

INCIDENCE OF HOME MODIFICATIONS AMONG YOUNGER OLDER ADULTS
AND OLDER OLD ADULTS USING CROSS LONGITUDINAL ANALYSIS

by

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(Under the Direction of ANNE SWEANEY)

ABSTRACT

Home modifications can help elders maintain their independence within the home. Modifications are features that make the home more accessible and safer for residents such as no-step entry, lever handles, and elevated toilet seats. With the number of elders in the United States climbing quickly it is important that housing be able to accommodate elder needs. This study explored whether or not elders are using home modification as an option to help them age in place. Using t-tests, chi-square and logistical regression, younger old adults (those 55 to 70 years old) and older old adults (those 71 years old or older) are compared longitudinally. Health and Retirement Survey (HRS) data were used in conjunction with RAND (research and development) data files to collect information on elders from the years 1996 and 2004. Elders were found to have greater odds of home modification absorption based on previous broken hips or housing condition rather than age itself. Age was not a significant indicator of whether or not elders chose to add modification features. Limitations on home modification data were present and future research on this topic needs to continue.

INDEX WORDS: elders, home modifications, older adults, universal design

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CHAPTER 1

Introduction

Older adults are rapidly increasing in numbers in the United States and will continue to make up a large proportion of our population. From 1990 to 2000 every state's older population grew and ranged anywhere from a one percent to a 72% increase (U.S Census Bureau, 2001, p. 3). These individuals are diverse in their capabilities and benefit from environments that are built to enhance their functional capacity. It is important that homes be safe for elders to live in and provide the comfort required to remain at home. With medical technology, health, and other factors expanding the average life span, it is important that persons be able to continue living independently for as long as possible if that is their desire. The purpose of this study is to determine whether or not older adults are choosing to incorporate modifications into their homes. The hypotheses for the study are: (a) there is no statistically significant difference in the existence of home modifications among younger old adults (55-70 years old) and older old adults (71 years and above) for cross-sectional and longitudinal analysis. These hypotheses will be tested using longitudinal data.

“The ability to age in place and never move is contingent on the livability of the dwelling in which an older person resides.”(Liebig, 1999, p.80) Living independently will require that the home be as hazard free as possible, comfortable, and accessible to the changing functional needs over time. Including universal design features and home modifications in the homes of older adults allows needs to be met efficiently. These environmental adaptations are increasingly important since they are a way to promote independence among older adults and improve caregiver quality. This study will add to

previous literature by focusing on the older adult population in the United States and assessing the correlation between the aging of the individuals and the consumption of home modification features.

Problem

Housing not meeting the needs of residents is an increasing problem. Elder needs are not limited to healthcare or medications, but also include housing and other aspects of their lives. As individuals age, there will be multiple life changes and knowing how housing can influence peoples quality of life is essential. “The quality of life resulting from housing types reflects a combination of: (1) personal choice of current housing; (2) the match between personal autonomy or independence with housing resources; and (3) social support provided to maintain residence in a specific housing type.”(Crist, 1999, p.105)

Problems arise when elder physical changes do not interact effectively with the home. When these physical changes are experienced in an older home or one that is not fitted to the needs of the resident, there may be many challenges. In order to maintain their independence in the community, older adults must be able to interact effectively with their home environments (Cream & Teaford, 1999).

The use of home modification features in an existing home increases the probability of a person maintaining their independence. Modifications that improve safety, security, and mobility are all important for elders who wish to remain at home. Regardless of the feature, the goal of these modifications is to allow older adults to maintain their independence while changing the home environment in a way that meets the declining physical abilities of the elder.

Universal design attempts to enable persons to remain living in their home environment as long as possible. While one feature may not meet the needs of everyone, there are some that can meet the needs of many. These features enhance the living environment of persons across all ages, not just older or disabled individuals. Universal design is a type of design for people of all ages and abilities. This concept may be better understood by the following definition from Null and Cherry (1996):

“Universal design, also known as lifespan design, seeks to create environments and products that are usable by children, young adults, and the elderly. They can be used by people with “normal” abilities and those with disabilities, including temporary ones.”(p. 25)

We have seen dramatic increases in survival rates for infants, younger people and older people with disabilities—increases that are expected to grow even more dramatically in the years to come. These changing demographics have led to the need for increased housing adaptations and personal services, and for policies that incorporate recognition of the need for options and flexibility in meeting these challenges (Zola, 1997). Many of the home modifications that are later added into the housing design are universal design features.

As the older population continues to increase in numbers, it is necessary to educate consumers and promote the use of home modification and universal design in the home. Increasing longevity and the inevitable onset of chronic conditions in old age that contribute to activity limitations make mechanisms of coping with activity limitation an important issue (Kutty, 1999). The majority of elders are living with at least one chronic illness and some with multiple chronic conditions. At least 80% of older people have at

least one chronic condition and 50% have two or more (Moore & Moir, 2004). Chronic problems are often accompanied by continuous pain and/or distress. At the very least, the individual is inconvenienced by the need to monitor health and daily activities (Hooyman & Kiyak, 2005). A major problem for older individuals is that their homes are nonconforming to their needs.

Along with the large increase of older adults there will also be a shortage of caregivers. Currently, nearly one out of four households provides some type of care to persons' age 50 or above (Glass, 2005). Home modifications are important to caregivers as a means of alleviating some of the stress. For example, having a no step shower would make it easier to assist an elder in bathing rather than lifting them in and out of a tub.

There may be a large number of reasons for the lack of adequate features in the homes of elders. The first starts with the way homes were originally designed for homeowners. Housing standards have not been updated to change with the diverse characteristics of the population. The need for change in housing is apparent with the elders increasing in numbers and desiring to "age in place". "To design for older people requires an understanding of how the aging process can affect the way in which an older person perceives, interprets, and negotiates the environment; it also demands an understanding of what it means to grow older in our society" (Carstens, 1985, p.10).

Home modifications such as universal design are appropriate changes for the housing sector but are often not included in new construction. Many homebuilders do not offer universal design features as an option to consumers and are reluctant to suggest them. If universal design is not initially incorporated into the home, the need for home modifications may not occur for many years. Builders often focus on the tangible items

and overlook the importance of the interaction between the environment and the individual. Universal design need not be a complicated concept. Most universal design features are standard building elements that are placed differently (lowered light switches), selected more carefully (lever faucet handles), or re-dimensioned (wider doorways). “Many universal design features can be added to a home during a home remodeling or rehabilitation project at little or no extra cost.”(NAHB Research Center, 1996, p.1) See Table 1 for a reference list of home modifications presented in different expense categories.

Table 1.

Relative Expense of Environmental Modification

Little or no cost:

- Install non-slip mats in the bathtub/shower, sink, and laundry areas
- Remove obstacles and clutter on floor
- Remove electrical and telephone cords that extend across the floor
- Provide adequate space to move around furniture
- Provide a remote for the television
- Remove wheels from furniture
- Remove/repair unstable furniture
- Adjust chair and bed height to reduce requirement for leg strength
- Provide adequate lighting throughout the house (use at least 100 watt bulbs)
- Install nightlights in the bedroom, bathroom, and hallways
- Wear footwear with rubber soles for added traction
- Avoid slippery waxes on hardwood and linoleum floors
- Remove throw rugs
- Place fluorescent tape on edges of top and bottom steps
- Mark doorway thresholds
- Ensure that carpets (especially on stairs) and area rugs have skid-proof backing or are tacked to the floor
- Place frequently used items within reach on shelves
- Label all medication bottles with large print instructions for ease in reading
- Provide cases to sort medications into daily/weekly doses to prevent accidental over/under dosing

Table 1. (Cont.)

Relative Expense of Environmental Modification

Moderate expense

- Add ceiling fixtures to rooms to provide better lighting
- Install lamps that can be turned on by a switch near the entryway of the room
- Install motion-, voice-, or sound-activated lamps
- Move electrical outlets and light switches so they are easy to reach
- Purchase a portable phone that can be taken from room to room
- Install additional electrical outlets to prevent stretching of extension cords across floors
- Install a phone extension on each floor (and each room)
- Use a change in color to designate a change in surface type or level
- Paint stairs alternating colors to improve contrast between steps
- Install an electronic emergency response system
- Provide bed mattress with firm edges for easy transfer
- Install assistive devices such as a shower seat, bath bench, shower hose, and raised toilet seat
- Install grab bars in the bathroom that can hold the weight of the resident
- Place gates in open doorways leading to stairs
- Purchase chairs with arm rests, sturdy backs, and that are at least 18 inches (the seat) in height
- Provide heavy furniture that will not tip if used for support
- Purchase hip pads to reduce the force of impact on the hip if a fall occurs

Significant Expense

- Modify stairs so they have a lower gradient and more depth
- Install walk-in showers that are easy to enter and exit
- Install easy to reach shelves and drawers in the kitchen and bathroom
- Provide bathroom and laundry facilities on same floor as bedroom
- Install non-glare surfaces and use non-glare paints
- Install touch-sensitive flooring in the bedroom that activates the lighting system

Rogers, M. E., Rogers, N. L., Takeshima, N., & Islam, M.. (2004).

Housing is currently built to be accessible by the “average” consumer. An average consumer would be hard to identify and describe today in this diverse population. Originally the average consumer guidelines were taken from research data conducted by the military. These data consisted of human factors taken from the World War II military

and were intended to be used for the creation of military equipment, but was also applied to areas such as housing to create the “average” consumer. These data standards were established for housing design, airplane seats, water fountains, and other objects used everyday. The greatest challenge with continuing to use these standards is that the “average” consumer today is not going to be a young Caucasian male. Thus, the rest of the population has had to adapt to an environment created for a specific subgroup of the population. Another problem is that the group of young men who were the focus group of the study are themselves no longer able to use these products as easily as was intended since they have aged. The term average consumer is no longer applicable to the United States population. The focus needs to shift to features that are usable across the life-span as peoples’ needs evolve from one stage of life into the next, but until that change occurs there will be a continued need for home modification.

The most important of these stages to focus on is later life. The reason is that as a person ages the probability of having a disability increases. At the present time there are 35 million Americans who are 65 years old or older and that number will increase to 70 million by 2030. Demographics are driving this trend (Kress, 2002). An important cohort that will have a major impact on this aging explosion is the baby boom generation. The baby boomers are those individuals who were born between 1946 and 1964 and make up one-third of the population. In a study conducted for the AARP, three in five elders were found to have lived in their current home for 11 or more years (Kress, 2002). Equally important with boomers is that according to a survey done by the AARP, 73% of their respondents aged 55 or older expressed that they thought they would always stay where they are (AARP, 2000). The U.S. Census Bureau data supports the trend of aging

in place finding that the percent of people 65 years and over living in nursing homes declined from 5.1% in 1990 to 4.5% in 2000 (U.S. Census Bureau, 2001, p. 7). However, there may be other factors that are driving nursing home numbers down. One explanation may be that there are more options available to elders today than in the past. Continuing care retirement communities and assisted living facilities are options that elders may choose to substitute for nursing home care.

Since the incidence of having a disability is correlated with age, it is important to educate individuals and offer housing alternatives that fit their lifestyle. In 2000, approximately 10 million persons 65 years or older needed some assistance to remain in the community (including 10.5 percent of those aged 65-79 and 51% of those over the age of 85)".(Hooyman and Kiyak, 2005). The house cannot adapt to them; therefore, options must be available to modify the home. Housing should also be designed to deal with the changes that occur with psychological aging. Universal design is one such way to approach these issues. Understanding both of the terms mentioned and addressing them is necessary. A disability or person with a disability, according to an article by Jack McNeil for the U.S. Census Bureau (1997) is:

A person is considered to have a disability if he or she has difficulty performing certain functions (seeing, hearing, talking, walking, climbing stairs and lifting and carrying), or has difficulty performing activities of daily living, or has difficulty with certain social roles (doing school work for children, working at a job or around the house for adults). A person who is unable to perform one or more activities, or who uses an assistive device to get around, or who needs assistance

from another person to perform basic activities is considered to have severe disability. (p.1)

Also important is psychological age which is defined by Hoyer & Roodin (2003) to refer to:

An individual's adaptive capacities—that is, his or her ability to adapt to changing environmental demands. Individuals adapt to their environments by drawing on various psychological characteristics: learning, memory, intelligence, emotional control, motivational strengths, coping styles, and so on. Therefore, adults who possess such psychological characteristics to a greater degree than their chronological age mates are considered “psychologically young”; those who possess traits to a lesser degree are “psychologically old.” (p. 12)

“To maximize the options for daily living for older people, design can and must respond to changes in sensory processes and perception, the central nervous system and cognitive functions, and health associated with the aging process.”(Carstens, 1985 p.10)

Concerns about health, disability and aging, coupled with the demographic changes that are currently taking place, make housing and universal design an important issue to be addressed. When designing for an older consumer, a builder should be aware of many common changes that these mature consumers have to consider. Being aware of these changes allows builders to create environments that are functional for older adult needs. For instance, since elders require a greater level of illumination, increasing the amount of light available within the home lets the individual move more safely; installing louder doorbells can also ease some of the stress.

Not only does the incidence of disability increase with age but so does the probability of a fall. Home modifications that could reduce these numbers are important especially since falls are currently the leading cause of injury deaths. Falls are the leading cause of fatal and nonfatal injuries to older people in the United States, and each year more than 11 million people over the age of 65 fall: one out of every three elders (Fredrikson, 2004). A fall is defined as:

The unintentional coming to the ground or some lower level and other than as a consequence of sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in stroke or an epileptic seizure (Gibson, Andres, Isaacs, Radebaugh, & Worm-Peterson, 1987).

Approximately half of the falls that older adults suffer occur in their home (Rogers, Rogers, Takeshima, & Islam, 2004). Falls are often classified as accidents, but there are preventative measures, such as home modifications and the removal of obstacles such as loose rugs that can lessen the likelihood of a fall occurring. The kitchen, bathroom, bedroom, and staircases are common areas within the home where falls occur. Falls are the leading cause of injuries for people over age 65 in United States, and account for up to 90% of all hip fractures.

It is important to find a way to reduce these numbers and prevent as many of these falls as possible. Reducing the number of falls by older adults will lower healthcare costs for the individual and the community. Over \$20 billion is spent each year as a result of these falls, treatment of the injury, and complications that may follow as a result.”(Lord, Munz, & Sherrington, 2006) Among persons 65 years of age and older falls are the number one leading cause of injury-related hospitalization (Lord et. al., 2006).

Education and exercise training of older adults and their caregivers are needed to reduce the risk of falls in addition to environmental interventions. Falls can result in a permanent disability, temporary disability, surgery, or may prove fatal to older adults. Injuries are generally regarded as one of the most preventable causes of disability (Zola, 1997). Home modifications and the incorporation of universal design can help to reduce some of the risks that are encountered by elders in the home and can also make performance of tasks easier for everyone within the dwelling unit.

Modifications will play an important role for caregivers of an injured person. It is not uncommon for a person to go home after an injury rather than into an institution. “Following an (often brief) inpatient stay, clients may expect to move along a continuum of treatment from home health care to out-patient before they have reached their maximal functional potential.”(Auriemma, Faust, Sibrian, & Jimenez, 1999, p.138) The reason for these brief inpatient stays may be that there has been an increase in assistive services to injured persons wishing to get home quickly. Many of these services are now covered by insurance and allow the person better health care at home.

The other reason for these shorter stays is the turnover rates in hospital rooms. Hospitals are often encouraged to flip rooms as quickly as possible. By the year 2040, the number of hospital admissions for hip fractures in persons 65 and older is expected to exceed 500,000 (Fredrikson, 2004). Many hospitals do not have the room to keep patients as long as might be desired by patients or doctors. When the person is sent home before they are ready the burden of care will often fall to a caregiver. Having “user” friendly features in the home make the recovery process smoother and ease some of the previous burdens caregivers.

Across generations the trend to “age in place” has remained. Today, the proportion of elders living in nursing facilities is less than five percent. Remaining in place is by far the most frequent choice made by older individuals when making decisions about where to live (Belser & Weber, 1995). “Aging in place” means:

living in one’s dwelling safely, independently, and comfortably—regardless of age, income, or ability level. For those opting to age-in-place, it also means that varying degrees of facility modifications will be necessary to make living spaces more “age-friendly” (Williams, 2004, p. 34).

The home is more than just a structure to these older adults because it is familiar, safe, and holds an emotional attachment for their personal identity. The home represents their independence from society and thus, they are reluctant to want to give up control. Many elders spend the majority of their time within their residence. The reason for this may be due to mobility impairment or social disengagement. AARP studies have consistently shown during the past ten years that the vast majority of the over-45 population wants to stay at home as long as possible. A major problem that may arise from this desire to age in place is that many of the homes have aged as well and do not meet the needs of the individual.

The significance of home changes over time and most elders place extreme value in their home. About three-fourths of all elders who choose to remain at home own their homes. This statistic helps to explain added attachment to the residence. To give all of that up and move to a new location can be too much for some to bear. The increase in the proportion of older adults has generated concern about their ability to function and live independently (Belser & Weber, 1995).

Elders often do not want to leave their current residences due to the importance their homes hold in their lives, making it increasingly essential to find a way to make residences safer for them. Extrinsic factors are a major contributor to falls and often the home environment contains many unsafe areas that predispose an individual to falls. Identifying and correcting potential hazards and installing assistive devices are effective fall prevention strategies that can make the home environment safer for older adults (Rogers et al, 2004). Of course, these problems could be alleviated if the home was fitted with universal design features to allow residents the option of aging in place (Kress, 2002). Making it easier for elders to function in their homes will have increased benefits on their longevity as well as their health. Coping with activity limitations that occur in old age is an important issue in the context of increasing life expectancy and the still inevitable onset of chronic conditions in old age (Kutty, 1999).

In order to increase the presence of home modification and/or universal design in homes there are some barriers to overcome. Issues must be dealt with on both the consumer and producer sides before universal design can be increasingly accepted in the housing industry. There is also the need for more education among homeowners as to what home modifications are and how to incorporate them into the home. In general, customers do not ask for these services unless they have already developed a need for them. Family members can let elders try out a feature and allow them to take the lead in choosing what they want in their home. Experienced re-modelers recommend marketing to health-care professionals who advise older clients on living options. Sometimes elders may prefer hearing about options from a professional rather than a family member. There are also the concerns about devaluing the home and the costs associated with including

universal design within the home. Presenting elders with the costs and benefits of features and examples of homes that already have them incorporated may help. Last, and perhaps more important, is to make sure that older adults do not view the transition or change as taking away their independence, but as a way to remain independent for a longer length of time. Including elders in the decision making process and emphasizing the help these features provide is important. Others must recognize that the elder is an adult and has the right to choose the amount of risk they are comfortable living with in the home.

Definitions and Application

Universal design is a design philosophy that includes existing codes and guidelines, but goes even further than barrier-free or accessible design standards. Universal design is meant to improve the lives of all people in the built environment. In this philosophy people of all ages are included, as well as people with or without what our society has determined to be physical disabilities (Baucom & Grosch, 1996). There are seven principles to universal design. These principles were developed at the University of North Carolina by The Center for Universal Design (1997) and are as follows:

1. Equitable Use: The design does not disadvantage or stigmatize any group of users.
2. Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

3. Simple, Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended action
6. Low Physical Effort: The design can be used efficiently and comfortably, with a minimum of fatigue.
7. Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

The universal design approach is “people first” (Null, 2003). Universal design features are easily placed in the home without drawing attention. These features may be lever handled door knobs, grab bars in the shower, or wider door frames throughout the house. Changes such as these can range from little cost to being a significant expense. Some are a part of universal design and others are just home modifications.

When considering whether or not to use universal design, one should realize that it is less costly if the design features are included in initial construction costs. Accessible or universally designed features tend to cost about five percent more than standard products, but they also last longer and save clients money in the long run on maintenance

and replacement (Professional Remodeler, 2001). If home modifications and universal design are done properly, they may actually increase the value of a home.

Even though there are many benefits to using these features within the home many builders are still not promoting their use. There are many reasons for the delay of knowledge between builders to buyers. Mainly, builders typically build for what is perceived to be the average consumer or family unit. A majority of standards and design practices in use prior to the 1950's have been carried on throughout the 1990's and do not respond to the needs and requirements of a large segment of the population (Belser & Weber, 1995). In the past, interior environments were designed for the able-bodied, adult male who is six feet tall, but he is not representative of the general population. We need to look for a model more accurately representing the population; we should look to the average person around the age of 65 (Baucom & Grosch, 1996). Other builders simply do not understand or know how to incorporate the features into a home.

On the other side of this problem is lack of education and awareness on the part of the consumer. Many consumers are not informed as to the decisions and choices they have about what goes into their home. Consumer acceptance has been and will be aided by the increased coverage of senior housing issues in the mainstream media as well as by the educational efforts of aging and housing organizations, re-modelers, and builders (Professional Remodeler, 2001). Some persons have trouble perceiving what something will look like when it is placed in the home and thus choose not to have it at all. There is also the need to help consumers understand they are gaining independence by absorbing features within the home not the other way around. Independence and the ability to

control one's environment have been found to be powerful variables in human behavior (Belser & Weber, 1995).

Purpose and Hypotheses

This study is focusing on the relationship between the use of home modifications and the aging population. "Advances in modern medicine and present life-style trends are directly affecting the older population and, in turn, the housing market for older persons." (Carstens, 1985, p. 162) The purpose of the study is to investigate whether or not older adults are choosing to incorporate modifications in their homes as they age or as the need arises. The following are the hypotheses for the study and examine whether or not home modifications are added to the home over time:

The following null hypotheses will be tested:

1. There is no statistically significant difference in the existence of home modifications among younger old adults (55+) and older old adults (70+) at the time of the study in 2004.
2. There is no statistically significant difference in the existence of home modification over time, from 1996 to 2004, among younger old adults and older old adults.

These hypotheses will be tested controlling for the following home, household, and personal characteristics:

Housing characteristics: whether the consumer owns the current residence or not, age of current residence, condition of current residence, and adaptability of home.

Household characteristics: total household income, total wealth of household, and total number of residents.

Personal characteristics of the principle householder: gender, race, education level, whether or not the principle householder has fallen, locations of residence by region, and disability status.

Summary

As society continues to age and become a larger proportion of the population, it is important that homes be able to compensate for personal changes over time. Homes must be functional for the residents, as well as safe and comfortable. Home modifications and universal design can meet these needs, but it is important that consumers be aware of their options.

This study will focus on the addition of home modification features within the home and whether or not there is an increased incidence of features that correlates with age. This study will investigate current consumption for home modifications and universal design features. Such consumption may be higher than expected. Expanding the use of these features is important as our older adult population rises and with the need for more care options and accessible environments.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

This study investigates the consumer demand for home modification features in future and current residences of older adults. The literature review is framed around Lawton and Nahemow's (1973) Competence and Environmental Press Model and Becker's Theory of Human Capital as an Investment. A discussion of legislation that has been associated with accessible environment follows. To further discuss accessible environments is a section consisting of other types of home designs and terminology, and then by a concise discussion of universal design. The link between home modification and housing issues will be established, in relation to older adults.

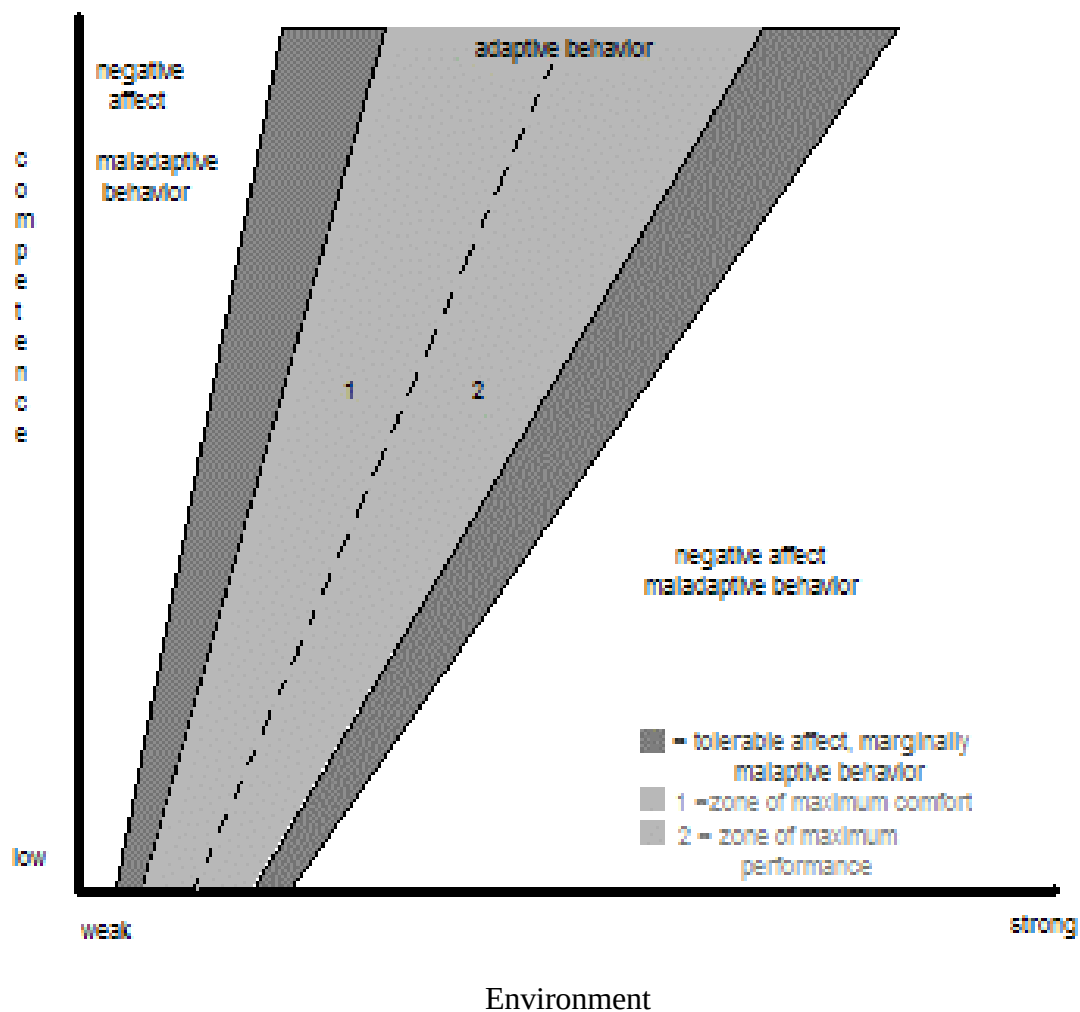
Competence and Environmental Press Model

This model provides a useful way to look at a person and how they interact with their environment. Lawton and Nahemow (1973) tried to specify this interdependence further by viewing the person term of the equation as a set of "competences" in the domains of biological health, sensorimotor functioning, cognitive skill, and ego strength. These aspects are basic domains of function even though in actuality there is no one way to look at competence. Lawton recognized that the majority of elders live independently in their own homes and preferred to continue this way for as long as possible (Pynoos, Nishita, & Perelman, 2003).

To maintain their independence in the community, older adults need to be able to interact effectively with their home environment. The environment part of this model may refer to many different situations. The environment may be a person's community,

neighborhood, or home. The environmental press is defined as the demand that social and physical environments make on the individual to adapt, respond, or change (Hooyman & Kiyak, 2005). A person is operating at the most desirable level when the press just exceeds the point at which they can adapt (Figure 1 expresses these points). An advantage of this model is that it takes into consideration that an individual's environment is changing and that an individual must make adaptations to their environment.

Figure 1: Competence and Environmental Press Model



Lawton and Nahemow (1973).

Individual competence is an issue addressed by this model. Lawton and Nahemow (1973) define this as the theoretical upper limit of an individual's abilities to function in the areas of health, social behavior, and cognition (Hooyman & Kiyak, 2005). There are many areas in which an older adult may have to make adaptations that include, but are not limited to job performance, performance of activities of daily living (ADLs), and choice of outside activities. As can be seen in the model, the higher a person rates in the competence area, the more press they will be able to handle. As a person ages and can no longer tolerate the same amount of environmental press, there may be a need for intervention with features that allow them to perform at higher levels and better adapt to stress. Home modification is one such option for these individuals.

According to Lawton (1989), there are three functions important to elders: maintenance, stimulation, and support. All need to be present in the home of an older adult. Maintenance deals with the routines that these individuals are accustomed to performing. Routines allow a person to be more comfortable within their home since they are familiar with their own schedules. Stimulation takes place when a response from the person must be rendered in a given situation. This response may be cognitive, emotional, or behavioral in nature. Last, there is support that allows the individual the ability to relax, knowing that a problem can be addressed without added stress. Many common types of support are spousal, familial, and social. Personal fulfillment and increased psychological well-being are the result of a successful combination of maintenance, stimulation, and support (Lawton, 1989).

M. Powell Lawton can be credited for important advancements in the home modification field. His work extended beyond theoretical contributions to practical

efforts that directly impact older adults' lives. Lawton's efforts shaped the home modification field with the recognition that a supportive physical environment can enable an older adult to successfully adapt to declining functional abilities (Pyoors & Natisha, 2003).

Health as a Human Capital Investment

According to Becker's (1975) human capital perspective, one should invest in an item as long as the returns received from that item continue to outweigh the costs that are associated with it (Bryant, 1990). The three most popular areas of investment that Becker examines are formal education, experience, and health. Health as a human capital investment can play a part in an individuals' decision of whether or not to purchase home modifications. A way of investing in human capital is by spending time and money maintaining and augmenting one's health. The results are fewer days of sickness per year, longer life expectancy, and higher productivity on the job and in household activities (Bryant, 1990).

If a person were to perceive the consumption of home modifications as a means to maintaining health longer, perhaps they would be more likely to incorporate them into the home. The United States is full of persons hoping to find the next solution to help them live longer and healthier, but may not make the connection to that as being a human capital investment. Others may overlook the simple solution that adapting the home to fit the needs of residents could help in the quest for longevity.

As with any investment, those who invest in home modifications early will reap more benefits. These benefits may be in the form of less falls or fewer back strains that allow residents to remain at home as they age. By reducing the probability of such

accidents, a person is investing in their health by preventing future medical visits and expenses that could potentially force them away from home earlier than they would prefer.

Universal Design Background

Legislation

The Americans with Disabilities Act (ADA) was signed on July 12, 1990. This act requires that accommodation be made to remove any barriers to full participation by people with physical or mental impairments (Null & Cherry, 1996). This act differs because it states that the environment itself can cause a disability. The ADA served to inform the general public of the civil rights of the disabled (Nunn, 2003).

The text of the Americans with Disabilities Act lists two reasons for its enactment. First, discrimination against people with disabilities based on historical isolation, misunderstanding, and stereotype is unjust and counter to the spirit of the Constitution. Second, such discrimination is extremely costly (Null & Cherry, 1996). Allowing these persons the opportunity to give back to society will cut down on the high costs that are associated with a dependent group. The hope of this act is to provide opportunities to a previously isolated cohort.

The ADA has been mentioned by many as an addition to the Civil Rights Act that was passed in 1964. The Civil Rights Act provided protection to individuals based on race, color, national origin, sex, and religion and is similar to the ADA which expands to provide protection to those who are discriminated against as well. ADA adds persons with disabilities to the groups of persons who face discrimination in the public sectors such as state and local government and employment opportunities. The ADA differs

from the legislation on civil rights because it is not based on race or gender but encompasses all groups in society. At any moment in time any individual may experience an accident or injury and find themselves disabled and protected under this act. As the group of persons with disabilities continues to grow in response to the increasing number of elders, the ADA will prove to be an important measure to allow these persons to maintain their individualism and seek opportunities.

Three other significant federal acts also had an impact on the passing of the ADA and are of continued importance in relation to equal rights. The Equal Education for All Handicapped Children Act of 1975 was aimed at the public school systems. This act required that schools offer equal education opportunities to children who had previously been segregated or isolated from the student body. This “mainstreaming” had two important effects on society. First, it introduced thousands of Americans to populations with which they had previously had little or no contact, and as people began to interact more fully with children who happened to have disabilities, many preconceived notions about capabilities and “limitations” began to change. Second, generations of Americans with various physical and mental impairments have now been formally educated in a mainstream setting (Null & Cherry, 1996). The ADA now allows those persons to use the education that they have obtained and have an equal opportunity at getting a job.

The second act that must be mentioned is that of The Architectural Barriers Act of 1968. Under this act, facilities that are funded by the federal government must be designed in an accessible manner. This act did not have as much impact since it did not affect public buildings and there was no penalty for noncompliance.

The last act to be mentioned is The Rehabilitation Act of 1973. The purpose of this act was to target discrimination. It took discrimination protection to the next level by not only prohibiting the discrimination against disabled persons but also authorizing affirmative action for them as well. This act allowed many persons to enter the labor force who previously thought it was not an option. All of these acts helped to pave the way for the ADA.

Barrier-free Design

Barrier-free design was originally intended to eliminate architectural barriers that might hinder people with a disability (Baucom & Grosch, 1996). An example of such a barrier would be narrow doors. This term has been expanded over time to include more standards that allow more comfortable use by disabled persons. Depending on a persons needs, this type of design may be most appropriate when choosing to modify the home. With barrier-free design, the environment will be open; it often applied to persons using wheelchairs or walker (Frechette, 1996).

Accessible Design

According to Baucom & Grosch (1996), accessible design takes the concept of barrier-free design one step further. Accessibility means removing barriers (Null & Cherry, 1996). “Accessible design implies that architecture should not only be barrier-free, it should be accessible to people with any type of reduced physical ability. (p.5)” The types of changes that followed included things such as lever handles on doors or rocker switch lighting. The problem with this design was in the way it was developed. When the design was tested, the group of persons they used only suffered from one condition that was not representative of the disabled population. Also, the average age of

the individual tested was in the mid-twenties which under-represents the United States population. This type of design seems to have the stigma of being for handicapped persons rather than usable by all. Before choosing to modify one should consider current situation and possible future obstacles.

Adaptable Design

Adaptable design was an attempt to go beyond accessible design and also overcome the problems that have arisen from it. Adaptable design is similar to accessible design except for that fact that it did not include features that can be added to a structure later. Adaptable means that a product or environment should serve a majority of individuals who have a wide variety of changing needs (Null & Cherry, 1996). The idea is that the housing unit be built so that if the need should arise that room can be easily adapted to meet the present and future needs. For example, a shower will be built so that when it is desired, the consumer is easily able to have grab bars installed in the bathroom without the bars looking as if they were an afterthought. As ideal as adaptable design may be, there will continue to be a need for modifications until the concept becomes more widely accepted.

Universal Design

According to the U.S. Department of Housing and Urban Development:

“Universal design is a developing approach to creating livable, marketable environments for everyone as common practice in design. It is inclusionary design that applies to spaces, features, and products to maximize the number of people who can function independently in a particular environment. Universal design considers the needs and abilities throughout the lifespan. It attempts to

meet the needs of people of all ages, sizes, and abilities. This concept includes the older, more narrowly focused concepts of barrier free and accessible design, but eliminates the stigma and special appearance to assure marketability. It is often called lifespan design, inclusive design, or transgenerational design.”(NAHB Research Center & Barrier Free Environments, 1996, p.2)

This method of design is the most successful since it does not draw attention to features or make them clearly distinguishable from other things within the home. The Principles of Universal Design are applicable to all types of design. These principles were presented in their expanded form earlier on page 15 as outlined by The Center for Universal Design (Steven Winter Associates, 1997). These principles could be used in architectural, landscape, graphic design, and many other areas.

There are a majority of positive benefits that can be associated with universal design. First, this design method is pleasing to the eye. Universal design is not easily recognized. Universal design adapts products that are already accepted by the population at large, or creates ones that will be pleasing to everyone (Null & Cherry, 1996). Second, universal design is marketable. Since the features are pleasing to the eye, they are easier to market to a wider group of persons, and as the boomers age, they will begin to spend money on themselves in order to remain independent. Last, universal design is also economical. Universal design does not just focus on enhancing the lives of the disabled but on helping everyone that uses the unit.

Examples of universal design are pervasive. For example, wider doorways allow persons in wheelchairs to move through with more ease and also assist in the task of moving furniture from room to room. Elevated outlets ease the strain on backs of elders

by placing outlets at a higher/reachable level and are also perfect for a child or person in a wheelchair. Also, no step entry ways prevent many falls in persons of all ages.

Universal design can be used to its fullest potential in the home if consumers were aware of all the potential gains and options that they have. It is currently not mandated that persons use universal design in the home and such a mandate will most likely never occur since it is a personal residence. Should a person choose home modifications, they will most likely incorporate universal design of some type.

Features

The features associated with universal design cover a wide spectrum. Some are structural and others are nonstructural changes to the home. An example of a low cost easily installed modification feature would be adding rocker switches into the home. These switches can be purchased at a local hardware store for little cost and do not require extensive installation. Other items such as doorways would be structural and the desire to change them would require more money and installation labor. There is no common definition that labels a feature “universally designed” or not.

Cost

The cost of home modifications may range from low to high depending on the choice of feature. Making smaller additions to a home, such as changing lighting and faucet handles will cost less than renovating existing structures. As previously mentioned, it is much cheaper to put these features in from the start then to add them to the home later. Also, by making these decisions in the beginning, the consumer gets the most for their money. Some changes such as grab bars and lever handles can be made for

as little as \$100 and those costs rise when structural changes are involved. Renovating a bathroom may range from \$15,000 on up, depending on the features chosen.

Empirical Literature Review

Kutty (1999) studied older adults using the Survey of Asset and Health Dynamics Among the Oldest Old (AHEAD). Kutty conducted a binomial logit model using determinants of home modifications variables available from the AHEAD dataset from October 1993 to May 1994. The model was used to determine the likelihood of having home modifications to cope with age-disabilities. Contrary to what would be expected, Kutty found that the demand for home modifications is fairly income inelastic. This is an interesting finding since years of schooling increased the demand for home modifications. The more schooling a person has is often reflected in their income. But in this study, income was not a driving factor behind the absorption of home modification features, but years of schooling did have a positive impact. Also found was, that to a certain extent, home modifications and personal care are substitutes. Home modification as a substitute for personal care is an important finding since as the older adult cohort continues to increase there will be fewer caregivers available to them. For this reason, adding home modifications into homes from the beginning can aid adults in maintaining independence longer.

Pynoos and Nishita (2003) researched the cost and financing of home modifications in the United States. They looked into obtaining home modifications, financing, options available to individuals, and options for home modification programs. The Consumer Decision model was introduced to try to explain factors that promote or inhibit the use of home modifications. There is conflicting evidence on whether or not

cost is a major deterrent in the addition of home modifications into the existing household. One other explanation was that the existing residence does not easily accommodate home modification additions. Houses built with universal design features would prevent this problem from continuing throughout future cohorts.

Theresa Nunn (2003) conducted a study comparing personal characteristics of consumers, whose house had universal design features and the characteristics of those who did not but indicated they were interested in having them in a future home. Nunn found that increased age and newer residences were associated with more universal design features within the home. Nunn's study, like Pynoos and Nishita(2003), found that the age and condition of the existing residence influences the decision or ability to include modifications. The increased age of a homeowner, presence of a person with mobility impairment, and planning to move in the future were all factors that increased the desire for future universal design features within the home.

Another study by Kutty (2000) was conducted to focus on the production of functionality in old age. Kutty researched elder functionality by extending Becker's model of household production function of human capital. Assistive devices, personal assistance, and nutritional intake inputs were used in the model. Once again, Kutty used AHEAD dataset, October 1993 through May 1994, in order to develop a model of the household production of bathing functionality. The reason for this model is that bathing is one of the most commonly problematic activities of daily living for elders. Also, the AHEAD survey data on home modification is limited to the bathroom. The use of assistive devices, nutritional intake, and moderate drinking was found to be inputs that play a role in producing bathing functionality. The level of bathing functionality was

found to be correlated with chronic health conditions and endowment variables (endowment variables were genetic endowment and sex). Assistive devices had the most pronounced impact on increasing bathing functionality while personal assistance did not make a contribution. If bathroom devices can significantly increase bathing functionality in older adults, then it is reasonable to assume that devices in other rooms would increase functionality throughout the home.

Research supporting home modifications as a means to preventing falls is not yet conclusive for first time fallers, but there have been studies that found environmental features effective in preventing further falls among previous fallers. In one study by Nikolaus and Bach (2003), intervention that consisted of shower seats, grab bars, and emergency alarms resulted in a 31% reduction in the group of frail elders. The decline was significant among elders who had fallen in the previous year. Even before this study Close, Ellis, Hooper, Glucksman, Jackson, and Swift (1999) had already found that falls were often attributed to environmental hazards. In their study, the interventions group also had significantly fewer falls than the control group.

These studies support the use of home modifications in the home. Universal design at the start of construction would alleviate the problem of having to make homes accommodate subsequent modifications. Increasing functionality in older adults is important in allowing them to age in place. As this cohort continues to grow in numbers and the availability of caregivers decreases, it is important to enhance opportunities to age successfully for our elders.

Summary

The Competence Environmental-Press Model established the importance that a person and their characteristics can have on the need to alter their environment. Beckers' Human Capital Theory was used to express how a person who holds their human capital as an important issue would be more likely to invest in home modification as a way to maintain their independence and health. Home modifications can be seen as applicable to both of these models.

Legislation with importance to disability was outlined to show the history of how the need for home modifications such as universal design has developed to date. Without this legislation, universal design would not be as prevalent as it is currently. But without further education and awareness the market may not expand further.

Applying home modification features and design to the housing market is beneficial to all. It has been proven to be economical, marketable, and aesthetically pleasing. There are a wide range of features to choose from and the costs are not prohibitive. This type of design is not only for the wealthy, but to persons of all ages and income levels.

CHAPTER 3

METHODS

Introduction

The purpose of this study was to determine whether or not there has been an increased incidence of home modification among older adults as they age. Older adults are defined as those persons who were 55 years old or older as of 1996. This study will add to previous literature by focusing on the older adult population in the United States and assessing the correlation between the aging of the individuals and the consumption of home modification features. The findings of this study allow builders and others to help determine whether or not more home modifications will be demanded in the future.

Data

The data for this study came from the Health and Retirement Survey (HRS) (Institute for Social Research). The study is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is a national panel study that has been conducted since 1992 at the University of Michigan (Health and Retirement Survey, 2006). The study includes 22,000 Americans that were 50 years of age and older in 1992, or at the initial time of sampling that took place during the course of the survey. Data are collected every two years from the same individuals. The first wave of the HRS began collecting housing data in 1995. Data from the RAND (Research and Design) Center for the Study of Aging in Santa Monica, CA were used for some of the variables included (RAND HRS Data, 2004). The RAND HRS Data file is an easy to use longitudinal data set based on the HRS data. It was developed at RAND with funding from the National Institute on Aging and the Social Security Administrations. Those variables that were

available in RAND were used and all others were taken from the HRS sections that were not included (See Tables 2 and 3).

Table 2

Health and Retirement Survey (HRS) Variables Used-1996

Variable Name	HRS Section, Question Number
Response Variable	
Home Modification	Section F (31a) – Housing- E2382
Main Experimental Variable	
Age Of Principle Householder	Section A (1) – Demographics-E638
Control Variables	
Homeownership	Section F (3) – Housing- E2226
Household Income	Section J (281) - Assets and Income-E4643
Gender of Principle Householder	Section CS – Coversheet
Highest Education Level Of Principle Householder	Section A (3) – Demographics-E649
Race of Principle Householder	Section A (8) - Demographics-E667M
Location of Residence	Section CS (33) – Coversheet-E430M
Principle Householder Has Fallen	Section B (12) - Health Status-E878
Home is in Good Condition	Section F (37) – Housing- E2387
Adaptability of Home	Section F (38) - Housing- E2394
Physical Limitation of Principle Householder	Section GD (1d) - Disability

Table 3

Health and Retirement Survey (HRS) Variables Used-2004

Variable Name	HRS Section, Question Number
Response Variable	
Home Modification	Section H (143) – Housing JH139-house modification in last 2 years (options -yes, already accessible, no)
Main Explanatory Variable	
Age of Principle Householder	Section CS(R) – Coversheet JA019-R Current Age Calculation
Control Variables	
Homeownership	Section H (F3) – Housing JH004 – Own-Rent Home
Household Income	Could not find in 2004
Gender of Principle Householder	Section PR – Preload (Household) JX060R – Sex of Individual
Highest Education Level Of Principle Householder	Section B (A3) – Demographics (Respondent) JB014 – R Highest level of Education
Race of Principle Householder	Section B (A8) – Demographics (Respondent) JB031 M – R Race Masked
Location of Residence	Section CS (CS33) – Coversheet (Household) JA076 M – Current Residence State Masked
Principle Householder Fallen in Past 2 Years	Section C (B12) – Physical Health (Respondent) JC079 – Fallen in past two years
Home is in Good Condition	Section H (F37) – Housing JH148 – Rate Home
Adaptability of Home	Section H (F38) – Housing JH149 – Make Accessible

Table 3 (Cont.)

Health and Retirement Survey (HRS) Variables Used-2004

Variable Name	HRS Section, Question Number
Physical Limitation Of Principle Householder	Section M1 (GD1d) – Disability for Re-interviews JM007 – HM007Limit in Anyway Section M2 – Disability for non-re-interviews JM507 – Limit in Anyway
Other Main Variables In HRS	HHID – Household Identifier – to identify original household – has six digits – same across waves PN – Person Number – does not change over waves three digits

The purpose of the HRS study is to help provide information that can be used in policy making decisions that will affect elders and their future. The study encompasses a wide range of topics but for the use of this study only select sections will be used.

The sample for this study came from 1996 and 2004 surveys in order to assess the addition of home modification over time. The sections used from these HRS surveys were demographics, assets and income, coversheet, health, disability, and housing. The questions from these sections are consistent for 1996 and 2004. The unit of observation was the head of household that is identified by a household identifier (HHI) number that consists of three digits. This person was referred to as the principle householder. Households that responded to the home modification questions in a way other than “don’t know” or “refused” were included in the sample for this study.

Variables

According to the HRS, home modifications are considered to be additions that make it easier and safer for older or disabled persons to live in the residence. These features consist of ramps, railings, modifications for wheelchairs and other. If a person

chooses the option “other,” they are then asked to specify. Special features, grab bars, shower seats, or call devices, to safeguard older/disabled adults within the home are addressed second. “Other” is also an option with further specification by the respondent.

In order to determine whether or not older adults live in homes with more modifications as they age, survey responses to home modifications were used to create a dichotomous variable indicating the changes in the number of home modifications that the respondents’ homes had between 1996 and 2004. For the longitudinal analysis the two categories are: positive home modifications, those whose home had at least one more home modification feature in 2004 compared to 1996; and (b) non-positive, those who had no change in the presence of home modifications or experienced a decrease in modifications. Home modification was the response variable for the analysis.

The main experimental variable in the study was age group. The age of the householders was classified into two groups. Group one was younger old adults which consists of persons aged 55 to 70. Group two was those individuals who were age 71 and older and were referred to as older old adults.

The following control variables were included in the model: housing characteristics, household characteristics, and personal characteristics of the principle householder. The focus was on controlling for any change in these variables. The reason for including these variables was to prevent confounding factors from affecting the data interpretations accounting for other sources of variation, and interaction between predictor variables (Meyer, 2005).

The housing characteristics were drawn from the housing section of the HRS. These variables were whether or not the home is owned, the condition of the residence,

and age of the current residence. Home ownership was important to include since renters may not be able to add home modifications to their residence as easily as a home owner.

Household characteristics came from the demographics and assets/income sections of the survey and included total household income and total number of residents. Household income was included here since it is often assumed that financially stable adults are more apt to purchase these modifications. Therefore, an increase in income could result in more modifications if wealth is a defining factor. Income is located in the assets and income section of the survey. The data for income in 1996 was adjusted for inflation using the Consumer Price Index (CPI). The reason for adjusting the 1996 household income was to make sure that stating changes in income over time would be reflected accurately. Total number of residents within the home was numerically represented by the actual number of persons within the home.

Personal characteristics of the principle householder that were also included in control variables are gender, race, education level, and disability status of the principle householder. The data for these variables were found in the demographics and coversheet sections of the HRS and are time invariant. Disability status of the head of household was included since it may be a defining factor in the decision to include home modifications or not. It is assumed that a person with a disability would take measures to adjust their current environment in ways to make things easier. Education level was included to control for the assumption that persons with higher education levels are more likely to have home modifications since they are more knowledgeable on the topic. Gender was also included since women make up a larger proportion of the elderly population than men, but not necessarily among younger old adults. This cohort also

experiences more falls. Since women live longer it is likely that they would make more modifications, particularly after a fall. Falls were included since a person who has fallen may be more likely to add home modifications.

Race was included to look at the difference among ethnicities. African Americans and Hispanics are more likely to be caregivers within the home and may need more assistive devices for such services or the opposite may be true and those persons who live alone without caregivers use more assistive devices to compensate for the difference. "A smaller percentage of elder of color (3 percent) than Caucasian elders (5.8 percent) live in nursing homes."(Hooyman and Kiyak, 2005) Caregiving roles may differ among race groups due to cultural differences that affect the type of care a parent will receive or because income differences among ethnicities may prevent the elder from having the option of going into a facility. African American caregivers tend to be economically disadvantaged, provide higher levels of care, and often have no alternative caregivers to provide assistance (Hooyman and Kiyak, 2005).

Hypotheses

The following null hypotheses were tested:

1. There is no statistically significant difference in the existence of home modifications among younger old adults (55+) and older old adults (70+) at the time of the study in 2004.
2. There is no statistically significant difference in the existence of home modifications over time, from 1996 to 2004, among younger old adults and older old adults.

These were tested controlling for the following home, household, and personal characteristics:

Housing characteristics: whether the consumer owned the current residence or not, age of current residence, condition of current residence, and adaptability of home.

Household characteristics: total household income and total number of residents.

Personal characteristics of the principle householder: gender, race, education level, whether or not the principle householder has fallen, locations of residence by region, and disability status.

Statistical Analyses

A descriptive analysis of the independent variables by two home modification categories was conducted using t-tests for all continuous variables and chi-square tests for categorical variables. T-tests are used when the response variable is continuous and the predictor variable is categorical. The interest was in comparing averages over two populations through the use of means and standard deviations.

Multivariate logistical regression was then used in order to compare the odds of adding home modification over time among age groups controlling for household, housing and personal characteristics. Logistic regression was conducted to estimate the effect of the predictor variable on the response variable. The reason for this model selection was that the predictor variable was continuous and the response variable was categorical. That is, the effect of the explanatory variable (age) on the response variable (home modification features). The interest was in estimating the probability of $y=1$ at the

value of the predictor x , instead of estimating the response itself. The interpretation of these results is not intuitive, but a concept of odds is used (Meyer, 2005).

CHAPTER 4

RESULTS

Introduction

This chapter provides descriptions and statistical analyses of the sample. The description of the sample will be discussed first, followed by the multivariate statistical analyses. The results of each of the logistic regression models will be presented and discussed in relation to the hypotheses that were tested in this study.

Data and Sample Descriptions

The descriptive analysis consists of the entire sample which included a total of 11,659 observations from two different years. The observation unit is an individual and no two individuals from the same household were included in this study. The two years were 1996 and 2004 from the HRS survey as well as the RAND data base. The study used 13 different variables to predict the likelihood of absorbing home modifications. Survey participants were originally divided into three groups. The original three age group were (0) younger older adults, (1) older old adults, and (2) other, those persons who did not fit into the two main groups of interest. The last group consisted mostly of persons who were under the age of 55 at the time of sampling. The age groups used were: (0) younger older adults and (1) older old adults in order to investigate whether or not the inclusion of home modification was related to age. For the purpose of simplification, younger older adults were referred to as YOA and older old adults were referred to as OOA.

Table 4 describes the similarities and differences between respondents by age category found through chi-square and t-tests. Each of the age groups is described by

predictor variables in the table. Each of the variables has subcategories and column totals. Among the sample of age groups surveyed, there were more persons in the younger old adult age group for each of the two years. The sample size for 2004 was also larger than the 1996 sample due to increased sampling over that past few years by the HRS.

Table 4

<i>Description of Age Groups for 1996</i>		
	Younger Older Adults 66.13% (1.857E7)	Older Old Adults 30.91% (8763379)
Home modifications		
Yes	6.10%	0.00%
No/Other	93.90%	100.00%
Homeownership*****		
Own Home	74.2%	99.96%
Other	25.8%	0.04%
Mean Number Household Residents	2.423	1.9025
Gender of Principle Householder***		
Male	44.33% (8312847)	37.49% (3286082)
Female	55.66% (1.044E7)	62.51% (5477297)
Highest Educational Attainment*		
No degree	21.34%	31.61%
GED	5.23%	2.33%
HS	33.57%	33.87%
HS/GED	16.41%	15.40%
AA/ Lt BA	3.81%	2.40%
BA	1.19%	8.96%
MA/MBA	6.18%	3.62%
Law/MD/PhD	2.45%	1.78%

Table 4 (cont.)

Description of Age Groups for 1996

	Younger Older Adults 66.13% (1.875E7)	Older Old Adults 30.91% (8763379)
Race of Principle Householder		
White/Caucasian	87.70% (1.644E7)	91.16% (7989115)
Black/African Amer.	9.28% (1740874)	7.09% (621313)
Other	3.03% (567295)	1.75% (152951)
Mean Household Annual Income-1996 Dollar Amount Adjusted For Inflation	\$72,201	\$40,206
Location of Residence		
Northeast	20.10% (3762062)	19.89% (1744189)
Midwest	24.68% (4628810)	28.11% (2462800)
South	34.47% (6485964)	32.31% (2806959)
West	20.62% (3867360)	19.96% (1749431)
Other	0.03% (5605)	0.00%
Principle Householder Fallen		
Yes	No data for 1996	
No		
Injury Due to Those Falls		
Yes	No data for 1996	
No		
Principle Householder Had Fractured Hip		
Yes	No data for 1996	
No		
Home in Good Condition		
Excellent	29.60%	0.00%
Very Good	35.30%	0.00%
Good	24.70%	0.00%
Fair	7.30%	0.00%
Poor	1.45%	0.00%
Blank/Refused	1.65%	100.00%

Table 4 (cont.)

Description of Age Groups for 1996

	Younger Older Adults 66.13% (1.875E7)	Older Old Adults 30.91% (8763379)
Home Easily to Make Accessible		
Yes	No data for 1996	
No		
Already Accessible		

Notes: *p<.05, **p<.01, ***p<.001, ****p<.0001

The statistical tests conducted were chi-square tests for categorical variables and t-tests for continuous variables.

Table 5

Description of Age Groups for 2004

	Younger Older Adults 54.82% (n= 4698.35)	Older Old Adults 45.18% (n= 3872.43)
Home modifications		
Yes	6.70% (315.39)	2.90% (111.81)
No/Other	93.30% (4382.96)	97.10% (3760.62)
Homeownership****		
Own Home	76.70%	99.20%
Other	23.30%	0.80%
Mean Number Household Residents***	2.106	1.88
Gender of Principle Householder		
Male	39.40% (1849.6)	41.90% (1623.8)
Female	60.60% (2848.8)	58.10% (2248.6)
Highest Educational Attainment**		
No degree	19.50%	28.10%
GED	4.80%	3.70%
HS	34.40%	35.80%
HS/GED	17.60%	15.40%
AA/ Lt BA	4.10%	2.60%
BA	7.50%	10.00%

Table 5 (Cont.)
Description of Age Groups for 2004

	Younger Older Adults 54.82% (4698.35)	Older Old Adults 45.18% (3872.43)
Highest Educational Attainment**		
MA/MBA	6.50%	4.70%
Law/MD/PhD	2.30%	1.80%
Race of Principle Householder		
White/Caucasian	88.80% (4172.1)	91.10% (3530.8)
Black/African Amer.	8.10% (381.3)	7.00% (265.11)
Other	3.10% (144.96)	1.90% (76.653)
Mean Household Annual Income in 2004		
Dollar value	\$63,704	\$38,435
Location of Residence*		
Northeast	18.46% (867.05)	19.90% (769.55)
Midwest	24.60% (1155.6)	27.00% (1044.6)
South	35.70% (1677.7)	32.10% (1241.7)
West	21.10% (992.20)	21.00% (812.33)
Other	0.10% (5.8238)	0.00% (0.0000)
Principle Householder Fallen		
Yes	14.90% (717.79)	36.20% (1431.24)
No/Other	85.10% (3980.5)	63.80% (2441.20)
Injury Due to Those Falls		
Yes	17.00%	15.20%
No/Other	83.00%	84.80%
Principle Householder Had Fractured Hip		
Yes	3.80%	0.85%
No/Other	96.20%	44.23%
Home in Good Condition		
Excellent	25.00%	16.50%
Very Good	31.60%	23.72%
Good	27.00%	20.50%

Table 5 (Cont.)
Description of Age Groups for 2004

	Younger Older Adults 54.82% (4698.06)	Older Old Adults 45.18% (3872.43)
Home in Good Condition		
Fair	11.00%	9.70%
Poor	2.00%	2.00%
Blank/Refused	0.10%	0.18%
Home Easily to Make Accessible		
Yes	9.80%	25.70%
No	3.53%	10.45%
Already Accessible	1.80%	1.30%

Notes: *p<.05, **p<.01, ***p<.001, ****p<.0001

The statistical tests conducted were chi-square for categorical variables and t-tests for continuous variables.

Younger older adults in 1996 made up about 67% of the total 1996 group. Among this group of younger older adults almost 75% responded that they owned their homes. Although not shown in the table, 56% percent of the YOA were living in households that were composed of two residents. Just over half of these YOA were female (55%). The majority of persons in this age category responded that they had achieved an educational level of high school (32%) with no degree being the second highest educational level response (20%). Caucasians made up the majority of respondents (86%) and therefore a weight variable was used in the logistic regression analysis to control for the over-sampling. The South was the most popular region to maintain residence and was followed by the Midwest. Many of the YOA believed that their home was in very good condition which may explain why only six percent had added home modifications to their homes. This group also had a higher income level than the OOA in the same year which may be the result of continued work participation.

The 1996 group of older old adults (OOA) shared many similar characteristics with the YOA from the same year. Living in a home with two people was the most common arrangement among OOA (58%). Females made up 61% of the total which is higher than the YOA group. High school education followed by no degree was once again the most common response (33% & 31%). Caucasians were the majority race by far with 90%. The South and Midwest continued to be the favorite locations for choices to live (32% and 28%) by older adults. The annual household income for OOA was slightly lower than the YOA and averaged out to be about \$40,206. It was surprising to find that none of these OOA mentioned the addition of home modifications to their home.

For the 2004 group of adults there were more OOA than in the 1996 group, but these OOA (45%) still did not outnumber the YOA (55%). Homeownership rates continued to be high for both YOA (97%) and OOA (99%) in 2004. The income levels for YOA (\$63,704) continued to exceed that of OOA (\$38,435) but both groups experienced an overall decline in income from 1996 group levels after adjusting for inflation. As with the 1996 group, these individuals also lived in mostly two person households. The only difference is that the percent of persons living alone also increased for the 2004 group. In 2004, 53% of OOA were living with another person and 33% were living alone. Among the YOA 58% were living with one other person and 22% were now living alone. In 1996 the percent of persons living alone were 13% for YOA and 32% for OOA. Females made up about 60% of both the groups and which continued the trend across all four groups. More respondents had educational attainment of a high school degree (34% YOA & 33% OOA) and second to that was no degree (20% YOA & 29% OOA). In both 2004 groups, Caucasians were the majority and made up about 90%

in each. Once again the most popular choice given by older adults as to the condition of their homes was a rating of one which coincides to very good condition. About one-fourth of OOA believed that their home was in good condition and 20% thought it was still in good condition. Those numbers were slightly higher among the YOA at 31% and 27%. The addition of home modifications continued to be minimal amongst both groups. Only 0.07% of YOA and 0.03% of OOA stated that they had made any recent home modifications to the home.

Multivariate Analysis

After the descriptive analysis was conducted it was then decided that for the regression analysis the variable data would need to be divided into different categories. The new codes that were assigned can be found in Tables 6 and 7. Since the sample size is large, it is hopeful that individual choices will not have to an impact on the overall results. These large numbers help make the results representative of the population rather than an individual. The population here was elders in the United States.

The purpose of this study was to determine whether or not older adults were choosing to incorporate home modifications into the home, and if so, are they more likely to do it as YOA or OOA. Home modification was then assigned the new variable, positive or non-positive, to compare additions across the two years of interest. By doing so, persons who were interviewed before they had turned 55 were screened out to prevent them from being included in the analysis. The inclusion of these and other multivariate codes are used to allow for improved results in the regression model.

The reason for conducting the multivariate analysis on the main variable home modification was to discover which results were significant before controlling for the

other variables. These other variables are ones that may also explain the variation in home modifications other than age.

Table 6:
Measurement of Variables: Variable Names, Definitions, and Coding for 1996

Variable Names	Coding and Description
Response Variable	
Positive Home Modification	1= Households that had at least one more modification 1996
Non-positive Home Modification	0= Households that had no change in the presence of home modifications or experienced a decrease home modifications in 1996
Main Explanatory Variable	
Younger Old Adult Household	0 = Principle householder in the HRS dataset 55 to 70 years old in 1996
Older Old Adult Household	1 = Principle householder who is 71 years or older in 1996
Control Variables	
Homeownership	1 = principle householder owns their home 0 = otherwise
Length of Occupancy	0 = less than 10 years 1 = less than 20 years but more than 10 years 2 = less than 30 years but more than 20 3 = more than 30 years
Household Income	0 = total household income is less than \$10,000 1 = total household income is less than \$20,000 but more than \$10,000 2 = total household income is less than \$30,000 but more than \$20,000 3 = total household income is less than \$40,000 but more than \$30,000 4 = total household income is \$50,000 or greater
Gender of Principle Householder	0 = head of household if female 1 = head of household is male

Table 6(Cont.):

Measurement of Variables: Variable Names, Definitions, and Coding for 1996

Variable Names	Coding and Description
Control Variables	
Highest Education Level Of Principle Householder	0 = head of household has some high school 1 = head of household high school diploma 2 = head of household has some college education 3 = head of household has college degree 4 = head of household has an advanced degree
Race of Principle Householder	0 = Caucasian only 1 = African American only 2 = Asian American only 3 = Latin American only 4 = Other
Location of Residence	0 = southeast 1 = southwest 2 = northeast 3 = northwest
Home is in Good Condition	1 = yes 0 = no

Table 7:

Measurement of Variables: Variable Names, Definitions, and Coding for 2004

Variable Name	Coding and Description
Response Variable	
Home Modification	1 = home has modifications in 2004 0 = home does not have modifications in 2004
Main Explanatory Variable	
Younger Old Adult Household	0 = principle householder is age 55 to 70 years old in 2004
Older Old Adult Household	1 = principle householder is 71 years old or older in 2004
Control Variables	
Homeownership	1 = principle householder owns their home 0 = otherwise
Household Income	0 = total household income is less than \$10,000 1 = total household income is less than \$20,000 but more than \$10,000 2 = total household income is less than \$30,000 but more than \$20,000 3 = total household income is less than \$40,000 but more than \$30,000 4 = total household income is \$50,000 or greater
Principle Householder Has Fallen	1 = have fallen 0 = have not fallen
Gender of Principle Householder	0 = head of household is female 1 = head of household is male
Highest Education Level Of Principle Householder	0 = head of household has some high school 1 = head of household high school diploma 2 = head of household has some college education 3 = head of household has college degree 4 = head of household has an advanced degree

Table 7: (Cont.)

Measurement of Variables: Variable Names, Definitions, and Coding for 2004

Variable Name	Coding and Description
Control Variables	
Race of Principle Householder	0 = Caucasian only 1 = African American only 2 = Asian American only 3 = Latin American only 4 = Other
Location of Residence	0 = southeast 1 = southwest 2 = northeast 3 = northwest
Home is in Good Condition	1 = home is in good condition 0 = other
Adaptability of Home	1 = home is adaptable 0 = not adaptable

Logistic Regression

The sample of 11,633 observations was used for the logistic regression analysis. The model predicted the ratios under each of the age groups using all of the variables of interest, a total of nine control variables. Relative risk ratios and confidence intervals are reported in Table 9. Age was used as the predictor/explanatory variables and home modification features were the response variables of interest. The purpose here was to assess the odds of a person adding home modification features into the home environment in relation to other factors.

Table 8:

Multinomial Logit model

Model (n= 11633)	Survey Year			
	1996		2004	
	Relative risk ratio	Std	Relative risk ratio	Std
Special Safety Features*	0.5860	0.0230	--	--
Condition of Home*	0.3754	0.0477	0.2407	0.0176
Adaptability of Home	--	--	(0.1690)	0.0221
Broken Hip*	--	--	0.2185	0.0124
Homeownership*	0.0276	0.0508	0.0298	0.0514
Number of Household Residents	0.0573	0.0372	(0.0379)	0.0125
Educational Attainment*	0.0582	0.0261	0.0120	0.0119
Gender	(0.1726)	0.0954	(0.3607)	0.0425
Location	0.0482	0.0460	(0.0529)	0.0213
Race	(0.5175)	0.0841	(0.4410)	0.0444
Annual Household Income	8.864E-7	6.36E-7	6.798E-8	2.895E-7

Note: *p<.05

The logistic regression model did not use the actual value of the response variable but instead uses the probability of $y=1$, or $P(y=1)$ as the underlying function. The logistic function fit a range between zero and one and was as follows:

$$P(y_i=1) = f(x_i) = \frac{\{(e^{\beta_0}) + \beta_1 x_i\}}{1 + \{(e^{\beta_0}) + \beta_1 x_i\}}.$$

The odds are defined as:

$$\text{Odds} = P(y_i=1)/P(y_i=0) = f(x)/1-f(x) = \{(e^{\beta_0}) + \beta_1 x\}.$$

The odds of a success are the probability of success divided by the probability of a failure.

The log-odds of success, given x , are

$$\text{Log-odd} = \log \{f(x)/(1-f(x))\} = \beta_0 + \beta_1 x,$$

This makes log-odds a linear predictor variable and gives some language for the use of interpreting the parameters. The parameter β_1 is the increase in the log-odds associated

with an increase of one unit in the x variable. The parameter β_0 was the log-odds associated with $x=0$ (Meyer, 2005).

The odds ratio is the estimated percent change in odds of the event, when the predictor variable increases by one unit. When the odds ratio is equal to one, x has no effect on the response variable.

The odds ratio is:

$$\frac{\{(e^{\beta_0} + \beta_1(x_0+1))\}}{\{(e^{\beta_0} + \beta_1x_0)\}} = e^{\beta_1}.$$

When $\beta_1=0$ the odds ratio is equal to one.

Confidence intervals for logistic regression are reported at 95% confidence intervals. If the confidence interval does not contain 1.0, then the predictor variable has a significant effect on the response variable at the 95% confidence level.

After conducting the logistic regression many interesting observations were made. First, the 1996 group of OOA demonstrated increased odds of having had home modifications by 0.2% compared with being in the younger older adults. In the 2004, when a person moved from the YOA group to the OOA group there was a decrease of 20% in the presence of home modifications. The condition of the home had an impact on home modification utilization as well. In 1996, it was reported that the odds of including home modification features increased by 45% when the condition of the home increased. This means that as the condition of the home improved there was also an increase in the incorporation of home modifications. The odds of having home modification features also increased with the increased condition of home for the 2004 (27%). For the 2004 group of elders a unit increase in home modifications was found to increase the odds of a better conditioned home by 10%. And along those lines, the odds of home condition

went up 37% when there was a unit increase in home accessibility. For the 1996 group an increase in the condition of the home was found to increase the odds of having safety features by 47%. Home modifications also increased the odds of having increased home condition by 15%. An increase in age among the 2004 group was associated with a decrease in the odds of having a better home condition by 7%. While home modifications were not representative in as many dwellings as would be desired there was some relationship between the condition of the home and modification features. Among the 2004 group an increase in features by one unit was associated with an increased odds of 10% in the condition of the home.

Some variables were not available for both years, but still are significant when looking at older adults and their decisions on the inclusion of home modification features within the home. First, among the 2004 group an additional fall only increased the odds of more home modifications by two percent, but an increase in broken hip as an outcome of a fall increased the odds of having modifications by 24%. Also interesting was that an increase in the number of falls was found to affect the odds of the home condition by one percent. A broken hip, however, was followed by an odds increase of seven percent in the condition of the home. These numbers did not prove to be significant in this analysis as was hoped. Home accessibility was one other variable that was only available for 2004 elders. The condition of the home increased by one unit when there was an increase in the odds of having a more accessible home by 53%.

CHAPTER 5

DISCUSSION

Introduction

The purpose of this study was to determine whether or not older adults are choosing to absorb home modifications into their home. And, if so, is the decision to include home modifications made when these adults are younger older adults (those 55 to 70 years old) or when they are older old adults (those 71 or older)? This was done through the use of longitudinal data extracted from the HRS and RAND data files for the years 1996 and 2004. The reason for the interest in the topic is to determine if the use of home modifications is made early on or delayed until later years. Early inclusion of these features could suggest a preventative attitude by elder consumers and delayed use of features may suggest that elders are waiting until the need arises to include such modifications into the home. Knowing when consumers are choosing to use home modifications is helpful to caregivers, healthcare professionals, home builders, policy makers, and many other professions. This research highlights the topic of home modifications and elders in an attempt to bring awareness to the issue at a time when the elder population is increasing dramatically.

Major Findings

The null hypothesis of the study was supported by the t-test, chi-square, and regression analyses; there was no statistically significant difference in the number of home modifications absorbed by older consumers on the basis of age group. Other factors were found to contribute to the incidence of home modification features among older adults. Home condition and accessibility of the home both resulted in a positive

influence on the presence of home modification features. Income was not found to have a significant effect on the use of features across age groups in either 1996 or 2004.

There was also a small relationship between falls and/or hip fractures and the inclusion of home modification features. Interesting was the fact that home condition decreased as the number of falls or hip fractures increased. This finding may be due to the fact that elders do not feel as safe within the home after a fall and are often apt to reduce physical abilities in order to prevent a future fall. These results support the Competence-Environmental press model by Lawton and Nahemow that was previously discussed in the literature review; as an individual experiences a change in their competence as the result of a fall or some other physical limitation, they will then adjust the environment to conform to these changed needs. The opposite may also explain why some elders have a decrease in home condition as the result of a fall. The explanation may be that the elder attributes the environment as the reason for the decrease in competence.

Beckers' Theory of Human Capital was supported by these findings. Health as a means of human capital investment would be the result of an increased home environment that can help prevent future falls among elders. But, younger elders are not choosing to invest any earlier than the older group as would be expected if the elder was choosing to do so as a preventative measure. By waiting to incorporate these features, elders are not getting the full benefit for the cost of the home modification.

Limitations

While the sample for this study came from a national data set and therefore provided a large sample size which is preferable in order to have a more representative

data set, there were still some limitations to this study. First, there was a problem with housing questions being consistent over the years of interest. For instance, some variables of interest had to be dropped because the data for that question was only available in one of the years and not both. Not having data in both years would leave the study without the ability to make comparisons across the two groups over time. Second, there were no data available for some of the variables of interest. Questions that were blank or missing by the majority of the sample were dropped because of their lack of strength in making assumptions about the groups. This was the case in many of the original variables of interest. There were also questions that contained no observations at all and were also dropped.

Unfortunately for this study, the housing data presented the most limitations. There were few questions on home modifications and the ones that existed were broad based. Over time there have been more housing questions added to the HRS survey, but these could not be used since there was no match for comparison in the 1996 data.

With such a large proportion of population being comprised by elders, it would seem that the diversity among elders in this study would be greater. While it could be expected that the majority of persons would be Caucasian, it was still surprising that there was less than one percent African American in each of the age groups. And even more surprising that the only other option after that was “other” and not “Asian” or “Latin”.

Another limitation of this study was that housing data only began being collected in 1995 which made doing a longitudinal study that would span ten years impossible. It will be interesting to see over the long term what housing decisions elders make, especially once a larger proportion of baby-boomers are included.

Location of residence provided a barrier to this study as well. For the 2004 data that was provided only the residence of those persons who had not moved was included. This left the option of either dropping all others (which would have been over ten percent of the total sample) or carrying forward the previously recorded location of residence. For the purpose of keeping the sample size large the second option was chosen.

Areas for Future Research

The main weakness to this study was the options for data sources on home modifications and older adults, which made it difficult to make accurate predictions about home modification use by elders and the direction in which the absorption of such features may be headed. It would be encouraging to see the HRS researchers ask more questions on home modifications. Also, some questions exploring the reasons behind the decision to include home modifications in the home would be beneficial. Perhaps many elders see the addition as too costly or difficult and others may not be aware of the options they have when it comes to these features.

Future research on home modifications and older adults may also want to look into education and what role it may play in an increased use of such features. It is often assumed that persons with higher education are more aware of their choices and have an increased income that makes options such as home modifications more feasible. When the baby-boomers begin to make up a larger proportion of elders there may be a shift in educational levels from High School/No degree to higher levels. That increase may be accompanied by more home modification usage and preventable tactics.

Also, more data needs to be collected on fall prevention and what role home modifications may play in that prevention. Currently data only suggests a decrease in the

number of falls by the inclusion of home modifications in persons who have previously fallen. As home modifications continue to improve and awareness rises there should be more positive results from such features. If a strong link could be found between the two, perhaps older adults might be more likely to incorporate them into the home.

It would also be beneficial if caregivers would form a focus group for home modifications research and older adults. As the number of caregivers continues to decline there needs to be some option to older adults rather than relying on other for all care. Previous literature by Kutty (1999) found that personal care and home modifications are substitutes. As such, this may be one way to alleviate the stress of overworked caregivers.

More exploration into the relationship between home modifications and falls is needed. From the little research done, there are strong assumptions about the link between the two areas. Falls may be an external force that drives an individual to absorb home modifications into the home. Unfortunately, this would mean that an elder would have to experience a fall before choosing to purchase such features in an attempt to avoid any future falls. Research on falls investigating such a relationship could prove important in future education of elders and the importance of having home modifications beforehand to prevent falls. Reducing the current 30% of all elders that fall each year would benefit all areas previously mentioned; caregivers, policy makers, healthcare professionals, homebuilder's, and most importantly elders themselves.

Summary

All of these areas would be of interest to policy makers and other special focus groups looking for ways to help our older adults maintain independence. Awareness and

education on the topic of home modifications and universal design needs to be more widespread. Home modifications are not yet being used to their full potential and as our elder population rises it will be important that these features are used. These features will affect everyone and quite possibly in more ways than one. At sometime or another most of the population may be placed in the role of caregiver and also in the role of elder. Being prepared is important and emphasizing home modifications role in maintaining independence can increase its attractiveness.

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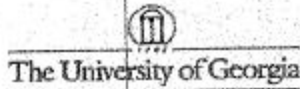
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APPENDIX A

University of Georgia Not Human Subjects Approval Form



Human Subjects Office
612 Boyd GSRC
Athens, GA 30602-7411
Phone 706.542.3199
Fax 706.542.3360

Request for Determination of Not Human Subject Research

1. Principal Investigator Information

20070218

First Name: Amanda	Middle Initial: L.	Last Name: Anglyn
Department: Housing & Consumer Economics		Campus Phone: cell 770-490-4753
Campus Address (Building and + Four):		E-mail: mander30uga@aol.com

2. Co-Investigator (complete if PI is a student) ☐ NA

Faculty Advisor's Name: Dr. Anne Sweaney	Title: Professor & Department Head
Department: Housing & Consumer Economics	Campus Phone: 706-542-4877
Campus Address (Building and + Four): Dawson Hall Rm 215	Email: asweaney@fcs.uga.edu

3. Study Information

- A. Title of Project: Correlation between age and home modification.
- B. Provide a brief description of the project, including the objectives and rationale.
The purpose of this study is to determine whether or not there is an increased incidence of home modification among older adults. This study will build on previous knowledge that shows that there is a need for home modifications among older adults by using data from the Health and Retirement Study to determine whether or not those features are being included in the home. This knowledge will be valuable to home builders, older adults, policy makers and family members of older adults.
- C. Describe the participant population, type and source of data and/or biological specimens to be studied. Submit a letter, or any form of acknowledgment, from the private source acknowledging permission for your proposed use of the data/biological specimens. If applicable, submit a copy of the IRB approval for the original data/specimen collection.
The sample for this study will come from the Health and Retirement Survey which is conducted by the University of Michigan. The study is funded by the National Institute on Aging. This is a public use data set available over the Internet. The study is longitudinal study that has been conducted since 1992.

4. Determination of "Human Subject". Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains: (1) data through intervention or interaction with the individual or (2) identifiable private information [45 CFR 46.102(f)].

- A. Will you obtain information (includes any data or biological samples) from or about a living person through intervention or interaction? (Intervention includes both physical procedures by which data are gathered [for example venipuncture] and manipulations of the subject or the subject's environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject.)
☒ No ☐ Yes

- B. Will you obtain or receive information that is considered private? (Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public [for example, a medical or educational record].)
- ☒ No ☐ Yes
- C. Will the information that you obtain or receive be individually identifiable? (Individually identifiable means the identity of the subject is or may be ascertained by the investigator or associated with the information.)
- ☒ No ☐ Yes
- D. Will the data/specimen(s) be coded such that a key exists that could allow the data/specimen(s) to be re-identified?
- ☒ No ☐ Yes
- If "Yes", is there a written agreement that prohibits you and your staff access to the link? ☐ No ☐ Yes (If "Yes", please submit the written agreement with this form.)
5. **Determination of "Research".** Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge [45 CFR 46.102(d)].
- A. Will the activity be a systematic investigation? (A systematic investigation is usually recognized by the fact that there is a question that you are trying to answer, or a hypothesis that you are attempting to prove/disprove.)
- ☐ No ☒ Yes
- B. Is the intent of the activity to develop or contribute to generalizable knowledge? (Generalizable knowledge is typically intended for dissemination beyond the institutional setting, i.e., information will be presented to a broader audience or published with the intent of drawing scientific conclusions or increasing the body of scientific knowledge. Projects that are intended solely for purposes of internal assessment, quality improvement, and program evaluations do not typically meet this definition.)
- ☐ No ☒ Yes

Amanda Anglin
Principal Investigator's Signature

09/29/06
Date

Ann Sweeney
Faculty Advisor's Signature (if PI is a student)

9/28/06
Date

For Human Subjects Office (HSO) Use Only:

- ☒ Based on the information provided, the UGA HSO has determined that this study **does not** qualify as human subject research as defined in 45 CFR 46.102(d) and (f). (Important: Please notify the UGA HSO if the project changes to assure that any changes do not affect the original determination.)
- ☐ Based on the information provided, the UGA HSO has determined that this study **does** qualify as human subject research and **submission of an application for review by the IRB is required.**

Donna P. Power
HSO Administrator

Date 10-12-06