing.

The financial status of Canadian older adults.

Financially, Canadian older adults appear to be much better off today than they were 20 years ago. During the ten year period from 1996 and 2006, the average income of coupled older adults increased by 18% to \$48,300 (after taxes) (Statistics Canada, 2009a), though inflation accounted for a 23.1% increase in the cost of living over this period so older adults were actually in worse financial shape in 2006 (Bank of Canada, 2010). Similarly, single older adults saw similar increases between 1980 and 2003, with men's total income after taxes increasing by 43% to \$20,200 and women's after-tax income increasing by 42% to \$18,200 (Schellenberg & Turcotte, 2007), though a 138.7% increase in the cost of living over this 23 year period indicates that older adults are now much further behind financially (Bank of Canada, 2010).

Among the three criteria that must be met to be deemed in core housing need

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(affordability, suitability, and adequacy) affordability is the most prevalent (Dunning, 2007). In Canada, 1.27 million households are in core housing need, of which 24.7% are households led by a person over the age of 65 (Canada Mortgage and Housing Corporation, 2010a). This amounts to 14.4% of older adult-led households in Canada living in core housing need, while only 12.2% of the non-older adult-led households experience core housing need (Canada Mortgage and Housing Corporation, 2010a). By 2031, it is estimated that 42% of households in core housing need will be older adult-led (Dunning, 2007). Newfoundland (14.2%), Prince Edward Island (12.6%) and Nova Scotia (12.1%) have high prevalence of households in core housing need, behind only British Columbia (14.6%) and Ontario (14.5%), provinces with large urban populations. Among the territories, Nunavut experiences the highest rates with 37.3% of households living in core housing need (Canada Mortgage and Housing Corporation, 2010c).

Among all households in core housing need, the average household income is \$17,427 (Canada Mortgage and Housing Corporation, 2010d). Renters (28.3%) are far more likely than homeowners (6.6%) to experience core housing need. Households with only one occupant (25.1%) are nearly twice as likely as households with two or more occupants (13.1%) to be in core housing need (Canada Mortgage and Housing Corporation, 2010d). Older adults and children are the most likely to experience core housing need. Older adults experience a smaller affordability gap compared with their younger counterparts (Dunning, 2007). The average 65-74 year-old led household would require only an additional \$283/month in income to no longer be considered in core housing need, while a 75-year-old led household would require only an additional \$223/month to be out of core housing need (Dunning, 2007).

The percentage of older adults living below the low-income cutoff has been steadily decreasing since 1981, from 22% to 5% in 2006. This decreasing trend is generally attributed to

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the quality of the pension system in Canada, and the overall increase in government transfers (National Seniors Council, 2009). Single older women are at higher risk (16%) of being categorized as low-income (Statistics Canada, 2009a). In a qualitative study examining the ways older adults felt their quality of life was supported, a sufficient income was identified as a key component to staying in their own home, maintaining independence, and to staying active (Bryant, et al., 2004).

There is a distinct linkage between higher socio-economic status and a reduced likelihood of health decline as one ages (Buckley, Denton, Robb, & Spencer, 2006; Prus, 2004; World Health Organization, 2008). An individual's income not only impacts their health status, but also their life expectancy. Men in the highest income quartile could be expected to live a full 4.7 years longer than men in the lower income quartile (Greenberg & Normandin, 2011). Sarma, Hawley, and Basu (2009) confirmed this finding showing that those in the high household income bracket seem to show slower health decline, delaying death longer than those in the lower household income bracket.

The Housing Decisions of Older Adults

Housing decision-making models.

A classic model of migration decision-making by created by Wiseman (1980) outlines nine factors which influence the decision to move from or stay in their current dwelling for older adults. The model predicts the likelihood of an older adult making the decision to move from their current home. These nine decision-making factors included the duration in their current dwelling; their health and care needs; the occurrence of critical events; how much a move would reduce their cost of living; how satisfied they are with their current dwelling and neighbourhood; the presence or absence of family and friends nearby; how involved they are in their community

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and the strength of those social ties; and finally, the services and amenities available near their dwelling. These nine factors help to predict whether the older adult will be a mover or a stayer.

Over 30 years ago, Wiseman (1980) identified four different types of housing decision-makers among older adults. The first category, *voluntary stayers*, were content with their current dwelling and made the decision to stay as a result. The second category of movers, *involuntary stayers*, included those who were not satisfied with their dwelling but due to some constraint choose to remain in their home. The third category of older adults, *voluntary movers*, were those who were not content with their dwelling and chose to move as a result. Lastly, there were *involuntary movers*, those who were content with their dwelling and who would have liked to remain there if possible, but due to some resource constraint (health, finances, social support) they chose to make a move (Wiseman, 1980). Wiseman illustrated with his model that there is not one ideal outcome for older adults (stay or leave) but rather, that for each older adult preferences and resources vary, and while for some a move may be the unattainable ideal, for others the ability to stay in their home may be the unattainable ideal.

For those who were identified as movers, Wister (1985) developed a model to predict the living arrangements of older adults and found that the living arrangement outcome was influenced by an interplay between a number of variables including; socio-demographic variables, personal preferences, societal norms, household status evaluations, and constraints. The model predicts where and with whom an older adult would move, if they were to move. Using this model Wister found that for older adults, a strong preference for independence was predicative of living alone in the community, while a strong tie to family was predicative of living with family. Very few community-dwelling older adults make plans for future moves

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(6%), but when they do think about their future housing preferences the majority report (94%) wanting to stay within their own community (Weeks, Bryanton, Nilsson, 2005).

Housing expectations and realities of older adults.

Many studies support that the preference, and expectation of the majority of older adults is to remain in their own home as they age (Johnston, 1999; MacDonald, Remus & Laing, 1994; Shiner, 2007; Wagnild, 2001; Weeks, Bryanton, & Nilsson, 2005), with the expectation to age in place increasing with age from midlife on (Robison & Moen, 2000). While this may be possible for older adults with sufficient health and resources, for those older adults who are lacking in one or more area (i.e. finances, good health, and social support) this may not be possible. Conversely, many older adults who would benefit from a move to a new dwelling may not have the resources to make it possible. The majority of older adults report anticipating some level of difficulty (24%), or express uncertainty about their ability to remain in their own home as they age (38%) (Sherman & Combs, 1997). This is especially true for older adults in poor health, or with mobility challenges (Sherman & Combs, 1997). A recent survey of adults aged 55 and older in British Columbia found that while only one-third of respondents felt they would have to move in the next ten years due to financial considerations, more than half felt they would have to move due to health-related issues (Wagner, Shubair, & Michalos, 2010). Interestingly, income, assets, housing characteristics, and gender did not influence the amount of difficulty an older adult anticipated in staying in their own home. There were no significant differences on these characteristics between those who perceived it to be somewhat or very difficult to stay in their home, those who were unsure of the level of difficulty to stay in their home, or those who did not feel it would be difficult to stay in their home (Sherman & Combs, 1997).

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Older Canadians are generally very independent. At any one time in Canada, fewer than 10% of older women, and 5% of older men aged 65 and older reside in institutions (Milan & Vezina, 2011), a number that has been steadily decreasing since the early 1980s. For older adults with severe disabilities, being over the age of 85, being single or widowed, being female, and having fewer sources of income were all predicative of institutionalization (Sarma, Hawley, & Basu, 2009; Trottier, Martel, Houle, Berthelot, & Légaré, 2000). For older adults with moderate disability, being over the age of 85, having Alzheimer's disease or dementia, incontinence, or being single were predicative of institutionalization (Sarma, Hawley, & Basu, 2009; Trottier, Martel, Houle, Berthelot, & Légaré, 2000).

The likelihood of making a move changes with age. There is a very high probability of having moved in the previous six years among those aged 25 and under (95%), steadily decreasing until age 85 (19%), where it once again rises (25%). Homeownership decreases among those aged 60 and older, while renting increases in this age bracket. Of those older adults aged 65-74 who had moved 54.8% were renters, and for those aged 75 and older, 54.5% were homeowners. This leads to the conclusion that homeowners tend to move at older ages.

Motivators of housing decisions for older adults.

Resources are key to housing decision-making power for older adults. Resources enable choice, and can come in the form of a supportive kin network, financial stability, and functional health, among others. Choice, autonomy, and the maintenance of independence are key themes noted in many examinations of housing choices for older adults (Bryant, et al., 2004; Doherty & DeWeaver; MacDonald, Remus, & Laing, 1994). According to Wister's (1980) model, voluntary movers, or voluntary stayers each have the resources to make the change necessary for their wellness, whether that is a move to a new dwelling, or the modification of their current dwelling

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to meet their current needs. Older adults with higher income (>\$15,000) have been shown to be more likely to plan to move in the future as their needs change (Canada Mortgage and Housing Corporation, 2006). While older adults with higher income may be more likely to plan to move, persons in the general population with lower income (<\$10,000) were almost twice as likely to have moved in the previous year compared to those who made more than \$10,000/year (Canada Mortgage and Housing Corporation, 2009b). Of those individuals experiencing core housing need, 21% had moved in the previous year, compared to only 12% of the general population (Canada Mortgage and Housing Corporation, 2009b).

Cost is one determining factor in the decision to move for older adults aged 65-74 in Canada, with 15.4% reporting that the need for less expensive housing was a reason for their move within the last six months (Canada Mortgage and Housing Corporation, 2006). Another factor was reducing the size of their dwelling, which all older adults aged 65 and older reported as a motivator for their recent move (Canada Mortgage and Housing Corporation, 2006). Renters are four times more likely to make a move compared to those who hold a mortgage, while those who live mortgage-free in their homes were two-thirds more likely to remain in their current homes compared to those who held mortgages (Robison & Moen, 2000).

Those older adults in good, very good or excellent health and those who have the support of a spouse are more likely to indicate that they plan to move in the future (Wagnild, 2001). While higher income cannot prevent the eventual need to make housing decisions, it can ensure that when a housing decision needs to be made that more options are available. Adequate income allows older adults to maintain their homes and cover shelter costs, make any required modifications, purchase care services in the home, or make a move to a more suitable dwelling. The most common reason for a recent move given by older adults aged 65 and older was health

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(Canada Mortgage and Housing Corporation, 2006). The probability of health being a motivating factor increased sharply with age, from 16.7% at ages 65-74, to 42.3% at ages 85 and older. In the general all-ages population, health in a motivating factor for only 4.3% of movers (Canada Mortgage and Housing Corporation, 2006). As age increases and limitations in functional mobility advance, maintaining a home can become challenging. More than a third of older adults reported needed a change in their in current dwelling due to a design-functional status gap, though only half reported that they could afford to make these necessary modifications (Wagner, Shubair, & Michalos, 2010).

There are two types of low-income older adults in Canada. There are those who have been persistently low-income throughout their lives and those who experienced diminished income later in life due to the loss of a spouse, or income due to illness (Bruce, 2003). Women are more likely to be single as older adults, and thus tend to have fewer options when making housing-related decisions. After the loss of a spouse, a woman's income usually decreases, with lower income women experiencing less of an income shift due to protection from social service programs (Burkhauser, Giles, Lillard, & Scharze, 2005). Moderate- to high-income women tend to experience a greater decline in income following the loss of a spouse (Burkhauser, Giles, Lillard, & Scharze, 2005), putting them at risk of not being able to cover shelter costs or maintain their home (Bruce, 2003). This can force an involuntary move to lower-cost housing. Women who experience a marital shift (divorce, widowed, remarried) are far more likely to move than women in stable marital situations (Robison & Moen, 2000). Women are also more likely than men to experience health problems as they age (Martel & Bélanger, 2000; Prus, 2004), and more likely to be below the low income cutoff (National Advisory Council on Aging, 2006) increasing the likelihood of a woman experiencing a dwelling-ability mismatch.

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Core Housing Need and Older Adults: The Need for Expansion

While many facts and figures have been presented to demonstrate the linkages between housing, health, and finances for older adults, there is still a need to discuss what those linkages mean with respect to the core housing need definition. The core housing need definition was established in the 1980's to address the housing concerns of the entire population of men, women and children. At that time, population aging was not a reality in our society and the issues related to this unique portion of the population were not front and center. Times have changed. We have demonstrated through research that older adults have unique concerns related to health, wealth and housing and are at increased risk of core housing need when compared to the general population. Older adults report far more current and future concerns related to their health and functional status than they do their financial status. Despite this fact, the current definition of core housing need does not take into account the safety and accessibility fit of a dwelling with its occupant, perhaps assuming that sufficient income (i.e., spending less than 30% on shelter costs) would offset any gaps in this relationship. This assumption fails to account for the costs associated with acute and chronic illness, such as rehabilitation, prescription medications, homecare visits, and a possible loss of income. Using this same assumption, that income offsets gaps, then one could assume that an older adult spending less than 30% of income on shelter could afford to complete major home repairs and move to a larger dwelling, making the second and third criterion of core housing need unnecessary. Households failing to meet the affordability criterion, alone or in conjunction with the suitability and adequacy criteria, account for 89.2% of Canadian households in core housing need (Dunning, 2007). The reality is that few older adults are in core housing need because their homes are too small or in need of major repairs, two of the criteria which define core housing need. The majority of older adults move to downsize, not

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upsized their homes (Canada Mortgage and Housing Corporation, 2006). Dwellings that were ideal when mobility may not have been a concern and when family size dictated larger spaces may no longer be practical to navigate or maintain as an individual ages. Similarly, the need for home modification, not major housing repair, is the pressing issue for many Canadian older adults (Wagner, Shubair, & Michalos, 2010). A lack of adequate housing is only an issue for 15.3% of all households in core housing need, with only 5% failing to meet only the adequacy criterion (Dunning, 2007).

For all age groups, affordability is the most common unmet criterion for households being categorized as in core housing. While older adults are more likely to be in core housing need, they are less at risk of being in severe housing need. If the affordability criterion was raised from 30% to 35% of income spent on shelter, the incidence of core housing need in the older adult population would reduce from 14.4% to 7.7%, nearly a 50% reduction. This is not to say that increasing the affordability criteria should be considered. A small increase in income, insufficient to provide for modifications or moves, could remove older adults from core housing need, thus reducing the probability of programs and supports being developed to support this vulnerable group. This vulnerable portion of the population would essentially become invisible to policy makers and program developers should there be a small increase in government transfers or a small increase in the affordability standard criterion.

Research has established many important linkages between finances, health, and dwellings for older adults. The current core housing need definition takes into account only two of these three factors (finances and housing), and it would be prudent to add the third factor, health, to the definition to offset potential housing challenges Canada could face with a rapidly aging population. Past research has supported the need for this expansion (Weeks & LeBlanc,

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2010). Further research is needed in this area so that informed decisions can be made by policy makers as resources become available to develop low-cost housing options, and home modification programs. Older adults in housing need, whether due to health issues, lack of income, or lack of another supportive resource should have their opinions and preferences taken into account when policies and services are developed to serve them.

Chapter 4: Methodology

Research Questions

The purpose of this study was to understand what dwelling, health and mobility, financial, and demographic characteristics were influencing the future housing preferences and expectations of older adults who experience, or who are assessed to be at risk of experiencing unmet housing needs, and which, if any, factors predict these future housing preferences and expectations. Three research questions were answered through the secondary data analysis of the *Seniors' Housing and Support Services Survey*.

1. How do older adults with self-reported or assessed risk of unmet housing needs compare to older adults with met/limited housing needs on demographic, dwelling, health and mobility and financial characteristics?

In the first research question, the dependent variable was the level of housing need and the independent variables were the demographic, dwelling, health and mobility, and financial characteristics (outlined in *Measures* section below). The purpose of this question was to draw out similarities and differences between those older adults who reported their housing was not currently meeting their needs, those who were assessed to have unmet housing needs, and those who had met or limited housing needs. It was hypothesized that those with self-reported or assessed risk of unmet housing needs would fall into one or more of the following categories;

- to live in an older dwelling compared to those older adults with met/limited housing needs (e.g. increase in safety concerns related specifically to dwelling)
- to have lived in the dwelling a longer period of time compared to those older adults with met/limited housing needs (e.g. increase in attachment to dwelling)
- to have less financial resources compared to those older adults with met/limited

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housing needs (e.g. decrease in choice of alternative living arrangements)

- to be more likely to be female, and more likely to be single compared to those older adults with met/limited housing needs
 - to have increased health and safety concerns compared to those older adults with met/limited housing needs (e.g. decrease in choice of alternative living arrangements, increase in safety concerns related to fit between dwelling and individual)
 - to be older than those older adults with met/limited housing needs (e.g. increased safety concerns related to mobility)
2. Among older adults with self-reported or assessed risk of unmet housing needs, what are the similarities and differences on demographic, dwelling, health and mobility, and financial characteristics between those older adults whose housing decision is congruent and those whose housing decision is incongruent?

In the second research question, the dependent variable is the congruence of housing plans and the independent variables are the demographic, dwelling, health and mobility, and financial characteristics. This question revealed what characteristics were related to future housing decision congruence among those who do not plan to make a housing change despite their self-reported or assessed risk of unmet housing needs.

3. Among older adults with unmet housing needs, what demographic, dwelling, health and mobility, and financial characteristics are most important in explaining why they are or are not demonstrating housing decision congruence?

In this question, the dependent variable was the congruence of the housing plans and the independent variables were the demographic, dwelling, health and mobility, and financial

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characteristics. This question was designed to examine the strength of the influence of select demographic, dwelling, health and mobility, and financial characteristics on future housing decision congruence for older adults whose current housing needs were not being met.

Design

Secondary statistical data analysis involves the use of existing data to answer questions other than those the data was originally gathered to answer. It makes use of resources that are already available and avoids investing funds or time into gathering redundant data (Hakim, 1982; Kiecolt & Nathan, 1985). The data set for this study resulted from the *Seniors' Housing and Support Services Survey*, a survey conducted by ASHRA in the fall of 2006 and the winter of 2007. A complete methodology for the original study can be found in Shiner (2007), pp. 55-61. A summary of the original methodology is provided below.

Random sampling was used in a cross-sectional survey design to recruit 400 respondents from each of the four Atlantic Provinces. In New Brunswick, Newfoundland & Labrador, and Prince Edward Island, the Health Departments within the Provincial Governments provided a random sample of 600 older adults, age 65 and over for their province. The Government of Nova Scotia opted not to provide a similar list, and as a result an alternate sampling method was used. Random digit dialing was used to find participants for Nova Scotia, with respondents agreeing during the telephone call to accept or not accept the survey via mail. For the three remaining provinces, the pre-selected older adults were mailed an information card asking if they would like to participate in the study. They were asked to return the postage prepaid information cards with their language preference indicated (English or French), if they wished to receive the survey. The survey was sent out to all those who replied with an information letter detailing ethical considerations including respondents' rights with regard to confidentiality and

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anonymity. The sample size was chosen so the result could be generalized to the entire older adult population in Atlantic Canada. As a result of these sampling procedures, the gross response rate for the survey was 19.2%, with 1702 older adults from Atlantic Canada completing and returning the survey. Of the 1702 respondents, 522 older adults were from New Brunswick, 406 older adults were from Newfoundland and Labrador, 392 older adults were from Prince Edward Island, and 382 older adults were from Nova Scotia (Shiner, 2007).

Housing Need Groups and Congruence Sub Groups

Below is a description of the selection criteria for the three housing need groups, and four congruence sub groups used in this research.

1. *Self-Reported Unmet Housing Needs group (n=131)*: The self-reported unmet needs group consists of all respondents who responded “no” to question A9, “Does your current dwelling meet your needs?”
2. *Assessed Risk of Unmet Housing Needs group (n=503)*: The assessed risk of housing need group is a more complex group constructed from those who failed to meet at least two of the five criteria to be assessed to be at risk of housing need despite self-reporting that their housing needs were met (See Figure 1.). These five criteria were: the three core housing need criteria set out by CMHC: 1) *Affordability*, which necessitates that the respondent not be spending more than 30% of household income on shelter costs. This was determined using survey question G21, which asked, “What proportion of household income is spent on shelter costs.” 2) *Suitability*, which necessitates that there be one bedroom for each adult or adult couple in a dwelling, and was determined through a ratio calculation of the survey questions A17, “How many bedrooms are there in your dwelling”, and G8 “Who lives with you in your dwelling?” and 3) *Adequacy*, which necessitates that the home not be in need of any major

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repairs. This was determined using survey question A28c, “Is your dwelling in need of any major repairs.” Two additional criteria were added: 4) *Safety*, assessed by using a composite variable created from eight survey questions related to safety in the dwelling (A20-A27). The original questions asked if there is a safety concern (yes/no) with any of the eight areas so a “Yes” response was a clear indication of a problem for the respondent. The “Yes” responses for the eight questions were summed, and if the respondent indicated that there was a safety concern with any one or more of the eight dwelling characteristics (stairs, kitchen layout, bathroom layout, bedroom layout, storage space layout, windows, entrance, other design problem) they were categorized as “Safety criteria not met” in the newly constructed dichotomous *safety* variable. And, 5) *Accessibility* was established from a series of questions. The nine questions asked respondents about nine areas of accessibility and function; seeing, hearing, using stairs, getting in or out of a bed/chair, getting on or off the toilet, taking a bath/shower, doing chores around dwelling, moving about dwelling, and moving about outside of dwelling. First, the original nine survey questions (D1a-D1i) were transformed from four levels of difficulty (no problem, minor problem, fairly serious problem, and very serious problem) to two levels (no problem, and some problem). The “some problem” responses to the nine questions were summed and those who indicated “Some problem” in two or more areas were categorized as “accessibility criteria not met” in the new dichotomous variable *accessibility*. The justification for requiring that two or more areas be categorized as “Some problem” to be selected is that it will no longer be clear whether the individual only has minor problems with an aspect of accessibility. Having a minor challenge with one aspect of accessibility is not necessarily indicative of a risk of housing need, but having a challenge with two or more may be. The addition of the two criteria above and

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beyond the CMHC core housing need criteria stems from a review of the literature which concludes that both safety in the home, and accessibility and function are major housing concerns for older adults (Canada Mortgage and Housing Corporation, 2006; Wagnild, 2001; Weeks & LeBlanc, 2010). To be included in the assessed risk of housing need group, a respondent had to fail to meet two or more of the following five criteria; spend 30% or less of their household income on shelter, have no more than one adult or adult couple living in a bedroom, live in a dwelling that does not require major repairs, not have a concern with one or more areas of safety in their dwelling, or not have a concern with two or more aspects of accessibility and function. For this research, it was determined that it would be prudent to require the failure of two or more housing need criteria to be at assessed risk of housing need as the two new housing need criteria (accessibility and safety) had not yet been confirmed to be valid determinants housing need in this population.

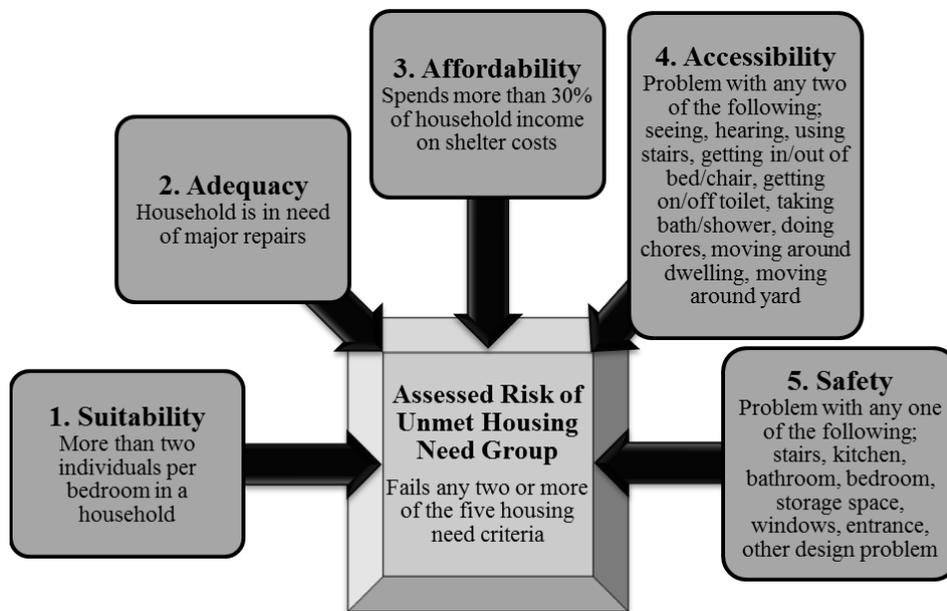


Figure 1. Assessed Risk of Unmet Housing Needs Group Selection Criteria Model

It is of particular importance to note at this stage that the variables created to

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measure affordability, adequacy and suitability in this research are not directly comparable to the measures used to evaluate these three criteria by CMHC. Variables were created, or selected from the Seniors' Housing and Support Services Survey that allowed for the closest comparison possible to CMHC core housing need data. There is particular challenge with comparison of the prevalence of affordability, as the question used to create this variable asks respondents to state the percentage of income spent on shelter and does not specify "before tax income" as required by CMHC, and also includes "home maintenance" in the list of items to include in the estimate. Maintenance costs are not included as a shelter cost in the CMHC definition of affordability.

3. *Met/Limited Housing Needs group (n=980)*: The met/limited housing needs group consists of those older adults who did not self-report having unmet housing needs, and who failed to meet two or more of the five criteria to be included in the assessed risk of unmet needs group. Using the criteria set out in this research, of an individual failing two or more criteria to be considered at assessed risk of housing need, individuals who fail only one housing need criterion are not assessed to be at risk of housing need. They may, however, be experiencing some level of housing need based on one failed criterion. For this reason, the group is deemed to have met or limited housing need. See Figure 2., for the study sample group distribution.

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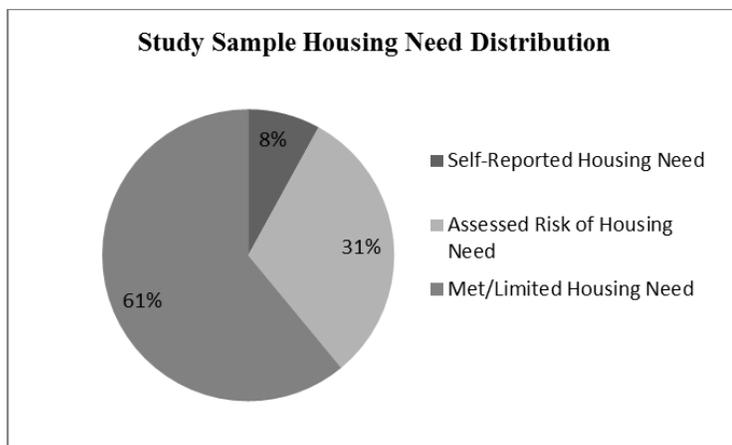


Figure 2. Study Sample Housing Need Distribution

Housing decision congruence measured whether participants with housing needs had plans to make a housing change in the future that would close the gap between their dwelling and their needs. A new variable was created by examining whether the self-reported unmet needs and assessed risk of housing need groups (See Housing Need Groups 1 & 2, above) plans to move (F1), or has considered making a housing modification (B2). If a respondent was in the self-reported unmet needs or assessed risk of housing need groups and they planned to move or make a modification, then there was seemingly congruence in their housing plans and they were be coded as “congruent” for the housing decision congruence variable. If the respondent was in the self-reported unmet needs or assessed risk of housing need groups and they did not plan to move or make a housing modification, then there was seemingly incongruence in their housing plans, and they were coded as “incongruent” for the housing decision congruence variable. This resulted in four sub groups to measure housing congruence: self-reported unmet needs congruent group (n=83), self-reported unmet needs incongruent group (n=48), assessed risk of unmet needs congruent group (n=221), and assessed risk of unmet needs incongruent group (n=282) (See Figure 2).

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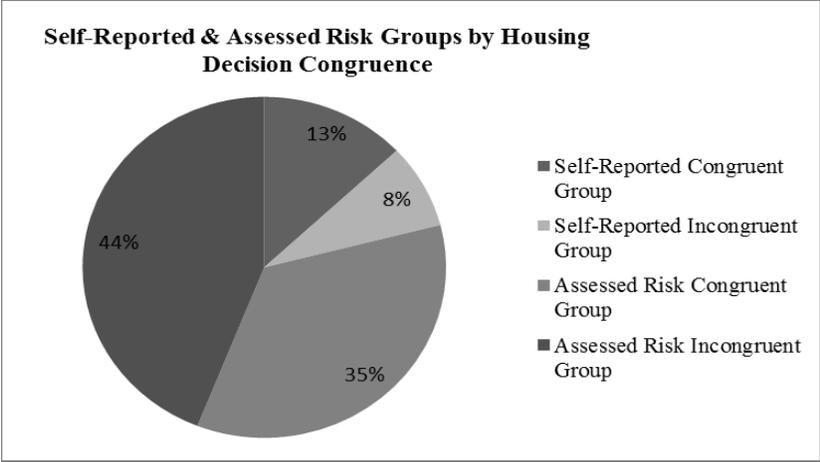


Figure 3. Self-Reported & Assessed Risk Groups by Housing Decision Congruence

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A visual model of the housing need groups and congruence sub groups is presented below in Figure 4. The first level shows the study sample, the second level shows the distribution of the three housing needs groups and the third level shows the distribution of the four congruence sub groups.

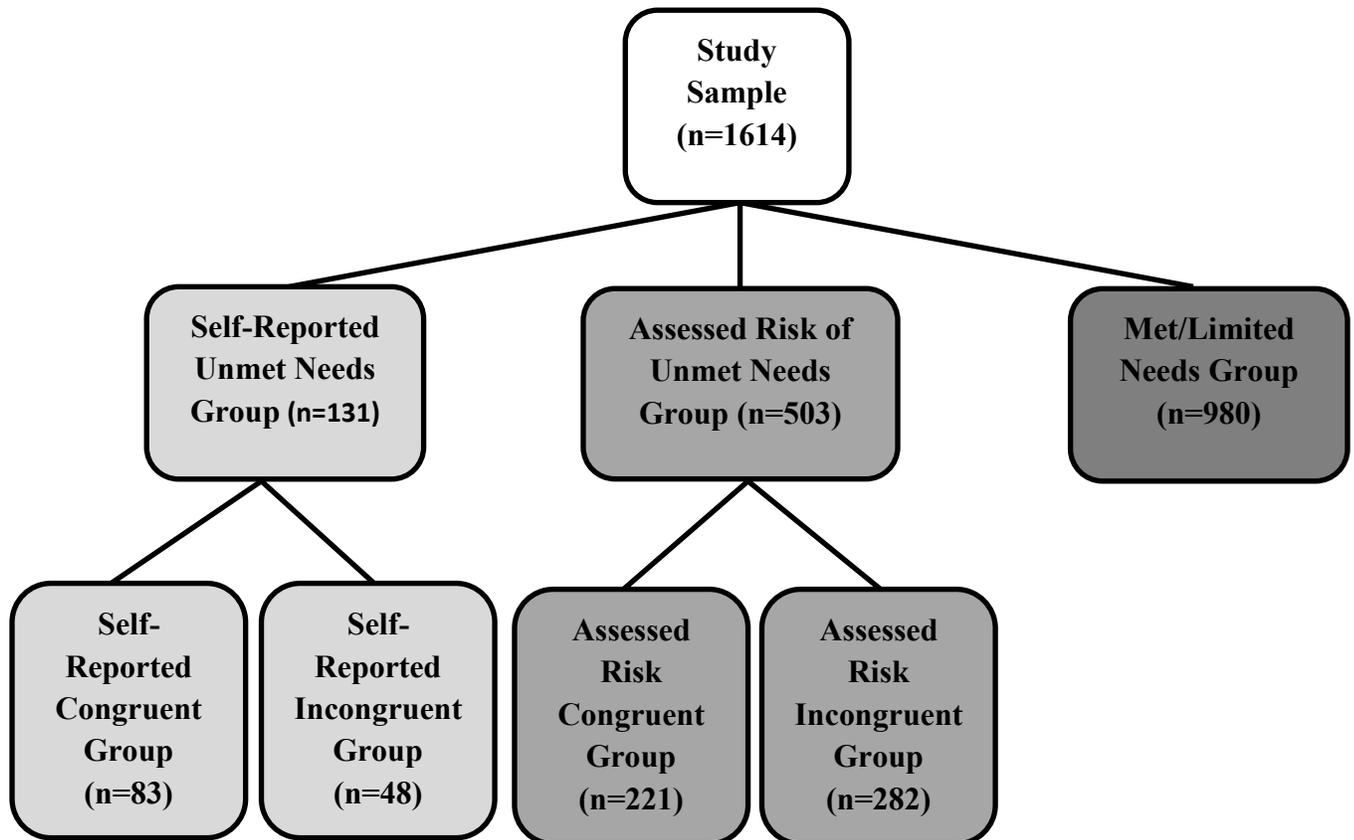


Figure 4. Study Sample Group Distribution

Measures

The instrument used to gather the data, the *Seniors' Housing and Support Services Survey*, was originally developed by the Canada Mortgage and Housing Corporation as a guide to be administered by professionals through an interview process. In 2006, the survey was pilot-tested on Prince Edward Island to alter its appearance and content so it could be self-administered by older adults. Altering the survey to allow it to be self-administered enabled the

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ASHRA team to gather feedback from a larger sample of older adults than would have been possible with the interview format. The pilot-test of the self-administered version of the survey was conducted to ensure that the newly altered instrument had high face, content and construct validity. The survey, though quite lengthy at 70 pages, was made highly accessible to people of varying education levels, and backgrounds and provided respondents with the option to use a family or community member as a proxy respondent.

The original ASHRA data set contains 1002 variables in total for each of the 1702 respondents. The original data set was created and cleaned in 2007 using the Statistical Package for the Social Sciences (SPSS Version 13.0). For this research, a total of 88 cases had to be removed from the data set; 1 case withdrew participation, 30 cases were under the age of 65, and 57 cases did not respond to the key selection question, A9_Dwell, “Does your current housing meet your needs?” This resulted in a study sample of 1614 Atlantic Canadian older adults. Below is a description of the 50 variables that were analyzed in this project organized into four themes; demographic characteristics, dwelling characteristics, health and mobility characteristics, and financial characteristics. Life course theory guided the choice of variables for analysis, ensuring that measures of the individuals past (duration in their current dwelling, reason for choosing current dwelling, age), present (current dwelling type, health status, income), and future (dwelling types the older adult would consider, plans to move) were included. During previous analysis of the survey data by project investigators, many of the variables were recoded to eliminate small cell sizes. It is noted in the measures section where questions were recoded previously by team members, and where they were recoded for this project specifically. The anticipated small sample sizes made the recoding of some variables necessary for this project to reduce empty or small cell sizes while retaining the highest level of data possible. Section and

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question number from the survey are provided for each variable for ease of reference.

Demographic characteristic measures.

The demographic characteristics of the housing need groups and congruence sub groups have been measured through five variables, and have been used to describe the key socio-demographic characteristics of the participants. *Gender* (G1) is coded using a dichotomous male/female response. *Relationship status* (G2) is coded using four categories; married/common-law/same-sex union, separated or divorced, widowed, and never married. As noted earlier in the literature, widowed persons, and widowed women especially could be at higher risk for housing need so it is especially important to capture the housing experiences of those who are widowed. *Age* (G3) was originally obtained through a date of birth. To ensure anonymity, the data was previously recoded into five age groups; 65-69, 70-74, 75-79, 80-84, and 85 and older. The *education level* (G11) of respondents was coded using four categories; less than elementary school, less than high school, graduated high school, attended or completed technical/college/university. Finally, *home province* (G18) was coded using four categories; New Brunswick, Newfoundland and Labrador, Prince Edward Island, and Nova Scotia.

Dwelling characteristic measures.

Dwelling characteristics have been measured using 24 variables from the survey. The *location* (A3) of the respondent's dwelling has previously been recoded from the original survey with those responding living in a town or city being categorized as urban, and those responding that they live in a village, or a rural area less or more than 10 kilometers from a town/city being categorized as rural. It was important to look at the geographic location of the older adult because rural older adults have been shown to be at high risk for housing need (Bruce, 2003). *Current dwelling type* (A7) has been recoded into four categories, single family dwelling, apartment, semi-detached/duplex row house/townhouse, and other. In order to examine the

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relationships between older adults on the housing continuum, it was important to understand what type of dwelling was or was not meeting their needs. The dichotomous variable of *current dwelling is meeting the respondents' needs* (A9) was coded with either a “yes” or “no” response. This is a key variable in this study and helps to select the self-reported unmet needs group. The *year the respondents home was built* (A14) was originally collected in eight categories but was recoded into four categories for this study; 1955 and earlier, 1956-1975, 1976-1995, and 1996-2006. The age of dwelling impacts the level of repairs that are needed, and the amount of accessible features that would have been included when it was built. The *number of years in current dwelling* (A15) was originally reported in months and years. The numeric data had previously been categorized into four categories; less than 5 years, 5-15 years, 16-30 years, and 31 or more years. This question speaks to the potential attachment to a home, and to whether a recent move was already made to meet needs. The *number of bedrooms in the dwelling* (A17) is expressed as a numeric value as is included to assess the suitability of a dwelling using the CMHC core housing need guidelines. *Housing tenure* (A19) was recoded into three categories, own, rent, and other. This question was included because it has been shown previously that renters and owners vary in their willingness to move in their later years (Canada Mortgage and Housing Corporation, 2006). For this study, a new dichotomous yes/no variable capturing *safety* within the dwelling was created using eight survey questions (A20-A27). If the respondent indicated that there was a safety concern with one or more of the eight aspects (stairs, kitchen layout, bathroom layout, bedroom layout, storage space layout, windows, entrance, other design problem) of their dwelling they were categorized as “Safety criteria not met” in the new variable, and if they responded no to all of the questions they were categorized as “Safety criteria met”. This variable is key component of the study, and assisted with the selection of the assessed risk

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of unmet needs group. The *dwelling in need of major repairs* (A28c) is coded using “yes” or “no” to the question. This variable also assisted in selecting the assessed risk of unmet needs group. *Home modifications* both completed (B1), and *considered* (B2) were reported using a yes/no response. The first variable, B1, shows if a dwelling is still not meeting needs despite a modification, and the second variable, B2, has considered making modifications, helps to create the housing congruence variable (below). There are *nine types of housing* that the respondents could indicate if they would be interested in living in the future (B4-B12). Originally, the willingness of the respondent to consider these type of dwellings were coded using four categories; I live in this type of dwelling, yes, no, or maybe. The “yes” and “maybe” responses are both speculative and they both indicate a willingness to consider the type of dwelling. For this study “yes” and “maybe” and “I currently live in this type of dwelling” were collapsed into “yes”, and “no” remained unchanged, creating two categories. The nine types of dwelling which were recoded (yes, no) into the two categories include; single-family detached house, co-operative housing, special retirement housing, sheltered housing, congregate housing, live-in housekeeper, Abbeyfield housing, garden suite, or mobile home. These questions highlight what types of housing older adults are willing to consider for the future.

A few variables enabled the examination of the respondent’s future housing plans. The respondent’s *plans to move* (F1) was coded using a yes/no response and helped to create the housing congruence variable (below). It was determined *who lives with the respondent* (G8) using six categories; no one, spouse/partner, children/grandchildren, sibling, parents, and/or friends. These categories, when summed and compared to number of bedrooms in the home, helped to create the suitability criteria for the assessed risk of unmet needs group. Finally, a new variable “housing decision congruence.” was created using F1, *plans to move* and B2, *has*

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considered making a housing modification. If a respondent had a self-reported or assessed risk of unmet housing need and they planned to move or make a modification they were coded as “congruent” for the housing decision congruence variable. If the respondent had a self-reported or assessed risk of unmet housing need, and they did not plan to move or make a housing modification, they were coded as “incongruent” for the housing decision congruence variable. This variable was used to select the congruence sub groups for the second research question.

Health and mobility characteristic measures.

Health and mobility characteristics were measured in this study using seven variables. The characteristics were chosen to represent the most common physical and cognitive challenges faced by older adults in Canada. Accessibility and mobility were captured by recoding a series of questions about the *level of difficulty respondent’s experience with nine aspects of accessibility and function* (D1a-D1i) from four levels of difficulty (no problem, minor problem, fairly serious problem, and very serious problem) to two categories (no problem, and some problem). The nine areas of accessibility and function included; seeing, hearing, using stairs, getting in or out of a bed/chair, getting on or off the toilet, taking a bath/shower, doing chores around dwelling, moving about dwelling, and moving about outside of dwelling. Once the nine aspects of accessibility and function were coded into no problem or some problem, a new dichotomous yes/no variable, *accessibility*, was created and all those who responded “some problem” to two or more of the nine aspects were coded as “yes” and all those who responded “some problem” to fewer than two were coded as “no”. This variable was used to select the assessed risk of unmet needs group. The respondent’s cognitive function was measured using two variables. The first, *ability to remember* (D2), was originally coded into four categories; unable to remember at all, very forgetful, somewhat forgetful and able to remember most things. For this study, three

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categories were created; generally forgetful (unable to remember at all and very forgetful), somewhat forgetful and able to remember most things. *Ability to think and problem solve* (D3) was originally coded using five categories; but unable to think or solve problems, great deal of difficulty, were collapsed to unable/great difficulty thinking or solving problems, while some difficulty, little difficulty, able to think clearly and solve problems were left as originally coded. The presence of three common chronic health conditions were measured using a yes/no response; *stroke* (D4a), *arthritis* (D4d), *Alzheimer's disease or other dementia* (D4e). *Respondent's self-reported health status* (G12) was recoded from five categories; very poor, poor, fair, good, and excellent into three categories, very poor or poor, fair, and good or excellent.

Financial characteristic measures.

Financial characteristics were measured in this study using 14 variables. The first set of variables looked at ten common *sources of income* (G19a-G19j) for older adults using yes/no responses. The potential sources of income included; Old Age Security Pension, Federal Guaranteed Income Supplement, Canada or Quebec Pension Plan, other government sources, retirement pensions/superannuation or annuities, employment, savings and investments, employment insurance, social assistance, or other. *Household income* (G20) was recoded into four categories from the original ten categories; \$19,999 or less, \$20,000-\$39,999, \$40,000-\$59,999, and \$60,000 or more. The self-reported variable *Percentage of income spent on shelter* (G21) was coded into three categories; less than 30%, 30-39%, and more than 40%. This variable assisted in the creation of the assessed risk of unmet needs group, as it allows for comparison to CMHC's core housing need affordability criteria. For renters, *monthly rent payment* (H1) was recoded into three categories; less than \$350/month, \$350-\$700/month and more than

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\$700/month. The *homeowners estimate of the dwellings worth* (I1) was coded into five categories; less than \$50,000, \$50,000-\$99,999, \$100,000-\$199,999, \$200,000-\$299,999, and \$300,000 or more.

In order to ensure that this study is valid, data from the ASHRA data set was compared with the *Seniors in Canada 2006 Report Card* issued by the Government of Canada to see if there were similarities on topics such as income, shelter costs and health status. Criterion validity was established when the results from the ASHRA survey were similar to those from the *2006 Canadian Report Card*. Threats to external validity were addressed during the data gathering in 2006 and 2007 and therefore did not require any additional action.

Defining Housing Need

In conducting an analysis of housing preferences and expectations of older adults with unmet housing need, the first task was to define “housing need” and then to test whether the variables created to measure housing need were in fact useful. As seen in Figure 5., the increasing order in prevalence of the five housing need criterion was the same amongst the self-reported and assessed risk groups, with safety and affordability being the most commonly failed housing criteria, followed by accessibility, adequacy and suitability. For the met/limited need group, of whom 46% failed no criterion and 54% failed one criterion, affordability was the most commonly failed, followed by safety, accessibility, adequacy and suitability. When comparing the self-reported and assessed risk groups on prevalence of failed housing need criterion, the assessed risk group had higher prevalence of accessibility and affordability issues, while the self-reported group had a higher prevalence of adequacy and safety issues. Suitability issues were uncommon among all three groups.

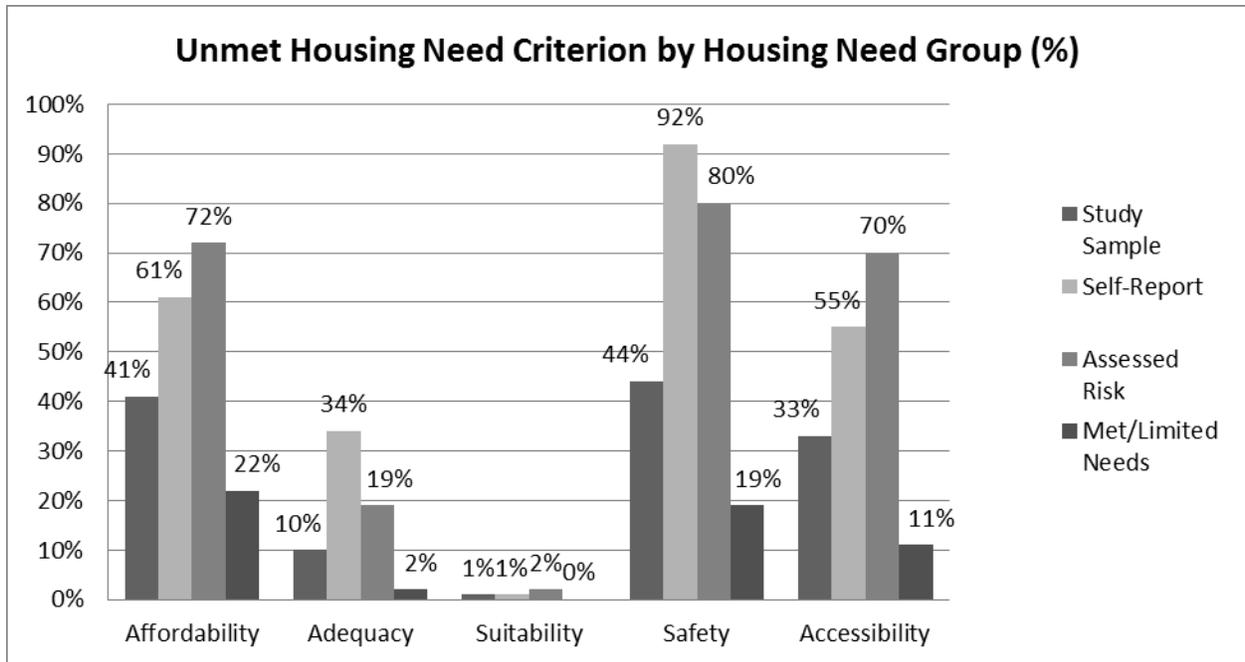


Figure 5. Unmet Housing Need Criterion by Housing Need Group

While it is important to understand which criterion are the most commonly failed among each group, it is equally important to understand the level of housing need of the group. The number of housing criterion failed can be indicative of the level of housing need of an individual (i.e., more failed criterion indicates higher levels of housing need). Among the study sample, 28% met all five criteria, and 34% failed one criterion. The self-reported unmet needs group differed considerably from study sample averages, with only 5% meeting all five criteria and 12% failing only one criterion. As anticipated, the self-reported unmet needs group had the highest proportion of respondents with four failed housing need criteria (15%), and thus, are expected to be experiencing high levels of housing need. The majority of the assessed risk of housing need group failed two criteria, while nearly a third of those at assessed risk failed three criteria. No respondents failed all five housing need criteria.

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On the affordability criterion, the assessed risk group had the highest prevalence with 72% of the group failing this criterion, compared to only 22% of the met/limited needs group. On the criterion of adequacy, the self-reported housing need group had the highest prevalence, with 34% of the group failing this criterion, in contrast to only 2% of the met/limited needs group. Suitability was not an issue for any of the three housing need groups. Safety was a considerable issue for those in self-reported (92%) and assessed risk of housing need (80%), compared to those in the met/limited housing need group (19%). Finally, the highest prevalence of accessibility issues was found in the assessed risk group with 70% failing this criterion, followed by those in self-reported housing need (55%). Comparatively, only 11% of those with met/limited housing need failed the accessibility criterion.

Table 1. Respondents Who Failed to Meet 0-5 Housing Need Criteria by Housing Need Group (%)

	Self-Reported Unmet Needs (n=131)	Assessed Risk of Unmet Needs (n=503)	Met/Limited Needs (n=980)	Study Sample (n=1614)
Zero Criterion	6 (4.5)	-	450 (45.9)	456 (28.3)
One Criterion	15 (11.5)	-	530 (54.1)	545 (33.8)
Two Criteria	47 (35.9)	316 (62.8)	-	363 (22.5)
Three Criteria	44 (33.6)	158 (31.4)	-	202 (12.5)
Four Criteria	19 (14.5)	29 (5.8)	-	48 (3.0)
Five Criteria	0 (0.0)	0 (0)	-	0 (0.0)
Total	131 (100%)	503 (100%)	980 (100%)	1614 (100%)

Note: A dash (-) indicates a cell that are necessarily empty due to group selection criteria.

To test the utility of adding the two additional criteria of safety and accessibility, two logistic regression models were developed (See Appendix D – Housing Need Criteria Logistic

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Regression Tables). The models were tested on the self-reported unmet needs group, as they were the only housing need group that was not created using the five housing need criteria. The first model included only the three CMHC core housing need criteria, of affordability, adequacy and suitability. The second model included the CMHC core housing need criteria, but also included the two additional criteria of safety and accessibility. The two models were compared to determine if the two additional criteria of safety and accessibility add to the model to predict if a respondent would be in self-reported housing need. Figure 6., shows the prevalence of the five housing need criteria in the self-reported unmet needs group.

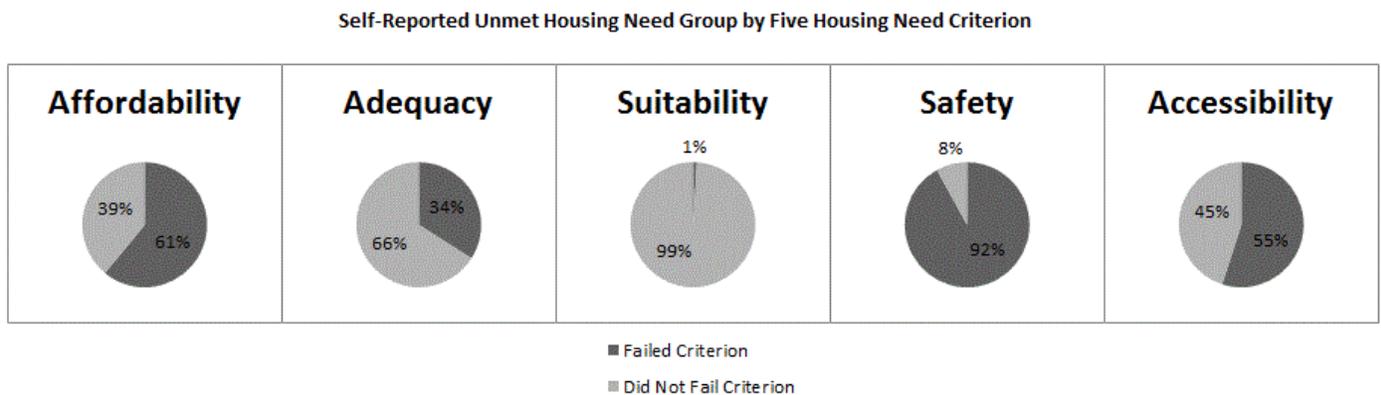


Figure 6. Self-Reported Unmet Housing Need Group by Five Housing Need Criterion

A comparison of two regression models was conducted, the first model contained only the three core housing need criteria (affordability, adequacy, and suitability), while the second model contained all five housing need risk criteria (affordability, adequacy, suitability, safety, and accessibility). It was found that by adding the two additional criteria (safety and accessibility) that a strongly statistically significant improvement was made in the models power to predict if an older adult was in self-reported housing need [$p = \sim 0$]. Next, it was determined if one or both of the two additional variables were contributing to the improvement in the model. When terms were added sequentially to the model, the test showed that accessibility was only a

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significant predictor of self-reported housing need when added before safety to the model [$p=0.0001$]. When safety was included in the model, accessibility was no longer needed to predict self-reported housing need. A similar finding was made when terms were added last in the model; accessibility was not significant when safety was included in the model. Suitability was not a significant predictor of self-reported housing need in any of the models that were tested.

Ethical Considerations

The *Seniors' Housing and Support Services Survey* project received ethical approval from five university ethics boards, including the Mount Saint Vincent University Research Ethics Board, and the Research Ethics Boards of the University of Prince Edward Island, Dalhousie University, Memorial University, and the University of New Brunswick. This research project received ethical approval on June 24, 2010 from the Mount Saint Vincent University Research Ethics Board (UREB# 2010-014).

Before the data were gathered in 2006, participants were advised of their rights with respect to anonymity and confidentiality through materials approved by the ethics boards, listed above. There were two layers of protection used to guard participants' anonymity in this study. The first layer involved the data being cleaned of identifying markers; this was done using a four-digit case identification number that could not be traced back to individual participants, and through the removal of personal information including postal codes, and dates of birth. Measures were taken to ensure that disclosure did not occur, whether by specifically identifying an individual, as in identity disclosure or by giving information that could lead the individual to be identified, as in attribute disclosure (Statistics Canada, 2009b). These measures included (a) not reporting cross tabulated cell sizes smaller than five, and (b) never reporting values of 100% or

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0% for any cell. Shredding will be the method used when disposing of all print materials, such as data outputs and syntax. The second layer of protection took place following analysis, when three members of the ASHRA team, including the Principal Investigator and two Co-investigators, reviewed all results and materials produced during this study. During this study, all ethical guidelines agreed upon by the ASHRA researcher group and the Tri Council's Ethical Conduct for Research Involving Humans were strictly adhered to.

Data Analysis Plan

As stated previously, there were three housing need groups examined in this research project, those respondents who self-reported that their current housing did not meet their needs, those who were assessed to be at risk of having unmet housing needs using CMHC's three core housing need criterion, plus two additional criteria related to health and safety. Finally, there was a group of older adults whose housing needs were met or limited. From the two unmet needs groups four additional sub groups were created using the "housing decision congruence" variable. This resulted in the creation of the self-reported unmet needs congruent group, self-reported unmet needs incongruent group, assessed risk of unmet needs congruent group, and assessed risk of unmet needs incongruent group. The two congruent groups and the two incongruent groups were combined to address research question #3. The overall purpose of the analysis was to determine what are the characteristics of older adults with various levels of housing needs and what factors are contributing to the congruence of housing choices made by older adults' with unmet housing needs, whether self-reported or assessed. To help determine what factors were at work, a number of statistical procedures, described below, were carried out using the Statistical Package for the Social Science (SPSS® Version 18.0) and R® (Version 2.13.1).

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To answer the first research question, the sampling procedures outlined in the *Design and Sample* section of this thesis were used to create the three housing need groups. Then a series of frequencies were conducted on each of the three housing need groups to describe the key socio-demographic characteristics of the three housing need groups. Frequencies were conducted on 41 demographic, dwelling, health and mobility, and financial characteristics, including the nine key characteristics; home province, sex, age, health status, relationship status, education, household income, dwelling type, and housing tenure. Chi Square Tests of Independence were conducted as part of a cross sectional correlate analysis to identify significant associations between level of housing need, and the 41 characteristics. Next, the three groups were described with respect to the three core housing need criteria, affordability, adequacy and suitability, and the two additional criteria, accessibility and safety. Classification trees were used to demonstrate which of the nine demographic characteristics contributed to a higher probability of being in each of the three housing need groups.

To answer the second research question, the sampling procedures outlined in the *Design and Sample* section of the paper were used to create the four congruent/incongruent unmet needs groups. Next, the nine key socio-demographic characteristics were examined using cross sectional correlate analysis with Chi Square Test of Independence to describe each of the four groups. Finally, two classification trees were used to show which of the nine demographic characteristics contributed to a higher probability of housing decision congruence (congruent versus incongruent) within the self-reported unmet needs group and within the assessed risk of unmet needs group.

To answer the third research question, cross sectional correlate analysis and a classification tree were used to show which of the nine demographic characteristics were related

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to housing decision congruence (n=304) versus incongruence (n=330), combining the self-reported unmet needs group and the assessed risk of unmet needs group. Logistic regression analysis was conducted on those respondents who self-reported or were at assessed risk of housing need (n=634). Logistic regression was used because the explanatory variables were dichotomous. The purpose of the logistic regression was to assess the impact of nine explanatory variables on the response variable, which was the congruence of the housing decision, characterized by either a plan to move or a consideration of making housing modifications by those who self-report or at assessed risk of their dwelling not meeting their needs. The explanatory variables were the nine key characteristics; home province, sex, age, health status, relationship status, education, household income, dwelling type, and housing tenure.

Recoding of the research variables and the development of descriptive statistics, including Chi Square testing were conducted using SPSS®. Chi Square tests were conducted on each variable to determine if there was a significant relationship between the variable and level of housing need (self-reported, assessed risk or met/limited), or housing decision congruence (congruent or incongruent). No correction was applied to the p values to account for multiple testing. Results indicate statistical significance but do not assess practical significance.

Both the classification trees and logistic regression were conducted using R®, a Linux-based statistical analysis software program. Regression analysis was conducted using the generalized linear modeling package in R® to fit the logistic models. Akaike Information Criterion (AIC) scores are used to compare models for best fit. The model with the best fit has the lower AIC score (Forster & Sober, 2010). Outputs from this process can be found in Appendix B. R Code Outputs – Logistic Regressions.

Classification trees are non-linear predicative models used to predict the distribution of a

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categorical dependent variable based on a selection of categorical predictor variables (Shalizi, 2009). Each “branch” of a classification tree represents a variable, and each split in the branch represents the way the categories of that variable are distributed. When creating classification trees, often the statistical analysis program “over fits” the tree, or continues to include variables (branches) despite the fact that they are not contributing to the accuracy of the distributional prediction in any meaningful way. The accuracy of the predicative power of the classification tree is determined by the misclassification error rate, or the percentage risk of a case being misclassified using the given tree. A misclassification error rate of .45 indicates that approximately 45% of cases will be misclassified using the current tree. A statistical procedure identifies extraneous branches, and therefore extraneous variables, that do not further reduce the misclassification error rate. The nomenclature for classification trees labels “pruning” as the procedure used to remove these extraneous branches from the model. The classification trees presented in the body of this thesis have been pruned. The over-fit, non-pruned trees along with the documentation of the creation of the trees can be found in Appendix C. R Code Output – Classification Trees.

Missing Variables

Missing variables were handled in three separate ways in this analysis. For the creation of the assessed risk of housing need group, the five housing need criteria were categorized as “met/limited need” or “unmet need”. Respondents with missing data for a given question were coded as met/limited need, allowing these individuals to remain in the study. Without this approach to handle missing data many survey respondents (~400) would have been excluded from the research due to their non-response to one or more question. This was the most conservative way to place all individuals into a housing need group. For the descriptive statistics

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(frequencies), valid percentages were expressed. Finally, in Table 15. (Appendix D), a comparison of two housing decision congruence models, cases with missing data were excluded from the comparison of the two models.

Chapter 5: Results

The results section of this thesis contains results from three different types of analysis; cross-sectional correlate analysis, classification trees, and logistic regression modeling. Sections 1-3 address Research Questions 1-3, respectively.

Section 1: Comparing Housing Need Groups

How do older adults with self-reported or assessed risk of unmet housing needs compare to older adults with met/limited housing needs on demographic, dwelling, health and mobility and financial characteristics?

Housing need group descriptions

The first part of Section 1 provides an overview of the three housing need groups by the nine key descriptive characteristics; home province, sex, age, health status, relationship status, education, household income, dwelling type, and housing tenure.

In the self-reported unmet needs group (n=131), 67% of respondents were female. The majority of the group had a partner (56%) or was widowed (27%), while 16% had been divorced or separated. While only 4% of group members were over the age of 85, 64% were between the ages of 65-74. More than half had not completed high school (56%), while nearly one third of group members reported attending or completing university or college (31%). While Nova Scotia (28%), New Brunswick (28%), and Newfoundland and Labrador (30%) residents were fairly equally represented in this group, Prince Edward Island residents accounted for far fewer subgroup members (15%). Only 13% of group members had household incomes greater than \$40,000/year, while 43% had household incomes of \$19,999/year or less. Most lived in single family dwelling (64%), and owned their dwelling (63%) though a considerable number were apartment dwellers (21%).

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In the assessed risk of housing need group (n=503), the majority of respondents were female (60%). Most had a partner (57%) or had been widowed (30%), while only 4% had never married. The majority of group members were aged 65-74 (55%), though 12% were over the age of 85. Many group members had not completed high school (41%), though 45.4% had attended or completed college or university. New Brunswick had the highest number of respondents in this group (32%), while Newfoundland and Labrador had the lowest (20%). The majority of individuals lived in a single family dwelling (70%), owned their dwelling (74%) and had household incomes of less than \$39,999/year (77%). Only 9% of group members had household incomes greater than \$60,000/year.

For the met/limited needs group (n=980), a small majority were female (55%). Most had a partner (70%), and only 3% had been separated or divorced. The majority were between ages 65-74 (65%) and 6% were over the age of 85. Half had attended or completed university or college (50%), and 32% had not completed high school. Nova Scotians represented the smallest proportion of this group (21%), while New Brunswickers made up 31% of group members. The majority of group members had household incomes between \$20,000/year and \$59,999/year (71%) with 14% making \$19,999/year or less, and 15% making \$60,000/year or more. Most group members lived in a single family dwelling (80%), and owned their dwelling (82%), with only a small proportion living in apartments (9%).

Correlates of housing risk

In this section patterns in demographic, dwelling, health and mobility, and financial characteristics are examined where they exist across the three housing need groups.

Demographic characteristics

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In the cross-sectional correlate analysis of data in Table 2., demographic characteristics that appeared to be related to a higher risk of housing need included; being female, being separated or divorced, and not graduating from high school. Factors that appeared to be related to a lower risk of housing need included; having a partner, and being male. Chi square analysis showed that there was a statistically significant relationship between all five demographic characteristics and level of housing need, though significance levels varied. The strongest associations existed between level of housing need and relationship status, and level of housing need and education.

Table 2. Demographic Characteristics of Housing Need Groups (%)²

	Self- Reported Unmet Needs (n=131)	Assessed Risk of Unmet Needs (n=503)	Met/Limited Needs (n=980)	Study Sample (n=1614)
Home Province*				
New Brunswick	37 (28.2)	162 (32.2)	300 (30.7)	499 (31.0)
Newfoundland & Labrador	39 (29.8)	99 (19.7)	247 (25.3)	385 (23.9)
Nova Scotia	36 (27.5)	115 (22.9)	207 (21.2)	358 (22.2)
Prince Edward Island	19 (14.5)	127 (25.2)	224 (22.9)	370 (23.0)
Sex*				

² Note: Data is organized so that each column totals to 100% for a given characteristic. For example, for the variable "Home Province", 28.2% of those in self-reported housing need are from New Brunswick, 29.8% are from Newfoundland and Labrador, 27.5% are from Nova Scotia, and 14.5% are from Prince Edward Island.

Housing Need

Male	42 (32.6)	198 (39.7)	431 (44.6)	671 (42.1)
Female	87 (67.4)	301 (60.3)	535 (55.4)	923 (57.9)
Relationship Status***				
Never Married	2 (1.6)	18 (3.6)	30 (3.1)	50 (3.1)
Widowed	35 (27.3)	150 (30.1)	227 (23.4)	412 (25.8)
Separated/Divorced	20 (15.6)	47 (9.4)	33 (3.4)	100 (6.3)
Married/Common-law	71 (55.5)	284 (56.9)	680 (70.1)	1035 (64.8)
Age**				
65-69	46 (35.7)	149 (30.1)	349 (36.7)	544 (34.5)
70-74	37 (28.7)	122 (24.6)	273 (28.7)	432 (27.4)
75-79	28 (21.7)	112 (22.6)	173 (18.2)	313 (19.9)
80-84	13 (10.1)	55 (11.1)	99 (10.4)	167 (10.6)
85+	5 (3.9)	57 (11.5)	57 (6.0)	119 (7.6)
Education***				
Less than Elementary	29 (22.5)	62 (12.7)	72 (7.5)	163 (10.4)
Less than High School	43 (33.3)	136 (27.8)	235 (24.6)	414 (26.3)
Graduation				
High School Graduation	17 (13.2)	69 (14.1)	173 (18.1)	259 (16.5)
Attended or Completed	40 (31.0)	222 (45.4)	474 (49.7)	736 (46.8)
Technical/College/University				

Note: *p < .05. **p < .01. ***p < .001.

Dwelling characteristics

Housing Need

In the cross-sectional correlate analysis of data in Table 3., dwelling characteristics that appeared to be related to a higher risk of housing need included; living in an apartment, townhouse, rowhouse, or duplex, renting a dwelling, and living in a rural area, and living in an older home. Factors that appeared to be related to a lower risk of housing need included; owning a dwelling, living in an urban area, and living in a newer home. Chi square analysis showed that there was a statistically significant relationship between dwelling type, housing tenure, geographic location, the year the dwelling was built and level of housing need, though significance levels varied. The strongest associations existed between level of housing need and housing tenure and level of housing need and dwelling type. The number of years in the current dwelling was not significantly related to level of housing need.

Table 3. Dwelling Characteristics of Housing Need Groups (%)

	Self- Reported Unmet Needs (n=131)	Assessed Risk of Unmet Needs (n=503)	Met/Limited Needs (n=980)	Study Sample (n=1614)
Dwelling Type***				
Single Family Dwelling	84 (64.1)	354 (70.4)	783 (79.9)	1221 (75.7)
Apartment	28 (21.4)	78 (15.5)	89 (9.1)	195 (12.1)
Townhouse/Duplex/Row House	8 (6.1)	21 (4.2)	37 (3.8)	66 (4.1)
Other	10 (7.6)	50 (9.9)	68 (6.9)	128 (7.9)
Housing Tenure***				

Housing Need

Other	10 (7.6)	18 (3.6)	53 (5.4)	81 (5.0)
Rent	37 (28.2)	112 (22.3)	120 (12.2)	269 (16.7)
Own	83 (63.4)	370 (73.6)	802 (81.8)	1255 (77.8)
<hr/>				
Geographic Location*				
Rural	105 (80.2)	337 (67.5)	668 (69.2)	1110 (69.6)
Urban	26 (19.8)	162 (32.5)	297 (30.8)	485 (30.4)
<hr/>				
Year Built**				
Before 1956	49 (41.5)	146 (30.2)	247 (26.4)	442 (28.7)
1956-1975	41(34.7)	159 (32.9)	328 (35.0)	528 (34.3)
1976-1995	23 (19.5)	144 (29.8)	258 (27.5)	425 (27.6)
1996-2006	5 (4.2)	34 (7.0)	104 (11.1)	143 (9.3)
<hr/>				
Years in Current Dwelling				
Less than 5 years	27 (20.6)	82 (16.3)	147 (15.0)	256 (15.9)
5-15 years	25 (19.1)	122 (24.3)	200 (20.4)	347 (21.5)
16-30 years	26 (19.8)	115 22.9)	228 (23.3)	369 (22.9)
More than 30 years	53 (40.5)	184 (36.6)	405 (41.3)	642 (39.8)

Note: *p < .05. **p < .01. ***p < .001.

Health and mobility characteristics

In the cross-sectional correlate analysis of data in Table 4., health and mobility characteristics that appeared to be related to a higher risk of housing need included; being in poor, very poor, or fair health, having cognitive issues, Alzheimer's disease, arthritis or having had a stroke. Factors that appeared to be related to a lower risk of housing need included; being in good or excellent health, and having no cognitive issues. Chi square analysis showed that there was a strongly

Housing Need

significant relationship between health status, ability to remember, ability to think clearly, having arthritis or having had a stroke and level of housing need. Having Alzheimer's disease was not significantly related to level of housing need.

Table 4. Health and Mobility Characteristics of Housing Need Groups (%)

	Self-Reported Unmet Needs (n=131)	Assessed Risk of Unmet Needs (n=503)	Met/Limited Needs (n=980)	Study Sample (n=1614)
Health Status***				
Very Poor or Poor Health	26 (19.8)	39 (7.9)	28 (2.9)	93 (5.9)
Fair	50 (38.2)	182 (36.8)	177 (18.4)	409 (25.7)
Good or Excellent	55 (42.0)	273 (55.3)	759 (78.7)	1087 (68.4)
Ability to Remember***				
Unable to remember/Very forgetful	5 (3.9)	12 (2.4)	11 (1.1)	28 (1.7)
Somewhat forgetful	29 (22.8)	128 (25.7)	132 (13.7)	289 (18.2)
Remember most	93 (73.2)	358 (71.9)	822 (85.2)	1273 (80.1)
Ability to Think Clearly and Solve Problems***				

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Unable to or great difficulty solving problems	5 (3.9)	10 (2.0)	3 (0.3)	18 (1.1)
Some difficulty	10 (7.8)	28 (5.6)	16 (1.7)	54 (3.4)
Little difficulty	19 (14.7)	95 (19.2)	56 (5.8)	170 (10.7)
Able to think clearly	95 (73.6)	363 (73.2)	891 (92.2)	1349 (84.8)
<hr/>				
Presence of Health Conditions				
<hr/>				
Stroke***	19 (14.8)	51 (10.3)	52 (5.4)	122 (7.7)
Arthritis***	92 (71.9)	331 (67.1)	417 (43.0)	840 (52.8)
Alzheimer's Disease	4 (3.1)	9 (1.8)	13 (1.3)	26 (1.6)

Note: *p < .05. **p < .01. ***p < .001.

Financial characteristics

Finally, in the cross-sectional correlate analysis of data in Table 5., financial characteristics that appeared to be related to a higher risk of housing need included; having a household income lower than \$19,999/year and owning a home with an estimated selling price of less than \$50,000. Factors that appeared to be related to a lower risk of housing need included; owning a home with an estimated selling price of more than \$100,000, and having income from savings and investments, a pension plan, or the Canadian Pension Plan. Chi square analysis showed that there was a strongly significant relationship between household income, estimated

Housing Need

selling price of home, receiving the Federal Guaranteed Income Supplement, having a pension, and saving and or having savings and investments and level of housing need.

Table 5. Financial Characteristics of Housing Need Groups (%)

	Self- Reported Unmet Needs (n=131)	Assessed Risk of Unmet Needs (n=503)	Met/Limited Needs (n=980)	Study Sample (n=1614)
Household Income***				
Less than \$19,999/year	51 (42.5)	123 (26.3)	117 (13.7)	499 (31.0)
\$20,000-\$39,999/year	54 (45.0)	235 (50.2)	395 (46.1)	684 (47.4)
\$40,000-\$59,999/year	13 (10.8)	66 (14.1)	213 (24.9)	292 (20.2)
More than \$60,000/year	2 (1.7)	44 (9.4)	131 (15.3)	177 (12.3)
Estimated Selling Price of Home***				
Less than \$50,000	36 (45.0)	69 (19.3)	77 (10.3)	182 (15.3)
\$50,000-\$99,999	23 (28.8)	137 (38.3)	230 (30.6)	390 (32.8)
\$100,000-\$199,999	18 (22.5)	126 (35.2)	334 (44.5)	478 (40.2)
\$200,000-\$299,999	2 (2.5)	16 (4.5)	77 (10.3)	95 (8.0)

Housing Need

More than \$300,000	1 (1.3)	10 (2.8)	33 (4.4)	44 (3.7)
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Monthly Rent

Less than \$350	5 (14.3)	9 (8.5)	11 (10.7)	25 (10.2)
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\$350-\$700	28 (80.0)	71 (67.0)	67 (65.0)	166 (10.3)
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More than \$700	2 (5.7)	26 (24.5)	25 (24.3)	53 (21.7)
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Respondents Sources of Income

Old Age Security	127 (100.0)	493 (98.8)	933 (97.6)	1553 (98.2)
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Federal Guaranteed Income Supplement***	62 (48.8)	192 (38.6)	228 (23.8)	482 (30.5)
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Canadian Pension Plan	99 (78.0)	422 (84.7)	821 (85.9)	1342 (84.9)
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Other Government Transfers	13 (10.2)	53 (10.6)	89 (9.1)	155 (9.8)
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Pensions***	35 (27.6)	230 (46.1)	495 (51.8)	760 (48.0)
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Employment	5 (3.9)	28 (5.6)	61 (6.4)	94 (5.9)
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Savings/Investments***	17 (13.4)	151 (30.3)	373 (39.0)	541 (34.2)
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Insurance/Welfare	0 (0.0)	7 (1.4)	10 (1.0)	17 (1.1)
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Social Assistance	0 (0.0)	2 (0.4)	1 (0.1)	3 (0.2)
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Housing Need

Other	5 (3.9)	16 (3.2)	24 (2.5)	45 (2.8)
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Note: *p < .05. **p < .01. ***p < .001.

Future housing preferences and expectations

A cross-sectional correlate analysis of data in Table 6., shows that those at higher level of housing need were more likely to be planning a move, more likely to have made housing modifications, and more likely to have considered housing modifications. For all three housing need groups, a single family dwelling was the most commonly considered future housing option, with more than half of respondents expressing a willingness to consider this option for their next dwelling. Other popular housing options included special retirement housing, sheltered housing, and garden suites. Those in the self-reported unmet needs group were far more likely to consider a mobile home (26%) when compared to the assessed risk of housing need group (18%), and those in the met/limited needs group (14%). Similarly, congregate housing was more likely to be considered as a future housing option among those in the assessed risk of housing need group (38%) and met/limited needs group (36%) compared to the self-reported unmet needs group (24%). Housing options that were not highly considered by any of the three groups included cooperative housing, Abbeyfield Housing, and a live-in housekeeper. Chi square analysis showed that there was a statistically significant relationship between plans to move, plans to modify a dwelling, having already modified a dwelling, and a number of future dwelling type references and level of housing need, though significance levels varied. The strongest associations existed between level of housing need and plans to move, level of housing need and plans to modify, and level of housing need and having made a modification to one's dwelling. There was also a

Housing Need

strongly significant relationship between level of housing need and a preference for a Garden Suite in the future.

Table 6. Future Housing Preferences and Expectations of Older Adults in Housing Need Groups				
	Self-Reported Unmet Needs (n=131)	Assessed Risk of Unmet Needs (n=503)	Met/Limited Needs (n=980)	Study Sample (n=1614)
Plans to Move***	48 (39.7)	69 (14.6)	69 (7.3)	186 (12.1)
Modified***	53 (42.4)	203 (41.8)	234 (24.2)	490 (31)
Considered Modifying***	52 (43.3)	173 (36.8)	131 (13.9)	356 (23.3)
Dwelling Type Respondent Would Consider for the Future				
Single Family Dwelling	64 (52.5)	263 (55.5)	542 (56.6)	869 (55.9)
Co-operative Housing	19 (15.7)	73 (15.2)	117 (12.3)	209 (13.5)
Special Retirement Housing	59 (48.8)	208 (43.3)	378 (39.7)	645 (41.6)
Sheltered Housing*	63 (50.0)	232 (49.2)	397 (42.2)	692 (45)

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Congregate Housing*	29 (24.0)	178 (37.6)	341 (36.2)	548 (35.7)
Live in Housekeeper	21 (16.5)	110 (22.9)	242 (25.4)	373 (23.9)
Abbeyfield Housing*	13 (10.4)	87 (18.3)	132 (14.0)	232 (15.0)
Garden Suite***	64 (52.0)	185 (39.3)	310 (32.9)	559 (36.4)
Mobile Home**	32 (25.6)	84 (17.6)	129 (13.6)	245 (15.8)

Note: *p < .05. **p < .01. ***p < .001.

Probability of housing need

The first classification tree was constructed to examine which, if any, of the nine key characteristics was predicative of a respondent being classified into one of the three housing need groups (See Figure 7.). The nine characteristics that were examined included; home province, sex, age, health status, relationship status, education, household income, dwelling type, and housing tenure. Of the nine key characteristics, only two were predicative of being in a given housing need group; health status and household income [misclassification error rate, 0.36]. For those individuals with very poor, poor, or fair health status, level of household income determined whether they were likely to be in the assessed risk of housing need group, versus the met/limited needs group. Those with household incomes of less than \$39,999/year were more likely to be in the assessed risk of housing need group (50%), compared to those with household incomes of greater than \$40,000/year (35%). A similar trend was apparent in those respondents with good or excellent health status. Those with household incomes of less than \$19,999/year were much less likely to be in the met/limited needs group (50%), compared to those with

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household incomes of greater than \$20,000/year (72%). Those most likely to be in the self-reported unmet needs group were those with very poor, poor or fair health status with household income less than \$39,999/year (18%).

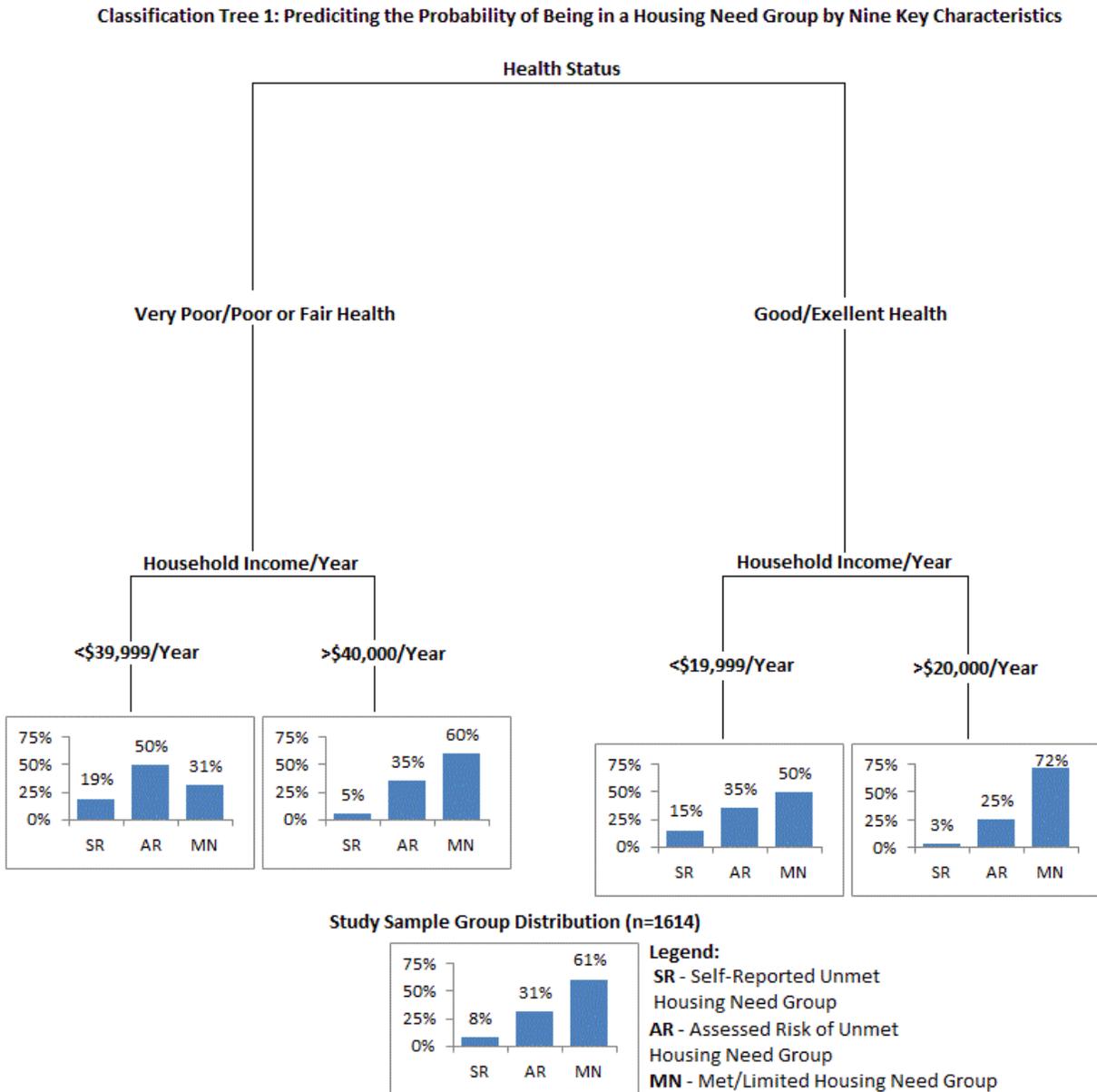


Figure 7. Predicting the Probability of Being in a Housing Need Group by Nine Key Characteristics

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Section 2: Comparison of Housing Decision Congruence Within Housing Need Groups Among older adults with self-reported or assessed risk of unmet housing needs, what are the similarities and differences on demographic, dwelling, health and mobility, and financial characteristics between those older adults whose housing decision is congruent and those whose housing decision is incongruent?

Section 2 provides an overview of the congruence or incongruence of the future housing decisions of those with self-reported or assessed risk of housing need. Future housing decision congruence was determined based on the respondent's intention to move from or modify their home in the future.

Congruence sub group descriptions
Correlates of housing decision congruence in self-reported and assessed risk groups
In this section patterns in demographic, dwelling, health and mobility, and financial characteristics are examined where they exist across the four congruence groups. For full descriptives of the self-reported and assessed risk congruence sub sample groups see Table 7.

A cross-sectional correlate analysis of the housing decision congruence of those with self-reported housing needs showed that factors that appeared to be related to making a congruent housing decision included; being under the age of 70, having a partner, having attended or completed technical school, college or university, having a household income greater than \$40,000/year, and living in a single family dwelling or townhouse, rowhouse, or duplex. Factors that appeared to be related to incongruent housing decisions included being over the age of 75, being never married, separated or divorced, having less than an elementary school education, having a household income less than \$19,999, and living in an apartment.

A cross-sectional correlate analysis of the data in Table 7., examining housing decision congruence of those with assessed risk of unmet housing needs showed that factors that appeared

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to be related to making a congruent housing decision included; having a partner, having attended or completed technical school, college or university, living in a single family dwelling and owning their own dwelling. Factors that appeared to be related to incongruent housing decisions included being over the age of 85, having less than high school graduation, having a household income less than \$19,999, renting their dwelling, and living in an apartment or other type of dwelling. Chi square analysis showed that there was a statistically significant relationship between age, health status, education, household income, dwelling type, and housing tenure and future housing decision congruence, though significance levels varied. The strongest associations existed between housing decision congruence and three variables; household income, dwelling type, and housing tenure.

Table 7. Demographics Characteristics of the Congruence Sub Groups of Respondents with Self-Reported or Assessed Risk of Housing Need (%)

	Self- Reported Congruent (n=83)	Self- Reported Incongruent (n=48)	Assessed Risk Congruent (n=221)	Assessed Risk Incongruent (n=282)	Self- Reported and Assessed Risk Groups (n=634)
Home Province					
New Brunswick	26 (31.3)	11 (22.9)	74 (33.5)	88 (31.2)	199 (31.4)

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Newfoundland & Labrador	23 (27.7)	16 (33.3)	41 (18.6)	58 (20.6)	138 (21.8)
Nova Scotia	21 (25.3)	15 (31.3)	52 (23.5)	63 (22.3)	151 (23.8)
Prince Edward Island	13 (15.7)	6 (12.5)	54 (24.4)	73 (25.9)	146 (23.0)

Sex

Male	26 (32.1)	16 (33.3)	94 (42.9)	104 (37.1)	240 (38.2)
Female	55 (67.9)	32 (66.7)	125 (57.1)	176 (62.9)	368 (61.8)

Age*

65-69 years	36 (43.9)	10 (21.3)	72 (33.5)	77 (27.5)	195 (31.3)
70-74 years	22 (26.8)	15 (31.9)	58 (27.0)	64 (22.9)	159 (25.5)
75-79 years	14 (17.1)	14 (29.8)	48 (22.3)	64 (22.9)	140 (22.4)
80-84 years	8 (9.8)	5 (10.6)	22 (10.2)	33 (11.8)	68 (10.9)
85+ years	2 (2.4)	3 (6.4)	15 (7.0)	42 (15.0)	62 (9.9)

Health Status**

Very Poor or Poor Health	16 (19.3)	10 (20.8)	17 (7.8)	22 (8.0)	65 (10.4)
Fair	32 (38.6)	18 (37.5)	82 (37.6)	100 (36.2)	232 (37.1)
Good or Excellent	35 (42.2)	20 (41.7)	119 (54.6)	154 (55.8)	328 (52.5)

Housing Need

Relationship Status					
Never Married	0 (0.0)	2 (4.3)	6 (2.7)	12 (4.3)	20 (3.2)
Widowed	23 (28.4)	12 (25.5)	57 (26.0)	93 (33.2)	185 (29.5)
Separated/Divorced	10 (12.3)	10 (21.3)	17 (7.8)	30 (10.7)	67 (10.7)
Married/Common-law	48 (59.3)	23 (48.9)	139 (63.5)	145 (51.8)	355 (56.6)
Education*					
Less than Elementary	14 (17.1)	15 (31.9)	26 (12.1)	36 (13.1)	91 (14.7)
Less than High School	28 (34.1)	15 (31.9)	51 (23.7)	85 (31.0)	179 (29.0)
Graduation					
High School Graduation	12 (14.6)	5 (10.6)	32 (14.9)	37 (13.5)	86 (13.9)
Attended or Completed	28 (34.1)	12 (25.5)	106 (49.3)	116 (42.3)	262 (42.4)
Technical/College/University					
Household Income***					
Less than \$19,999/year	29 (37.2)	22 (52.4)	43 (20.9)	80 (30.5)	174 (29.6)
\$20,000-\$39,999/year	36 (46.2)	18 (42.9)	111 (53.9)	124 (47.3)	289 (49.1)
\$40,000-\$59,999/year	11 (14.1)	2 (4.8)	27 (13.1)	39 (14.9)	79 (13.4)

Housing Need

More than \$60,000/year	2 (2.6)	0 (0.0)	25 (12.1)	19 (7.3)	46 (7.8)
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Dwelling Type***

Single Family Dwelling	55 (66.3)	29 (60.4)	185 (83.7)	169 (59.9)	438 (69.1)
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Apartment	4 (4.8)	11 (22.9)	14 (6.3)	64 (22.7)	106 (16.7)
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Townhouse/Duplex/Row	17 (20.5)	4 (8.3)	8 (3.6)	13 (4.6)	29 (4.6)
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House

Other	7 (8.4)	3 (6.3)	14 (6.3)	36 (12.8)	60 (9.5)
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Housing Tenure***

Other	5 (6.0)	5 (10.4)	7 (3.2)	11 (3.9)	28 (4.4)
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Rent	22 (26.5)	15 (31.3)	25 (11.3)	87 (30.9)	149 (23.5)
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Own	55 (66.3)	28 (58.3)	189 (85.5)	181 (64.2)	453 (71.5)
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Note: *p < .05. **p < .01. ***p < .001.

Predicting housing decision congruence in self-report and assessed risk groups

A second classification tree was developed to test if any of the nine key characteristics were predicative of future housing decision congruence of the self-reported unmet needs group (see Figure 8.). The tree showed that only age, sex, and relationship status were predicative of housing decision congruence in this sub group [misclassification error rate, 0.34]. For those respondents aged 70 and over, only age was needed to predict the probability of housing decision congruence, with 53% making congruent decision.

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For those respondents aged 65-69, women had a 95% probability of making a congruent housing decision, while men had an 85% probability of making a congruent future housing decision if they were married/common-law or widowed. Men who were never married or who were separated or divorced had only a 33% probability of making a congruent future housing decision.

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Classification Tree 2: Predicting the Probability of a Congruent or Incongruent Future Housing Decision by Nine Key Characteristics

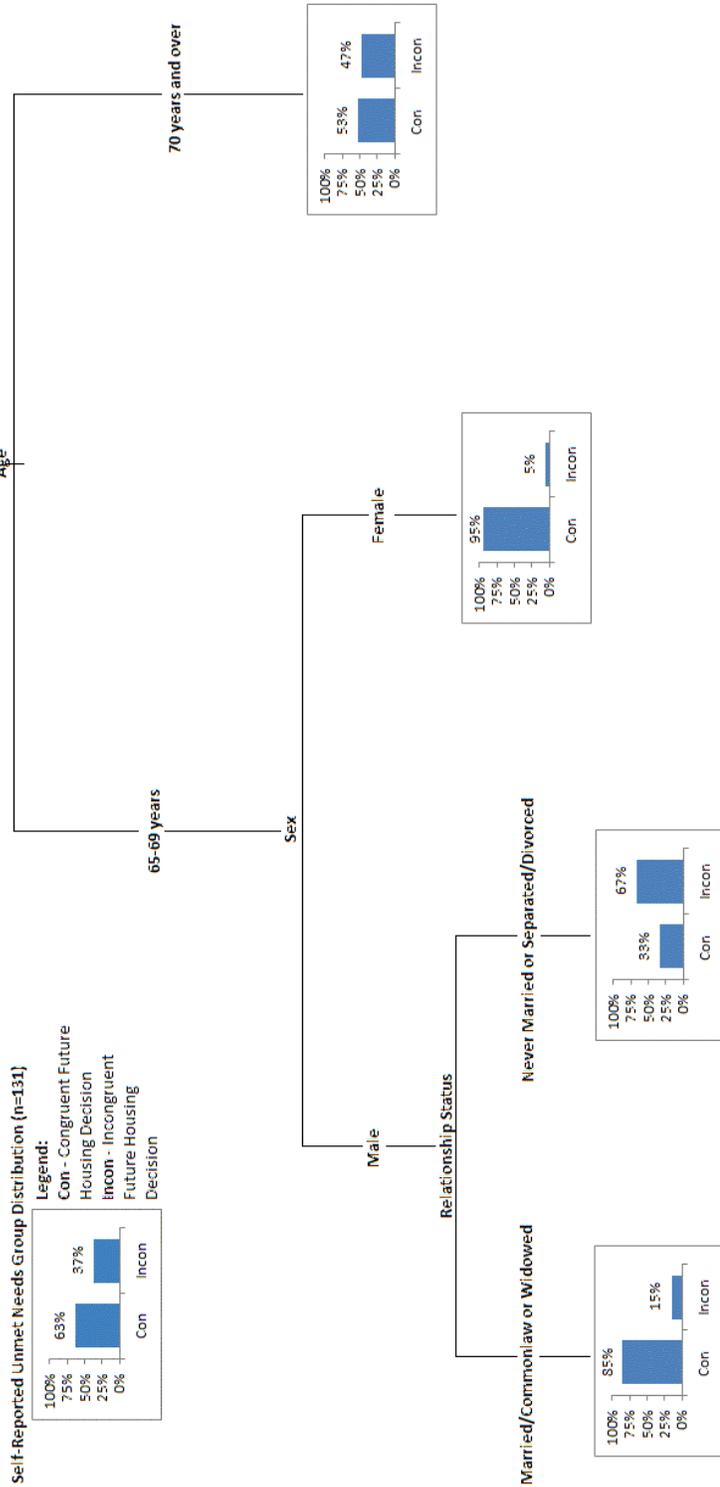


Figure 8. Predicting the Probability of a Congruent or Incongruent Future Housing Decision by Nine Key Characteristics (Self-Reported Unmet Needs Group)

Housing Need

A third classification tree was developed to test if any of the nine key characteristics were predicative of future housing decision congruence of the assessed risk of housing need group (See Figure 9.). The tree showed that only dwelling type, home province and level of education were predicative of housing decision congruence in this sub group, [misclassification error rate, 0.41]. For those respondents who lived in a single family dwelling or apartment, only dwelling type was needed to predict the probability of housing decision congruence, with 52% making congruent decisions.

For those respondents who lived in a rowhouse, townhouse, duplex or other type of dwelling, those from Newfoundland and Labrador had a 0% probably of making a congruent housing decision, while those from New Brunswick, Nova Scotia and Prince Edward Island had an 52% probability of making a congruent future housing decision if they had less than an elementary education or had attended or completed technical school, college or university. It may seem counter-intuitive that those with the highest and lowest levels of education are grouped together on housing decision congruence, however, unknown intervening variables may be contributing to the congruence of their responses. Those respondents from New Brunswick, Nova Scotia and Prince Edward Island had only a 19% probability of making a congruent future housing decision if they had some high school education or had graduated high school.

Housing Need

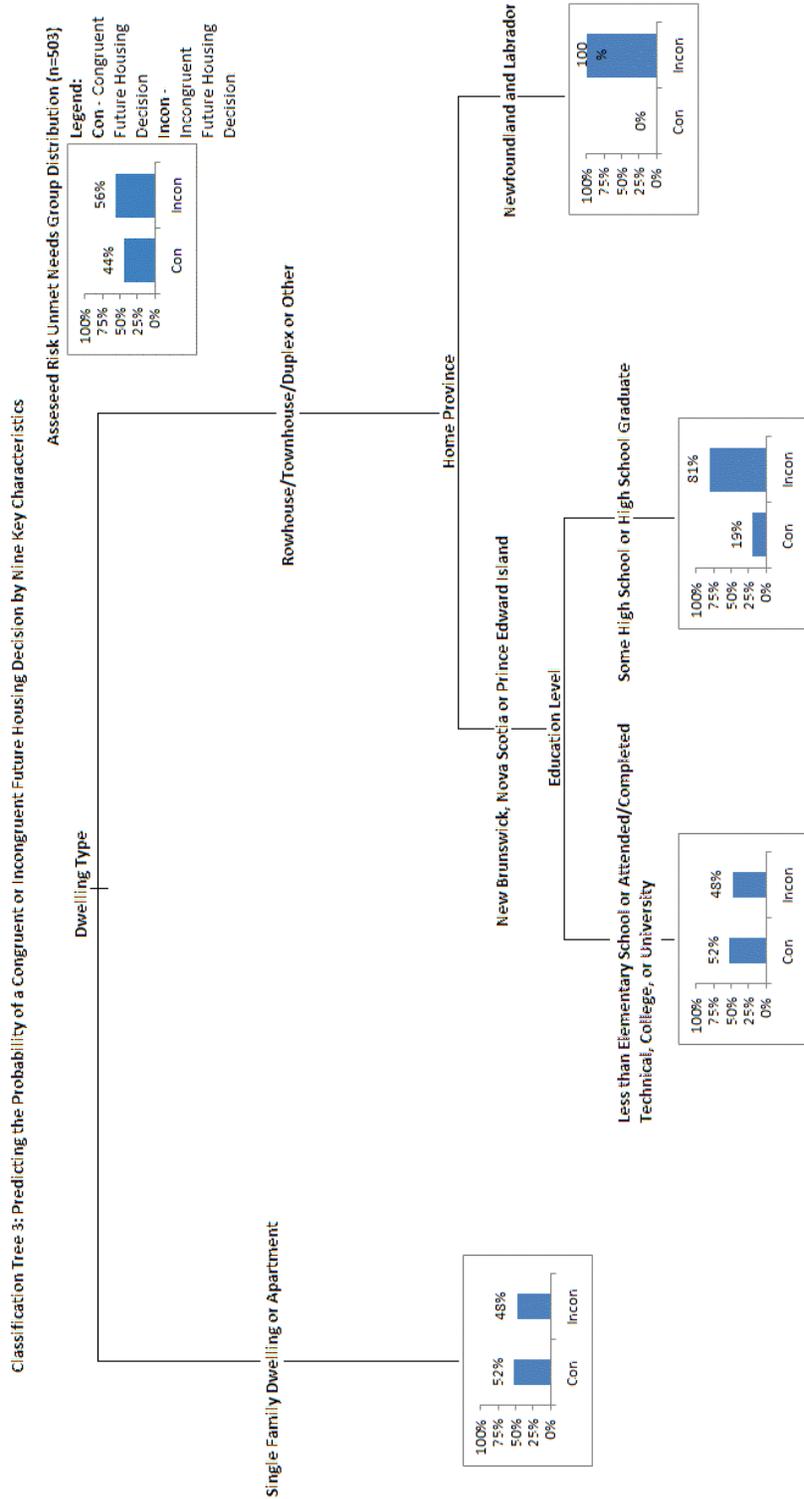


Figure 9. Predicting the Probability of a Congruent or Incongruent Future Housing Decision by Nine Key Characteristics (Assessed Risk Unmet Needs Group)

Housing Need

Section 3: Comparison of Housing Decision Congruence Among Housing Need Groups
Among older adults with unmet housing needs, what are the similarities and differences on demographic, dwelling, health and mobility, and financial characteristics between those older adults whose housing decision is congruent and those whose housing decision is incongruent?

In the first part of Section 3, patterns in demographic, dwelling, health and mobility, and financial characteristics are examined where they exist across the two congruence groups. The second part of Section 3 provides an examination of the future housing decision congruence of those in or at risk of housing need through the results of a classification tree and logistic regression. For a full description of the self-reported and assessed risk combined congruence sub groups see Table 8.

Correlates of housing decision congruence in self-reported and assessed risk groups combined

When comparing all those with congruent future housing decisions and all those with incongruent future housing decisions from the self-reported unmet needs and assessed risk of housing need groups, a cross-sectional correlate analysis of the data in Table 8., showed that being under the age of 70, having a partner, having attended or completed technical school, college or university, owning their dwelling and living in a single family dwelling appeared to be related to a congruent future housing decision. Conversely, being aged 85 or older, having a household income of less than \$19,999/year, living in an apartment, townhouse, rowhouse, duplex or other type of dwelling, and renting their dwelling appeared to be related to making an incongruent future housing decision. Chi square analysis showed that there was a statistically significant relationship between age, relationship status, dwelling type, and housing tenure and future housing decision congruence, though significance levels varied. The strongest associations

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existed between housing decision congruence and dwelling type, and housing decision congruence and housing tenure.

Table 8. Demographics Characteristics of the Congruence Sub Groups of Respondents with Self-Reported and Assessed Risk of Housing Need (%)

	Congruent Group (n=304)	Incongruent Group (n=330)	Self-Reported & Assessed Risk Groups (n=634)
Home Province			
New Brunswick	100 (32.9)	99 (30.0)	199 (31.4)
Newfoundland & Labrador	64 (21.1)	74 (22.4)	138 (21.8)
Nova Scotia	73 (24.0)	78 (23.6)	151 (23.8)
Prince Edward Island	67 (22.0)	79 (23.9)	146 (23.0)
Sex			
Male	120 (40.0)	120 (36.6)	240 (38.2)
Female	180 (60.0)	208 (63.4)	368 (61.8)
Age**			
65-69 years	108 (36.4)	87 (26.6)	195 (31.3)

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70-74 years	80 (26.9)	79 (24.2)	159 (25.5)
75-79 years	62 (20.9)	78 (23.9)	140 (22.4)
80-84 years	30 (10.1)	38 (11.6)	68 (10.9)
85+ years	17 (5.7)	45 (13.8)	62 (9.9)

Health Status

Very Poor or Poor Health	33 (11.0)	32 (9.9)	65 (10.4)
Fair	114 (37.9)	118 (36.4)	232 (37.1)
Good or Excellent	154 (51.2)	174 (53.7)	328 (52.5)

Relationship Status*

Never Married	6 (2.0)	14 (4.3)	20 (3.2)
Widowed	80 (26.7)	105 (32.1)	185 (29.5)
Separated/Divorced	27 (9.0)	40 (12.2)	67 (10.7)
Married/Common-law	187 (62.3)	168 (51.4)	355 (56.6)

Education

Less than Elementary	40 (13.5)	51 (15.9)	91 (14.7)
Less than High School	79 (26.6)	100 (31.2)	179 (29.0)

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Graduation

High School Graduation	44 (14.8)	42 (13.1)	86 (13.9)
Attended or Completed	134 (45.1)	128 (39.9)	262 (42.4)
Technical/College/University			
Household Income			
Less than \$19,999/year	72 (25.4)	102 (33.6)	174 (29.6)
\$20,000-\$39,999/year	147 (51.8)	142 (46.7)	289 (49.1)
\$40,000-\$59,999/year	38 (13.4)	41 (13.5)	79 (13.4)
More than \$60,000/year	27 (9.5)	19 (6.3)	46 (7.8)
Dwelling Type***			
Single Family Dwelling	240 (78.9)	198 (60.0)	438 (69.1)
Apartment	31 (10.2)	75 (22.7)	106 (16.7)
Townhouse/Duplex/Row House	12 (3.9)	17 (5.2)	29 (4.6)
Other	21 (6.9)	39 (11.8)	60 (9.5)
Housing Tenure***			
Other	12 (3.9)	16 (4.8)	28 (4.4)

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Rent	47 (15.5)	102 (30.9)	149 (23.5)
Own	244 (80.3)	209 (63.3)	453 (71.5)

Note: *p < .05. **p < .01. ***p < .001.

Predicting housing decision congruence in self-report and assessed risk groups combined

A fourth, and final classification tree was developed to test if any of the nine key characteristics were predicative of future housing decision congruence of the self-reported unmet needs and assessed risk of housing need groups combined (See Figure 10.). The tree showed that only dwelling type was predicative of housing decision congruence in the combined congruence sub group [misclassification error rate, 0.42]. Those respondents who lived in a single family dwelling had a 55% probability of making a congruent future housing decision, while those who lived in an apartment, rowhouse, townhouse, duplex, or other had a 34% probability of making a congruent future housing decision.

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Classification Tree 4: Predicting the Probability of a Congruent or Incongruent Future Housing Decision by Nine Key Characteristics



Figure 10. Predicting the Probability of a Congruent or Incongruent Future Housing Decision by Nine Key Characteristics (Self-Reported and Assessed Risk Unmet Needs Groups)

A logistic regression was also conducted on the self-reported unmet needs and assessed risk of housing need groups combined to determine if any of the nine key characteristic were predicative of housing decision congruence (See Tables 9-13.). In the first model all nine characteristics were added sequentially, and only dwelling type [p=0.0008], relationship status [p=0.0236] and age [p=0.0296] were statistically significant in predicting housing decision congruence. When variables were added last in model, only age remained significant [p=0.0189]. Finally, we tested a model with only the three significant variables of dwelling type, relationship

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status, and age and found no evidence of statistical improvement with the addition of the other six variables in the models ability to predict housing decision congruence. The purpose of this analysis was to determine if it was possible to accurately predict future housing decision congruence using less information from respondents. Upon comparison, the Akaike Information Criterion (AIC) score of model with only the three significant variables (762.88) was a lower than that of the model with all nine variables (780.21). This indicates there was some improvement to the model, though not at a statistically significant level, when the six additional characteristics were removed.

Table 9. Logistic Regression Comparing Two Models to Predict Housing Decision Congruence with Nine Key Characteristics (Analysis of Deviance)

	Residual Degrees of Freedom	Residual Deviance	Degrees of Freedom	Deviance	P (> Chi)
Model 1: All Nine Characteristics	536	730.21	-	-	-
Model 2: Three Significant Characteristics	550	740.88	-14	-10.673	0.7115

Note: *p < .05. **p < .01. ***p < .001.

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Table 10. Logistic Regression Predicting Housing Decision Congruence with Nine Key Characteristics (Analysis of Deviance, Added Sequentially)

	Degrees of Freedom	Deviance	Residual Degrees of Freedom	Residual Deviance	P (> Chi)
Null	-	-	560	777.20	-
Sex	1	0.1557	559	777.04	0.6932
Relationship Status	3	9.3833	556	767.66	0.0246*
Dwelling Type	3	16.8020	553	750.85	0.0008***
Housing Tenure	2	1.7597	551	749.10	0.4148
Household Income	3	2.4155	548	746.68	0.4908
Age	4	10.7423	544	735.94	0.0296*
Health Status	2	1.7068	542	734.23	0.4260
Education	3	1.2102	539	733.02	0.7506
Home Province	3	2.8123	536	730.21	0.4215

Note: *p < .05. **p < .01. ***p < .001.

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Table 11. Logistic Regression Predicting Housing Decision Congruence with Nine Key Characteristics (Analysis of Deviance, Last in Model)

	LR Chisq	Degrees of Freedom	Pr (>Chisq)
Sex	0.1441	1	0.7043
Relationship Status	2.7089	3	0.4387
Dwelling Type	3.4165	3	0.3318
Housing Tenure	2.0126	2	0.3656
Household Income	2.4723	3	0.4803
Age	11.7995	4	0.0189*
Health Status	1.6972	2	0.4280
Education	1.2888	3	0.7318
Home Province	2.8123	3	0.4215

Note: *p < .05. **p < .01. ***p < .001.

Table 12. Logistic Regression Predicting Housing Decision Congruence with Three Significant Characteristics (Analysis of Deviance, Added Sequentially)

	Degrees of Freedom	Deviance	Residual Degrees of Freedom	Residual Deviance	P (> Chi)

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Null	-	-	560	777.20	-
Relationship	3	9.3624	557	767.83	0.0248*
Status					
Dwelling Type	3	16.5740	554	751.26	0.0009**
Age	4	10.3781	550	740.88	0.0345*

Note: *p < .05. **p < .01. ***p = .00.

Table 13. Logistic Regression Predicting Housing Decision Congruence with Three Significant Characteristics (Analysis of Deviance, Last in Model)

	LR Chisq	Degrees of Freedom	Pr (>Chisq)
Relationship	2.5486	3	0.4666
Status			
Dwelling Type	14.9374	3	0.0019**
Age	10.3781	4	0.0345*

Note: *p < .05. **p < .01. ***p = .00.

The following table, Table 14., presents a summary of the key findings of this research.

Table 14. Key Findings of The Housing Preferences and Expectations of Older Adults with Unmet Housing Need Study

Housing Need	<ul style="list-style-type: none"> Suitability, as defined by CMHC, is not a significant contributor to housing need among older adults. Safety and accessibility issues with a dwelling were related to self-
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reported housing need among older adults.

- Health and financial status were strongly associated with the older adults' level of housing need.

Housing Preferences and Expectations

- The future housing preferences of older adults in housing need or who were assessed to be at risk of housing need differ very little from those older adults with met/limited housing need.
- The future housing expectations of older adults in housing need or who were assessed to be at risk of housing need differ from those older adults with met/limited housing need.

Housing Decision Congruence

- The factor that has the greatest impact on the future housing decision congruence of an individual is their current dwelling type.
 - Self-identifying as being in housing need may contribute to greater future housing decision congruence.
-

Chapter 6: Discussion

Defining Housing Need in an Older Population

The first challenge in examining the experience of older adults in housing need was finding a way to accurately identify the population in need. To do this, the three core housing need criteria of affordability, adequacy and suitability were selected as risk criteria. Based on the literature, two additional criteria of housing risk, safety and accessibility, were selected as they had been found to be factors that impact on housing risk in the older population (Weeks & LeBlanc, 2010). These five criteria were used to categorize those who had not been placed in the self-reported unmet needs group into two additional groups, assessed risk of unmet housing needs and met/limited housing needs. More than three-quarters of the self-reported unmet needs group would have been placed in the assessed risk of housing need group had they not self-reported as being in housing need. This shows that the assessed risk of housing need group selection guidelines identified most respondents who were in or at risk of housing need.

Had the CMHC selection criteria been utilized to determine housing need in this study, failure of one of three criteria (affordability, adequacy and suitability), approximately half of the study sample would have been in housing need. Using the selection criteria developed for this research, a requirement that a respondent must fail two or more of the five criteria to be selected, 39% of the study sample was self-reported or at assessed risk to be in housing need. Among the full study sample, more than one-quarter of respondents met all five housing need criteria, while only small percentage of the self-reported unmet needs met all five criteria. This research failed to capture the nature of the housing need risk for those in the self-reported unmet needs who met all five housing need criteria. Those in the self-reported unmet needs group were shown to have issues with a higher number of housing need risk criteria. This information supports the

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assumption that those who self-report housing need may in fact be experiencing a higher level of risk compared to those who do not self-report but were assessed to be at risk. Other factors related to the individual's history, such as their past housing experiences, culture, and character traits may also contribute to an individual's willingness to report an unmet need.

The five housing need criteria, rank ordered from most prevalent to least prevalent were the same for the self-reported unmet needs group and assessed risk of housing need group, with safety as the most prevalent housing need risk factor, and affordability as the second most common. For the met/limited needs group, affordability was the most prevalent housing need risk factor, followed by safety. These descriptive statistics support the findings of the logistic regression, which showed that the safety criterion contributed to the prediction of self-reported housing need at a strongly statistically significant level. These findings provide both statistical and practical evidence to support the inclusion of a health-related criterion when assessing housing need in the older population. They are also consistent with Canada Mortgage and Housing Corporation's (2006) findings that health status and housing costs were both motivators for a change in dwelling. With older adult led households comprise almost one-quarter of those in core housing need in Canada (Canada Mortgage and Housing Corporation, 2010a), the addition of one or more health-related criteria to the housing need definition could result in older adults making up an even larger proportion of those in core housing need.

Suitability did not appear to be a housing need risk factor for any housing need group. As evidenced in the literature (Canada Mortgage and Housing Corporation, 2006), having a dwelling that is too small for the number of occupants is rarely a concern in the older population. To the contrary, a dwelling that is too large is often a motivator of housing changes, whether due to maintenance or mobility issues (Canada Mortgage and Housing Corporation, 2006; Wagner,

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Shubair, & Michalos, 2010). This is of particular interest, as CMHC does not consider the “suitability” of living in a dwelling that is too large when assessing core housing need. Homes that are too large not only impact the suitability of the home, but can contribute to accessibility issues, whether due to stairs or issues travelling from room to room within the home.

Level of housing need differs depending on the time in the person’s life when they are evaluated. A home that was once “just big enough” to house a family of four, may be too large to maintain in later years with only one occupant. Similarly, a home that was once affordable with two salaries may exceed affordability standards in retirement. In these examples, the choice of the children to leave home impacts the housing need of the parents, and the choice of one person to retire, impacts the level of housing need of their spouse.

What Characteristics Contribute to Housing Need and Housing Need Risk

Two methods of analysis were used to examine characteristics that contribute to risk of housing need in the three housing need groups. The first method was a cross-sectional correlate analysis of the 41 socio-demographic characteristics, looking for increases or decreases in prevalence of given characteristics across the three groups. Chi square tests were used to confirm the presence of significant relationships between the 41 variables and level of housing need. The second method was the development of a classification tree which tested the power of nine key characteristics to predict an individual being in a given housing need group.

In the cross-sectional correlate analysis, many variables were shown to be significantly related to level of housing need. Of the nine key characteristics, six were strongly associated with level of housing need; relationship status, education, dwelling type, housing tenure, health status, and household income. The results of the classification tree showed that of the nine key characteristics, only health status and household income, two variables that have been shown to

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be linked to one another (Buckley, Denton, Robb, & Spencer, 2006; Prus, 2004; World Health Organization, 2008) were needed to predict level of housing need. Other characteristics that were strongly associated with level of housing need included; ability to remember, ability to think clearly, having had a stroke, having arthritis, estimated selling price of the dwelling, and sources of income from Federal Guaranteed Income Supplement, pensions, and saving and investments. All of the additional characteristics that were associated with level of housing need were related to either the health or financial status of the respondent, consistent with the findings of previous research (Canadian Mortgage and Housing Corporation, 2006).

Interestingly, four of the six hypothesized differences between those with unmet and met/limited housing needs that were generated based on the literature were supported in the cross-sectional correlate analysis. Those in housing need were, in fact, more likely to be living in older dwellings, had more respondents with income in the lowest bracket, were more likely to be female, and had lower self-reported health status and more health concerns. However, respondents in the housing need groups were more likely to have lived in their dwelling for five years or less than those with met/limited housing needs. The relationship between housing need risk group and age was also not as expected, with the highest proportion of respondents aged 85 and older at assessed risk of housing need, rather than in self-reported housing need.

Results confirm how an individual's housing need today can be impacted by events and decisions in the past. The respondents who completed this survey lived in a society and time where values related to gender-equality, education, and career options were very different. In contrast to Canadian society today, survey respondents, particularly women, may not have had the option to obtain an education or to pursue a career. Similarly, the dissolution of a relationship

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in the past, and the transition from partner to single individual with all its social and financial ramifications, may contribute to current level of housing need.

Preferences and Expectations of Older Adults in Housing Need

The future housing preferences of older adults with self-reported or assessed risk of unmet housing needs did not differ greatly from those with met/limited needs. What did differ was their housing expectations. Older adults with self-reported housing need were more than three times more likely to report a plan to move than those in the full study sample, and almost six times more likely to report a plan to move than those with met/limited housing needs. Similarly, those with self-reported housing need were almost twice as likely to have modified their dwelling and more than three times more likely to have considered modifying their home than those with met/limited housing needs. Contrary to the literature (Canada Mortgage and Housing Corporation, 2006; Wagnild, 2001), this research found that older adults with housing need or housing need risk were more likely to be expecting and planning for a move, despite the higher proportion of individuals with lower household incomes than those with met/limited need.

Three of the future dwelling options were not among the top five housing options for any of the three housing need groups. These included Abbeyfield housing, co-operative housing, and a live-in housekeeper. For all three housing need groups, a single family dwelling was the most preferred future housing option. Only respondents with self-reported housing need indicated that a mobile home was among their top five future housing options. The results of this research are promising, because while many older adults wish to live in a single family dwelling throughout their lives, many were also open to consider other housing options that may be more cost-efficient to develop and maintain.

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What Characteristics Contribute to Congruence of Future Housing Decisions

Housing decision congruence was determined by the respondents in housing needs' intention to move or modify their home in the future. A cross-sectional correlate analysis of the housing decision congruence of those in housing need showed that factors that were strongly associated with decision congruence included; age, relationship status, education, health status, household income, dwelling type and housing tenure. Classification trees of those with self-reported unmet housing needs showed that only age, sex, and relationship status were needed to predict their housing decision congruence and only dwelling type, home province, and level of education were needed to predict the housing decision congruence of those with assessed risk of unmet housing need. It is interesting to note that those with self-reported unmet needs were far more likely to have made a congruent future housing decision than those at assessed risk.

The classification tree of decision congruence for the self-reported and assessed risk groups combined showed that only dwelling type was needed to predict housing decision congruence. Those living in single family dwellings were far more likely to make a congruent future housing decision compared to those living in all other types of dwellings. The logistic regression of housing decision congruence and its relationship to the nine key characteristics showed that only dwelling type, relationship status, and age were statistically significant in predicting the congruence of future housing decisions.

Future housing decision congruence is a complicated construct to evaluate, especially given the fact that the vast majority of older adults wish to remain in their own home as they age (Johnston, 1999; MacDonald, Remus & Laing, 1994; Shiner, 2007; Wagnild, 2001; Weeks, Bryanton, & Nilsson, 2005). The elements of choice and perceived options are key to understanding an individual's housing decision congruence. If an individual in housing need can

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self-justify a choice to stay in their home, regardless of the legitimacy of their justification, they do not feel that their decision is incongruent. Understanding all of the intervening factors related to decision congruence and the creation of such justifications, such as a person's history, connection to "home", relationships, and feeling of agency is not possible with quantitative methodology. Therefore, this research cannot answer the question of why a respondent is making a seemingly congruent or incongruent housing decision, but can only speak to the characteristics of persons who have made, or will make congruent or incongruent housing decisions. It is also important to note that those individuals in the assessed risk group may not view themselves as being in or at risk of housing need, and thus may not feel that planning to move, or modify their home is a congruent housing decision. It seems likely that the awareness, and acknowledgement of a housing need is a necessary motivator for making plans to address that housing need.

Implications for Practice and Policy

Results of this research support the future investigation of the CMHC core housing need criteria with regards to the development of a health-related criteria. This research points towards safety as a promising construct to capture issues of mobility and fit between the dwelling and the individual. The acknowledgement of this housing issue for older adults and the 4.4 million Canadians with disabilities (Statistics Canada, 2006) would provide evidence to increase funding to current housing modification programs and develop new programs. A funding increase to modification programs may be necessary to meet the housing needs of an aging population, without demolishing and rebuilding the current housing stock. Finding mechanisms, such as home modifications, to keep people in their own homes longer would also reduce the demand on the long term care sector.

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A shift towards the recognition of safety as a housing need factor could also lead to the development of building codes that require contractors to build new home construction using the universal design principles (Pynoos, Caraviello, & Cicero, 2009). These homes include design features that support the mobility of residents such as wider doors, and a wheelchair accessible bathroom on the main floor.

Study Limitations

The major limitation of this research, as is the case with most secondary data analysis-based research, is the challenge of addressing issues specific to a research question using variables that were designed to address different questions. The original intent of the Seniors' Housing and Support Services Survey was not to capture data on core housing need. A strong effort was made to develop measures of the three core housing need criteria that were useful in discussing housing need, though findings are not comparable to CMHC core housing need data.

The small sample size of less than 100 respondents for two of the congruence sub groups in this project resulted in some cell sizes that were too small to report in the writing of the final thesis. To overcome this challenge, Donald Shiner (Principal Investigator) assisted with the recoding of variables to maintain detail, and produce acceptable cell sizes. As anticipated, the data analysis plan did require some modifications from the plan set out in the thesis proposal. The small size of the self-reported unmet needs group, combined with the large number of categorical variables investigated in this project resulted in a shift from the original analysis plan away from chi square tests towards classification tree modeling. The use of chi square on a small sample with a large number of test variables would have led to multiple test interference and results of the procedures would not have been reportable. Classification trees were used in regression problems and enabled the testing of many categorical variables without interference.

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As indicated in the methods section of this paper, the *Seniors' Housing and Support Survey* is a high-quality instrument originally developed by CMHC, then modified for self-administration and pilot tested by ASHRA. The rigorous development process of this survey ensured that there were few limitations to the instrument itself. Limitations of the instrument, and the survey process itself include the difficulty in ascertaining accurate self-reported financial information from individuals. Studies have found that there were statistically significant levels of error when reporting income, due to both non-response and the inaccurate reporting of income (Peterson & Kerin, 1980; Weaver & Swanson, 1974). The length of the survey itself (70 pages) may have deterred those with decreased cognitive abilities, mobility issues impeding writing ability, or those with lower education levels.

Future Research

As with much research, this project has raised more questions than it has answered. There were three particular areas that warrant further investigation. The first area is the development and formal validation of scales to measure the concepts of safety and accessibility, as they relate to a dwelling. This study had to rely on the use of secondary data to measure the five housing need criteria, but a subsequent study could gather data in accordance with CMHC protocol for core housing need, and validate the health-related criteria of housing need under controlled conditions. The second recommendation for future research would be to administer the ASHRA Seniors' Housing and Support Services Survey with the leading edge and trailing edge Boomer groups to examine the differences between the two groups, and to aid in the preparation of housing, and services for this heterogeneous cohort of individuals. The final recommendation for future research would be to conduct in-depth interviews with members of each of the three housing need groups, stratified by housing decision congruence, to further explore the

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information that came out of the survey research, particularly their interpretation of their own level of housing need, and their perspective on contributing factors and expected outcomes.

Conclusion

The purpose of this study was to understand what dwelling, health and mobility, financial, and demographic characteristics were influencing the future housing preferences and expectations of older adults who experience, or who were at risk of experiencing unmet housing needs and which, if any, factors predict these future housing preferences and expectations.

Results showed that both safety and accessibility issues were related to being in self-reported housing need, supporting the addition of health-related criteria to the CMHC core housing need definition. Older adults in housing need do indeed differ from those with met or limited housing needs on a number of socio-demographic characteristics, most notably health and financial status. The future housing expectations of those with met or limited housing need do differ from those experiencing housing need, with those in need more likely to anticipate modifications to or moves from their current dwelling. Interestingly, those in housing need do not differ greatly in their future housing preferences from those with met or limited housing need, with persons at all levels of housing need most likely to express a preference for a single family dwelling in the future. Housing decision congruence, a complex construct, seems to be most strongly related to the current dwelling type of the older adult. Self-reporting housing need, and thus awareness of a housing need, appears to have a positive impact on future housing decision congruence.

This research explored many areas that warrant future research, as the housing needs of the ever-increasing older population move to the forefront of societal concerns. To address the issue of unmet housing need in the older population, we must first accurately define the complex

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construct of “housing need”, and then develop mechanisms to support older adults in need so they may expect and obtain their preferred housing.

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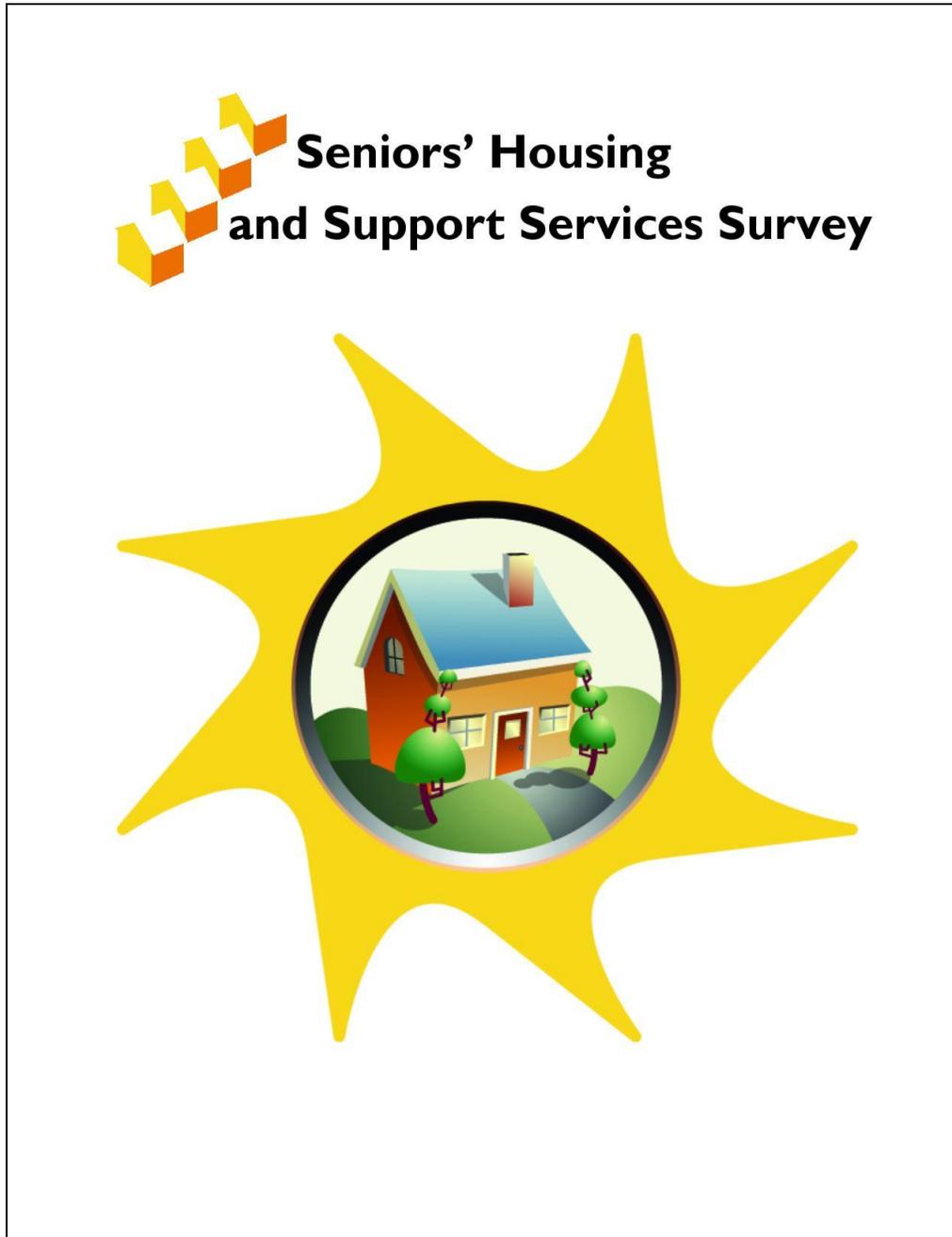
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Appendix A: ASHRA Seniors' Housing and Support Services Survey

For a copy of the Atlantic Seniors' Housing and Support Services Survey please contact Dr. Donald Shiner at donald.shiner@msvu.ca.



Housing Need

Appendix B: R® Code Output – Logistic Regressions

Please note that the following Appendix is in Courier New Font and single-spaced, as it allows the data charts to stay aligned.

Logistic Regression Using GLM Package in R®

Part I: Regression of Five Housing Need Criterion in Self-Reported Sample

Model 1 – Five Housing Need Criterion

```
GLMOct30 <- glm(Group1SA ~ Suit + Adeq + Afford + Safe +
Access,family=binomial,d ata=HousingGLM1)
anova(glmggp1,test="Chisq")
Analysis of Deviance Table
Model: binomial, link: logit
```

```
Call: glm(formula = Group1SA ~ Suit + Adeq + Afford + Safe +
Access,
family = binomial, data = HousingGLM1)
```

```
Coefficients:
(Intercept)          Suit          Adeq          Afford          Safe
Access
-4.78740          0.06974          1.17282          0.58119          2.45708
0.28704
```

```
Degrees of Freedom: 1613 Total (i.e. Null); 1608 Residual
Null Deviance:          909
Residual Deviance: 722.5          AIC: 734.5
```

```
Anova(GLMOct30)
Analysis of Deviance Table (Type II tests) - Last in Model
```

```
Response: Group1SA
      LR Chisq Df Pr(>Chisq)
Suit      0.004  1  0.950478
Adeq     25.865  1  3.662e-07 ***
Afford    8.484  1  0.003583 **
Safe     89.988  1  < 2.2e-16 ***
Access    2.019  1  0.155304
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(GLMOct30, test="Chisq")
```

Housing Need

Analysis of Deviance Table

Model: binomial, link: logit

Response: Group1SA

Terms added sequentially (first to last)

	Df	Deviance	Resid. Df	Resid. Dev	P(> Chi)
NULL			1613	909.02	
Suit	1	0.045	1612	908.98	0.8323
Adeq	1	63.181	1611	845.80	1.886e-15 ***
Afford	1	18.526	1610	827.27	1.676e-05 ***
Safe	1	102.785	1609	724.49	< 2.2e-16 ***
Access	1	2.019	1608	722.47	0.1553

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Model 2 - Five Housing Need Criterion with Order of Accessibility and Safety Switched

```
GLM1b<-glm(Group1SA ~ Suit + Adeq + Afford + Access +  
Safe,family=binomial,data=HousingGLM1)\  
GLM1b
```

```
Call: glm(formula = Group1SA ~ Suit + Adeq + Afford + Access +  
Safe,  
family = binomial, data = HousingGLM1)
```

Coefficients:

(Intercept)	Suit	Adeq	Afford	Access
-4.78740	0.06974	1.17282	0.58119	0.28704
2.45708				

Degrees of Freedom: 1613 Total (i.e. Null); 1608 Residual

Null Deviance: 909

Residual Deviance: 722.5 AIC: 734.5

```
> Anova(GLM1b)
```

Analysis of Deviance Table (Type II tests) - Last in Model

Response: Group1SA

	LR	Chisq	Df	Pr(>Chisq)
Suit	0.004	1	0.950478	
Adeq	25.865	1	3.662e-07 ***	

Housing Need

```
Afford      8.484  1    0.003583 **
Access      2.019  1    0.155304
Safe       89.988  1   < 2.2e-16 ***
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(GLM1b, test="Chisq")
Analysis of Deviance Table
```

```
Model: binomial, link: logit
```

```
Response: Group1SA
```

```
Terms added sequentially (first to last)
```

	Df	Deviance	Resid. Df	Resid. Dev	P(> Chi)
NULL			1613	909.02	
Suit	1	0.045	1612	908.98	0.8322664
Adeq	1	63.181	1611	845.80	1.886e-15 ***
Afford	1	18.526	1610	827.27	1.676e-05 ***
Access	1	14.816	1609	812.45	0.0001185 ***
Safe	1	89.988	1608	722.47	< 2.2e-16 ***

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Model 3 - Comparing Two Regressions (Five Criteria versus Three Criteria)

```
GLM1c<-glm(Group1SA ~ Suit + Adeq +
Afford, family=binomial, data=HousingGLM1)
> anova(GLM1c, GLM1b, test="Chisq")
Analysis of Deviance Table
```

```
Model 1: Group1SA ~ Suit + Adeq + Afford
```

```
Model 2: Group1SA ~ Suit + Adeq + Afford + Access + Safe
```

	Resid. Df	Resid. Dev	Df	Deviance	P(> Chi)
1	1610	827.27			
2	1608	722.47	2	104.8	< 2.2e-16 ***

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

PART II Regression of Housing Decision Congruence and Nine Key Characteristics

Model 1 - Nine Key Characteristic by Housing Decision Congruence

Housing Need

```
GLM3a<- read.table("HousingGLM3.csv", header=T,
sep=",",na.strings="99999")
for (i in 3:10) { GLM3a[,i]<-as.factor(GLM3a[,i]) }
options(contrasts=c("contr.treatment","contr.poly"))
GoodDataGLM3a <- na.omit(GLM3a)
GLM3a1 <- glm(Con ~ Sex + MrtSt + DwTyp + OwnRnt + HH. + Age +
Hlth + Educ + Prov,family = binomial, data=GoodDataGLM3a)
summary(GLM3a1)
```

Call:

```
glm(formula = Con ~ Sex + MrtSt + DwTyp + OwnRnt + HH. + Age +
Hlth + Educ + Prov, family = binomial, data = GoodDataGLM3a)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-1.6389	-1.1140	-0.6254	1.0821	1.9275

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.43067	0.68262	-0.631	0.52811
Sex	0.07587	0.19994	0.379	0.70435
MrtSt1	0.79926	0.55169	1.449	0.14740
MrtSt2	0.51950	0.58729	0.885	0.37639
MrtSt3	0.73574	0.53661	1.371	0.17035
DwTyp2	-0.08837	0.48994	-0.180	0.85686
DwTyp3	-0.54784	0.44672	-1.226	0.22006
DwTyp4	-0.53511	0.33397	-1.602	0.10910
OwnRnt2	-0.42041	0.39163	-1.074	0.28305
OwnRnt3	-0.46746	0.43726	-1.069	0.28504
HH.2	0.25616	0.24556	1.043	0.29687
HH.3	-0.03115	0.34184	-0.091	0.92738
HH.4	0.42734	0.41885	1.020	0.30760
Age2	-0.17134	0.23544	-0.728	0.46678
Age3	-0.55435	0.25013	-2.216	0.02668 *
Age4	-0.41381	0.32485	-1.274	0.20272
Age5	-1.12536	0.37345	-3.013	0.00258 **
Hlth2	0.13252	0.32189	0.412	0.68056
Hlth3	-0.12639	0.31354	-0.403	0.68686
Educ1	-0.04798	0.29571	-0.162	0.87111
Educ2	0.27028	0.34060	0.794	0.42747
Educ3	0.10083	0.29027	0.347	0.72831
Prov2	-0.27899	0.25195	-1.107	0.26815
Prov3	0.16993	0.24537	0.693	0.48859
Prov4	0.03203	0.25121	0.128	0.89853

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Housing Need

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 777.20 on 560 degrees of freedom
Residual deviance: 730.21 on 536 degrees of freedom
AIC: 780.21

Number of Fisher Scoring iterations: 4

anova(GLM3a1, test="Chisq")
Analysis of Deviance Table

Model: binomial, link: logit

Response: Con

Terms added sequentially (first to last)

	Df	Deviance	Resid.	Df	Resid.	Dev	P(> Chi)
NULL				560		777.20	
Sex	1	0.1557		559		777.04	0.6931767
MrtSt	3	9.3833		556		767.66	0.0246059 *
DwlTyp	3	16.8020		553		750.85	0.0007762 ***
OwnRnt	2	1.7597		551		749.10	0.4148454
HH.	3	2.4155		548		746.68	0.4907587
Age	4	10.7423		544		735.94	0.0296180 *
Hlth	2	1.7068		542		734.23	0.4259548
Educ	3	1.2102		539		733.02	0.7505597
Prov	3	2.8123		536		730.21	0.4214792

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Anova (GLM3a1)

Analysis of Deviance Table (Type II tests)

Response: Con

	LR	Chisq	Df	Pr(>Chisq)
Sex	0.1441	1	0.70428	
MrtSt	2.7089	3	0.43871	
DwlTyp	3.4165	3	0.33176	
OwnRnt	2.0126	2	0.36556	
HH.	2.4723	3	0.48033	
Age	11.7995	4	0.01891 *	
Hlth	1.6972	2	0.42802	
Educ	1.2888	3	0.73180	
Prov	2.8123	3	0.42148	

Housing Need

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Model 2 - Three Significant Variables by Housing Decision Congruence

```
GLM3a<- read.table("HousingGLM3.csv", header=T,  
sep="," ,na.strings="99999")  
for (i in 3:10) { GLM3a[ ,i]<-as.factor(GLM3a[ ,i]) }  
options(contrasts=c("contr.treatment","contr.poly"))  
GoodDataGLM3a <- na.omit(GLM3a)  
GLM3a2 <- glm(Con ~ MrtSt + DwlTyp + Age,family = binomial,  
data=GoodDataGLM3a)  
summary(GLM3a2)
```

Call:
glm(formula = Con ~ MrtSt + DwlTyp + Age, family = binomial,
data = GoodDataGLM3a)

Deviance Residuals:

Min	1Q	Median	3Q	Max
-1.3959	-1.1694	-0.6597	1.0847	1.8861

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	-0.1786	0.5310	-0.336	0.736582	
MrtSt1	0.6781	0.5333	1.272	0.203544	
MrtSt2	0.4006	0.5703	0.702	0.482453	
MrtSt3	0.6789	0.5194	1.307	0.191134	
DwlTyp2	-0.4260	0.4389	-0.971	0.331775	
DwlTyp3	-0.8958	0.2602	-3.443	0.000576	***
DwlTyp4	-0.6631	0.3140	-2.112	0.034691	*
Age2	-0.1668	0.2311	-0.721	0.470619	
Age3	-0.5192	0.2432	-2.135	0.032753	*
Age4	-0.3145	0.3117	-1.009	0.313044	
Age5	-1.0178	0.3609	-2.820	0.004801	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 777.20 on 560 degrees of freedom
Residual deviance: 740.88 on 550 degrees of freedom
AIC: 762.88

Number of Fisher Scoring iterations: 4

Housing Need

```
anova(GLM3a2, test="Chisq")
Analysis of Deviance Table
```

```
Model: binomial, link: logit
```

```
Response: Con
```

```
Terms added sequentially (first to last)
```

	Df	Deviance	Resid. Df	Resid. Dev	P(> Chi)	
NULL			560	777.20		
MrtSt	3	9.3624	557	767.83	0.0248417	*
DwlTyp	3	16.5740	554	751.26	0.0008646	***
Age	4	10.3781	550	740.88	0.0345187	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
Anova (GLM3a2)
Analysis of Deviance Table (Type II tests)
```

```
Response: Con
```

	LR Chisq	Df	Pr(>Chisq)	
MrtSt	2.5486	3	0.466572	
DwlTyp	14.9374	3	0.001871	**
Age	10.3781	4	0.034519	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Model 3 - Comparing Two Regressions (9 Key Characteristics versus 3 Significant Characteristics)

```
anova(GLM3a1, GLM3a2, test="Chisq")
Analysis of Deviance Table
```

```
Model 1: Con ~ Sex + MrtSt + DwlTyp + OwnRnt + HH. + Age + Hlth
+ Educ +
  Prov
```

```
Model 2: Con ~ MrtSt + DwlTyp + Age
  Resid. Df Resid. Dev Df Deviance P(>|Chi|)
1      536      730.21
2      550      740.88 -14 -10.673 0.7115
```

Housing Need

Model 4: Removing Dwelling Type to Test Significance of Housing Tenure

in Housing Decision Congruence

```
GLM3b <- glm(Con ~ Sex + MrtSt + OwnRnt + Hlth +HH. + Age + Educ
+ Prov,family = binomial, data=HousingGLM3)
anova(GLM3b, test="Chisq")
GLM3b <- glm(Con ~ Sex + MrtSt + OwnRnt + Hlth +HH. + Age + Educ
+ Prov,family = binomial, data=HousingGLM3)
> anova(GLM3b, test="Chisq")
Analysis of Deviance Table
```

Model: binomial, link: logit

Response: Con

Terms added sequentially (first to last)

	Df	Deviance	Resid. Df	Resid. Dev	P(> Chi)
NULL			560	777.20	
Sex	1	0.1557	559	777.04	0.6931767
MrtSt	3	9.3833	556	767.66	0.0246059 *
OwnRnt	2	15.0892	554	752.57	0.0005289 ***
Hlth	2	0.6312	552	751.94	0.7293427
HH.	3	2.7524	549	749.18	0.4313956
Age	4	11.5690	545	737.62	0.0208612 *
Educ	3	1.3939	542	736.22	0.7069738
Prov	3	2.5967	539	733.62	0.4580735

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

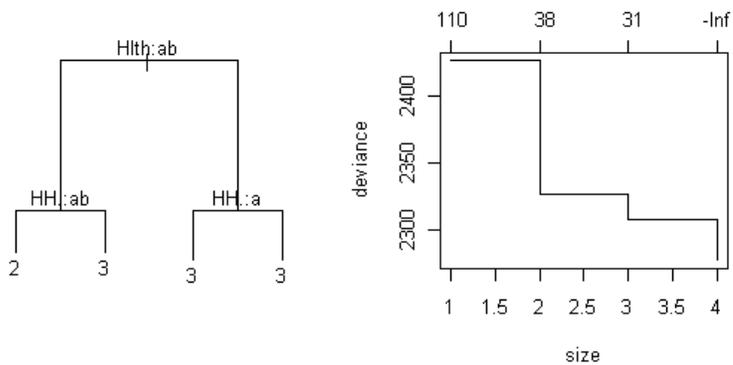
Appendix C: R® Code Output – Classification Trees

R Code:

```
test<- read.table("Housingoct22q1.csv", header=T, sep=" ", na.strings="99999")
for (i in 1:11){test[,i] <- as.factor(test[,i])}
library(tree)
treeQ1<-tree(Group~Sex + MrtSt+ Prov + DwITyp +OwnRnt + HH. +Age +Hlth + Educ, data =
test)
plot(treeQ1)
text(treeQ1)
treeQ1
```

Pruning Code:

```
cv1<-cv.tree(treeQ1)
par(mfrow=c(2,2))
plot(treeQ1)
text(treeQ1)
plot(cv1)
summary(treeQ1)
*No Pruning Required.*
```



Classification tree (No Pruning Required):

```
tree(formula = Group ~ Sex + MrtSt + Prov + DwITyp + OwnRnt +
  HH. + Age + Hlth + Educ, data = test)
```

Variables actually used in tree construction:

```
[1] "Hlth" "HH."
```

Number of terminal nodes: 4

Residual mean deviance: 1.638 = 2237 / 1366

Misclassification error rate: 0.3642 = 499 / 1370 Output:

Housing Need

Output:

node), split, n, deviance, yval, (yprob)

* denotes terminal node

```
1) root 1370 2420.0 3 ( 0.08321 0.32628 0.59051 )
 2) Hlth: 1,2 424 855.3 2 ( 0.15094 0.46698 0.38208 )
   4) HH.: 1,2 323 658.4 2 ( 0.18266 0.50464 0.31269 ) *
   5) HH.: 3,4 101 165.8 3 ( 0.04950 0.34653 0.60396 ) *
 3) Hlth: 3 946 1450.0 3 ( 0.05285 0.26321 0.68393 )
   6) HH.: 1 150 299.6 3 ( 0.15333 0.34000 0.50667 ) *
   7) HH.: 2,3,4 796 1113.0 3 ( 0.03392 0.24874 0.71734 ) *
```

Classification Tree 2: Self Assessed Congruent versus Incongruent

R Code:

```
test<- read.table("Housingoct22q3a.csv", header=T, sep=" ", na.strings="99999")
for (i in 1:11){test[,i] <- as.factor(test[,i])}
library(tree)
treeQ1<-tree(SACon~Sex + MrtSt+ Prov + DwITyp +OwnRnt + HH. +Age +Hlth + Educ, data
= test)
plot(treeQ1)
text(treeQ1)
treeQ1
```

Classification tree (Not Pruned):

```
tree(formula = SACon ~ Sex + MrtSt + Prov + DwITyp + OwnRnt +
  HH. + Age + Hlth + Educ, data = test)
```

Variables actually used in tree construction:

```
[1] "Age" "Sex" "MrtSt" "Educ" "Prov" "DwITyp" "Hlth" "HH."
```

Number of terminal nodes: 15

Residual mean deviance: 0.8823 = 87.34 / 99

Misclassification error rate: 0.1842 = 21 / 114

node), split, n, deviance, yval, (yprob)

* denotes terminal node

```
1) root 114 148.900 1 ( 0.64035 0.35965 )
 2) Age: 1 41 37.480 1 ( 0.82927 0.17073 )
   4) Sex: 0 19 23.700 1 ( 0.68421 0.31579 )
     8) MrtSt: 1,3 13 11.160 1 ( 0.84615 0.15385 )
       16) Educ: 0,1,2 7 0.000 1 ( 1.00000 0.00000 ) *
         17) Educ: 3 6 7.638 1 ( 0.66667 0.33333 ) *
         9) MrtSt: 0,2 6 7.638 2 ( 0.33333 0.66667 ) *
       5) Sex: 1 22 8.136 1 ( 0.95455 0.04545 )
```

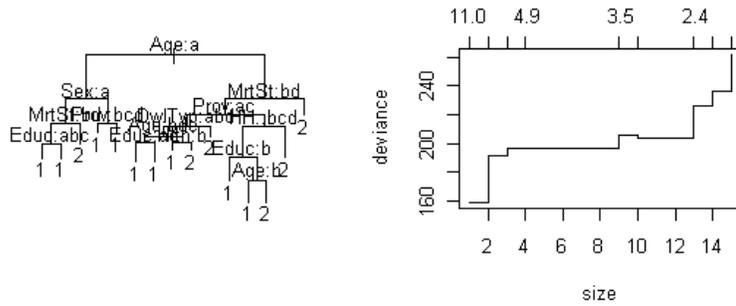
Housing Need

10) Prov: 2,3,4 15 0.000 1 (1.00000 0.00000) *
11) Prov: 1 7 5.742 1 (0.85714 0.14286) *
3) Age: 2,3,4,5 73 100.900 1 (0.53425 0.46575)
6) MrtSt: 1,3 62 84.330 1 (0.58065 0.41935)
12) Prov: 1,3 34 42.810 1 (0.67647 0.32353)
24) DwITyp: 1,2,4 27 30.900 1 (0.74074 0.25926)
48) Age: 2,4,5 17 15.840 1 (0.82353 0.17647)
96) Educ: 0,3 8 0.000 1 (1.00000 0.00000) *
97) Educ: 1,2 9 11.460 1 (0.66667 0.33333) *
49) Age: 3 10 13.460 1 (0.60000 0.40000)
98) Hlth: 2 5 5.004 1 (0.80000 0.20000) *
99) Hlth: 1,3 5 6.730 2 (0.40000 0.60000) *
25) DwITyp: 3 7 9.561 2 (0.42857 0.57143) *
13) Prov: 2,4 28 38.670 2 (0.46429 0.53571)
26) HH.: 2,3,4 19 25.010 1 (0.63158 0.36842)
52) Educ: 1 5 0.000 1 (1.00000 0.00000) *
53) Educ: 0,2,3 14 19.410 2 (0.50000 0.50000)
106) Age: 2 6 5.407 1 (0.83333 0.16667) *
107) Age: 3,4 8 8.997 2 (0.25000 0.75000) *
27) HH.: 1 9 6.279 2 (0.11111 0.88889) *
7) MrtSt: 2 11 12.890 2 (0.27273 0.72727) *

Pruning Code:

```
cv1<-cv.tree(treeQ1)
par(mfrow=c(2,2))
plot(treeQ1)
text(treeQ1)
plot(cv1)
summary(treeQ1)
treeQ2<-prune.tree(treeQ1, best=4)
plot(treeQ2)
text(treeQ2)
summary(treeQ2)
*Pruning Required.*
```

Housing Need



Classification tree (Pruned):

`snip.tree(tree = treeQ1, nodes = c(5, 8, 3))`

Variables actually used in tree construction:

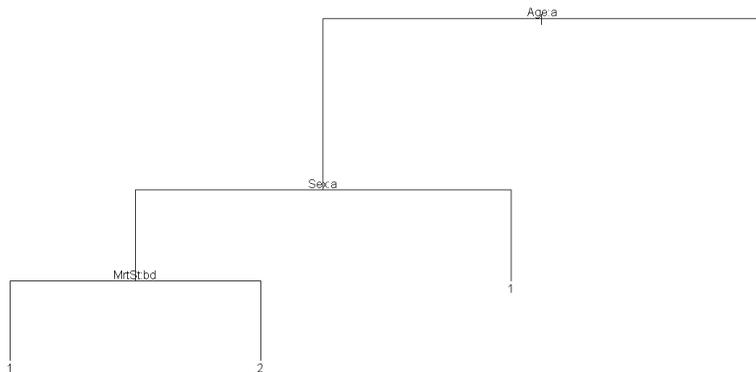
[1] "Age" "Sex" "MrtSt"

Number of terminal nodes: 4

Residual mean deviance: $1.162 = 127.8 / 110$

Misclassification error rate: $0.3421 = 39 / 114$

- 1) root 114 148.900 1 (0.64035 0.35965)
- 2) Age: 1 41 37.480 1 (0.82927 0.17073)
- 4) Sex: 0 19 23.700 1 (0.68421 0.31579)
- 8) MrtSt: 1,3 13 11.160 1 (0.84615 0.15385)
- 9) MrtSt: 0,2 6 7.638 2 (0.33333 0.66667) *
- 5) Sex: 1 22 8.136 1 (0.95455 0.04545)
- 3) Age: 2,3,4,5 73 100.900 1 (0.53425 0.46575)



Classification Tree 3: Assessed Risk Congruent versus Incongruent

R Code:

```
test<- read.table("Housingoct22q3b.csv", header=T, sep="," ,na.strings="99999")
for (i in 1:11){test[,i] <- as.factor(test[,i])}
library(tree)
treeQ1<-tree(ARCon~Sex + MrtSt+ Prov + DwITyp +OwnRnt + HH. +Age +Hlth + Educ, data
= test)
plot(treeQ1)
text(treeQ1)
treeQ1
summary (treeQ1)
```

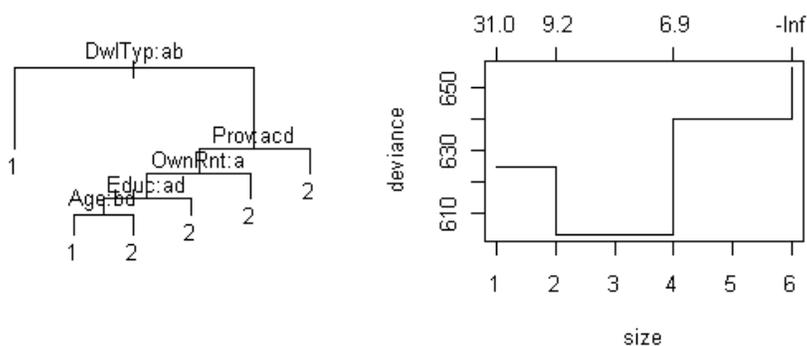
Classification tree (Before Pruning):

```
tree(formula = ARCon ~ Sex + MrtSt + Prov + DwITyp + OwnRnt +
  HH. + Age + Hlth + Educ, data = test)
Variables actually used in tree construction:
[1] "DwITyp" "Prov" "OwnRnt" "Educ" "Age"
Number of terminal nodes: 6
Residual mean deviance: 1.25 = 551.4 / 441
Misclassification error rate: 0.4004 = 179 / 447
```

node), split, n, deviance, yval, (yprob)
* denotes terminal node

- 1) root 447 614.300 2 (0.4452 0.5548)
- 2) DwITyp: 1,2 333 461.100 1 (0.5195 0.4805) *
- 3) DwITyp: 3,4 114 122.400 2 (0.2281 0.7719)
- 6) Prov: 1,3,4 98 113.400 2 (0.2653 0.7347)
- 12) OwnRnt: 1 23 31.840 1 (0.5217 0.4783)
- 24) Educ: 0,3 16 19.870 1 (0.6875 0.3125)
- 48) Age: 2,4 7 0.000 1 (1.0000 0.0000) *
- 49) Age: 1,3 9 12.370 2 (0.4444 0.5556) *
- 25) Educ: 1,2 7 5.742 2 (0.1429 0.8571) *
- 13) OwnRnt: 2,3 75 72.200 2 (0.1867 0.8133) *
- 7) Prov: 2 16 0.000 2 (0.0000 1.0000) *

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Pruning Code:

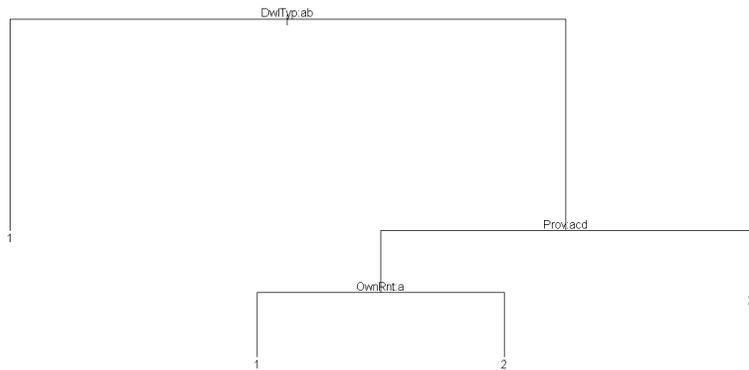
```
cv1<-cv.tree(treeQ1)
par(mfrow=c(2,2))
plot(treeQ1)
text(treeQ1)
plot (cv1)
summary(treeQ1)
treeQ2<-prune.tree(treeQ1, best=3)
plot(treeQ2)
text(treeQ2)
summary(treeQ2)
*Pruning Required*
```

Classification tree (After Pruning):

```
snip.tree(tree = treeQ1, nodes = 12)
Variables actually used in tree construction:
[1] "DwITyp" "Prov" "OwnRnt"
Number of terminal nodes: 4
Residual mean deviance: 1.276 = 565.2 / 443
Misclassification error rate: 0.4139 = 185 / 447
```

- 1) root 447 614.300 2 (0.4452 0.5548)
- 2) DwITyp: 1,2 333 461.100 1 (0.5195 0.4805) *
- 3) DwITyp: 3,4 114 122.400 2 (0.2281 0.7719)
- 6) Prov: 1,3,4 98 113.400 2 (0.2653 0.7347)
- 12) OwnRnt: 1 23 31.840 1 (0.5217 0.4783)
- 13) OwnRnt: 2,3 75 72.200 2 (0.1867 0.8133) *
- 7) Prov: 2 16 0.000 2 (0.0000 1.0000) *

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Classification Tree 4: Congruent versus Incongruent Combined SA and AR

R Code:

```
test<- read.table("Housingoct22q4.csv", header=T, sep=" ", na.strings="99999")
for (i in 1:11){test[,i] <- as.factor(test[,i])}
library(tree)
treeQ1<-tree(SAARCon~Sex + MrtSt+ Prov + DwlTyp +OwnRnt + HH. +Age +Hlth + Educ,
data = test)
plot(treeQ1)
text(treeQ1)
treeQ1
summary (treeQ1)
```

Pruning Code:

```
cv1<-cv.tree(treeQ1)
par(mfrow=c(2,2))
plot(treeQ1)
text(treeQ1)
plot (cv1)
*Pruning Not Required**
```

Classification tree (Pruning Not Required):

```
tree(formula = SAARCon ~ Sex + MrtSt+ Prov + DwlTyp + OwnRnt +
  HH. + Age + Hlth + Educ, data = test)
```

Variables actually used in tree construction:

```
[1] "DwlTyp"
```

Number of terminal nodes: 2

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Residual mean deviance: $1.352 = 756 / 559$

Misclassification error rate: $0.4171 = 234 / 561$

Output:

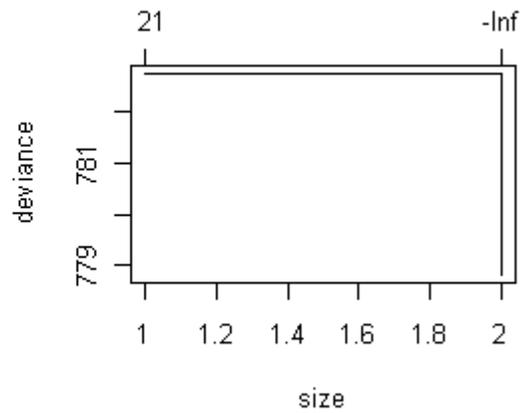
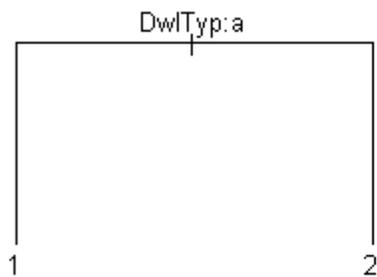
node), split, n, deviance, yval, (yprob)

* denotes terminal node

1) root 561 777.2 2 (0.4848 0.5152)

2) DwlTyp: 1 390 536.9 1 (0.5487 0.4513) *

3) DwlTyp: 2,3,4 171 219.0 2 (0.3392 0.6608) *



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Appendix D: Housing Need Criteria Logistic Regression Tables

Table 15. Logistic Regression Comparing Two Models to Predict Self-Reported Housing Need with Housing Need Criteria (Analysis of Deviance)

	Residual Degrees of Freedom	Residual Deviance	Degrees of Freedom	Deviance	P (> Chi)
Model 1: Three Housing Need Criteria	1610	827.27	-	-	-
Model 2: Five Housing Need Criteria	1608	722.47	2	104.8	$\sim 0 (< 2 \times 10^{-16})^{***}$

Note: *p < .05. **p < .01. ***p < .001.

Table 16. Logistic Regression Predicting Self-Reported Housing Need with Five Housing Need Criteria (Analysis of Deviance, Added Sequentially)

	Degrees of Freedom	Deviance	Residual Degrees of Freedom	Residual Deviance	P (> Chi)
Null	-	-	1613	909.02	-
Suitability	1	0.045	1612	908.98	0.8323
Adequacy	1	63.181	1611	845.80	$\sim 0 (1.9 \times 10^{-15})^{***}$
Affordability	1	18.526	1610	827.27	0.00002***

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Safety	1	102.785	1609	724.49	$\sim 0 (< 2 \times 10^{-16})^{***}$
Accessibility	1	2.019	1608	722.47	0.1553

Note: *p < .05. **p < .01. ***p < .001.

Table 17. Logistic Regression Predicting Self-Reported Housing Need with Five Housing Need Criteria – Accessibility Added Before Safety (Analysis of Deviance, Added Sequentially)

	Degrees of Freedom	Deviance	Residual Degrees of Freedom	Residual Deviance	P (> Chi)
Null	-	-	1613	909.02	-
Suitability	1	0.045	1612	908.98	0.8323
Adequacy	1	63.181	1611	845.80	$\sim 0 (1.9 \times 10^{-15})^{***}$
Affordability	1	18.526	1610	827.27	0.00002***
Accessibility	1	14.816	1609	812.45	0.0001***
Safety	1	2.019	1608	722.47	$\sim 0 (< 2 \times 10^{-16})^{***}$

Note: *p < .05. **p < .01. ***p < .001.

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Table 18. Logistic Regression Predicting Self-Reported Housing Need with Five Housing Need Criteria (Analysis of Deviance, Last in Model)

	LR Chisq	Degrees of Freedom	Pr (>Chisq)
Suitability	0.004	1	0.9505
Adequacy	25.865	1	0.0000004***
Affordability	8.484	1	0.0036**
Safety	89.988	1	$\sim 0 (< 2 \times 10^{-16})$ ***
Accessibility	2.019	1	0.1553

Note: *p < .05. **p < .01. ***p < .001.