

**SURLC 17-006**

**Aging in Place in Small Urban and Rural Communities**



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## ABSTRACT

The American population continues to mature with an impending “aging tsunami” just a few years away. It is projected that by 2050, the number of Americans 65 years old or older will increase to more than 83 million, nearly double its current population of 43 million (U.S. Census 2014). Public transportation provides freedom to much of the aging population who would otherwise be forced to give up their lifestyles. Critics of publicly funded transportation argue that many members of the aging population would be better off relocating to larger communities where desired services are more readily available, while public transportation proponents believe it is more desirable for aging Americans in small urban and rural areas to remain in their homes and utilize public transportation. This study’s objectives are to determine the current state of aging in place in small urban and rural settings throughout the country and quantify the costs for residents to live at home and ride public transportation versus moving to an assisted living facility.

Overall, simulation results show that the cost of assisted living is almost always higher compared with other alternatives. Homeowners without mortgages have the lowest costs, followed by apartment dwellers and homeowners with mortgages. Policy makers should consider the potential cost savings from aging in place found in this study. Seniors and their families can potentially save thousands of dollars annually by remaining at home and utilizing home health and public transportation services. Policies that increase the availability and accessibility of public transportation should be considered, as these will increase the likelihood of seniors aging in place and utilizing important amenities within their local communities. Without available transportation, many seniors are forced to relocate well before they either want to or have to, due to poor access to services.

Because 90% of older adults want to age in place while 80% plan to live out their lives in their current homes, (Farber et al. 2011), the emotional cost of moving before it is entirely necessary should also be considered. Change can be difficult, especially for seniors who have often lived for decades in the same small urban or rural community and highly value their friends and available services. They want to continue to support their local communities. Policies that not only save important financial resources but also assist in allowing older adults to remain vibrant and active should be considered.

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# **1. INTRODUCTION**

Developing communities with greater transportation alternatives while expanding housing choices to improve the economic competitiveness of neighborhoods are key principles put forth by the U.S. Department of Transportation (U.S. DOT 2015). Aging in place is a growing issue that highlights these principles and more. The American population continues to mature with an impending “aging tsunami” just a few years away. It is projected that by 2050, the number of Americans 65 years old or older will increase to more than 83 million, nearly double its current population of 43 million (U.S. Census 2014).

Public transportation provides freedom to much of the aging population who would otherwise be forced to give up their lifestyles. Critics of publicly funded transportation argue that many of the aging population would be better off relocating to larger communities where desired services are more readily available; while public transportation proponents believe it is more desirable for aging Americans in small urban and rural areas to remain in their homes and utilize public transportation. This topic receives a lot of discussion, but very little research has been done to quantify the actual cost. This study builds on previous work done solely in North Dakota (Peterson and Scott 2010). Although similar methodology was used, the study area has been expanded to include eight different states throughout the country, and differing sensitivity analyses were also conducted. These included a break-even analysis, a cost savings forecast, and a home modification analysis.

## **1.1 Objectives**

The objectives of this study are to determine the current state of aging in place in small urban and rural settings throughout the country and quantify the costs for residents to live at home and ride public transportation versus moving to an assisted living facility. Costs associated with living at home, both with and without a mortgage, and living in an apartment were analyzed along with the equivalent assisted living expenses. Costs were quantified in eight different states throughout the country considering overall living costs for seniors, break-even analysis, total cost savings, transit use sensitivities, and potential home modification costs to aide seniors with aging in place as long as possible.

## **1.2 Organization of Content**

The study begins with a literature review. Topics covered include the overall theme of aging in America along with the costs of relocating versus those costs associated with aging in place. Following the literature review is an overview of the research methodology used in this study. Next is the simulation results chapter focusing on cost variability by state and sensitivity analysis looking at different hypothetical costs associated with aging in place. Results and conclusions are presented in the last chapter.

## **2. LITERATURE REVIEW**

### **2.1 Introduction**

The literature review examines research broadly relating to aging in place (AIP) and transportation. This research includes statistics and trends regarding the living arrangements of older people as well as their tendencies to relocate to larger communities. Also presented are costs associated with AIP, assisted living, and travel behavior of older people. This research builds on previous work done solely in North Dakota (Peterson and Scott 2010). Although a similar methodology was used, the study area has been expanded to include eight different states throughout the country. Differing sensitivity analyses were also conducted, which included a break-even analysis, a cost savings forecast, and a home modification analysis.

### **2.2 Living Arrangements and Travel Behavior**

This section provides information about the kinds of housing arrangements older adults utilize as well as their day-to-day travel activities. Presented first is an overview of older adults' residential choices. Next, definitions and information specifically highlight AIP and assisted living arrangements.

Senior citizens (those 65 years and older) predominately own their homes and have lived in them a long time. According to the 2013 American Housing Survey (AHS), nearly 81% of seniors own their home as opposed to renting. This compares with about 65% of the overall population who own their own home. According to data from AHS, on average, people 65 years of age and older have lived in their homes since 1993, or about 20 years. The overall population, on average, has lived in their homes since 2006, or about seven years (U.S. Census Bureau 2014). Senior citizens, for the most, stay put.

In 2015, 70% of senior men lived with their spouse, while 20% lived alone. Conversely, 45% of women lived with their spouse, and 36% lived alone. In 2014, 3.2% of the over-65 population "lived in institutional settings." Of the people living in institutions, 80% lived in nursing homes. This is as expected because as people age, the proportions of people living in nursing homes increase, from 1% for people between 65 and 74, to 10% for people 85 and older (Administration on Aging 2015).

Defining further the favored living arrangement of older adults, in 2005, the Stanford Center on Longevity found Medicare beneficiaries over 65 predominately lived in traditional housing. Over 90% of people between 65 and 84 and 76% of people 85 and older live in traditional housing. Among those between 65 and 84, 5% or less live in either community housing (such as assisted living facilities) or in long-term care facilities (such as nursing homes). In comparison, among people 85 and older, 7% lived in community housing and 17% in long-term care facilities (Hayutin, Dietz and Mitchell 2010).



## 2.3 Aging in Place

AARP defines aging in place as “the ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level” (Farber, et al. 2011). According to AARP, almost 90% of senior citizens’ desire to live in their homes as they age. Further, 80% of senior citizens *expect* to live out their lives in their current homes (Farber, et al. 2011).

In 2010, AARP commissioned a telephone survey of more than 1,600 people over 45 years of age profiling respondent dwellings and communities. With one-third of the respondents age 65 and older, the survey highlights potential issues for people who wish to age in place. Some of the survey responses were broken out into age groups including those 65 and older. The survey provided data on household features vital to AIP, such as the location of a full bathroom facility and a bedroom within a dwelling (over 80% said these were on the main level) as well as other architectural features such as sidewalk, entrance without steps, and door handles instead of knobs (Keenan, Home and Community Preferences of the 45+ Population 2010). The same survey also provided information about people’s reasons for wishing to stay in their communities as they age. For example, 85% of the respondents either strongly or somewhat agreed about wanting to remain in their local community (Keenan, Home and Community Preferences of the 45+ Population 2010). Over 60% of the respondents stated it was extremely or very important to be near friends and family as well as near where they want to be (Keenan, Home and Community Preferences of the 45+ Population 2010). Older respondents more strongly embraced these community attributes.

Coordinated private and public programs designed to support seniors can facilitate AIP. These programs can be a factor for people wishing to stay independent as they age. According to the U.S. Department of Housing and Urban Development (HUD), many older people who want to age in place are unaware of services that may assist them (U.S. Department of Housing and Urban Development 2013). Two community-centered options potentially address this issue, *Naturally Occurring Retirement Community Supportive Services Programs (NORC SSPs)* and *Villages*. Both models coordinate various services seniors need, including transportation assistance. Service providers (such as human service agencies) recognize that concentrations of seniors who are more efficiently served through coordination have initiated NORCs. The Village model is similar except it is member based with elders buying into a package of services. Sometimes these can be “concierge” services offering differing levels of assistance (U.S. Department of Housing and Urban Development 2013).

Transportation tends to be an important issue for seniors and a vital component to successfully age in place. Efforts to compel older people to give up their car keys in favor of transit will be a necessary part of determining AIP cost. While a 2009 AARP survey indicated that 40% of the respondents highly valued the availability of transportation alternatives; 90% of elders nonetheless drive (Keenan, Transportation Use and Options of Midlife and Older Adults 2010). Keenan (2010) also provided various statistics about elderly driving habits and attitudes regarding transit. To understand the challenge in getting seniors to shift travel modes, Nakanishi and Black (2016) explored the elderly’s travel habits through interviews of 37 retired or semiretired people in Canberra, Australia. They found that driving habits form early and are not

influenced by the availability or quality of public transit. Further, these habits continued into retirement. Rather than give up driving, retirees tend to adjust their driving to reflect the effects of aging, such as driving during off-peak times (Nakanishi and Black 2016). The tendency for seniors to hold on to their car keys has been also been researched by others, including Zeitler, Buys, Aird, and Miller (2012), who noted mobility challenges for seniors in low density areas, and DeGood (2011) who advocated the need for affordable transit while presenting comprehensive statistics on senior access to transit.

Efforts to move seniors to use transit seem daunting. Older adults who continue to drive are an increasingly larger portion of all drivers. Sivak and Schoettle (2011) studied information from the Federal Highway Administration (FHWA) covering 1983 to 2008, which showed that 78% of people 70 and older were licensed to drive, compared with only 55% in 1983. According to data from 1990, people 75 and over have the highest rate of driving fatalities of any age group at 11.5 fatal accidents per 100 million miles. In comparison, teenage drivers (16- to 19-year-old group) have the second highest rate at 9.2 fatal accidents per 100 million miles. While older adults are reluctant to give up their car keys, considering transportation alternatives are important and continue to be a popular research topic (Sivak and Schoettle 2011).

Deficiencies in transit service present a barrier for those who would or should give up driving their cars. The Michigan Department of Transportation (MDOT) commissioned a transportation study regarding older people in rural Michigan. The study focused on six rural counties that had populations of people 70 and older in higher proportions than the rest of the state. The counties were located throughout the state, including the Upper Peninsula. The study found “good evidence that older adults who live in rural areas are not satisfying all of their mobility needs, particularly those who no longer drive. Public transit services are inadequate in many rural areas and the barriers to using public transit in rural areas are unique and challenging to overcome” (Kostyniuk, et al. 2012).

Kim (2011) evaluated transportation deficiencies among older people by analyzing survey data from a 2005 national AARP survey. He segmented the sample of the age 65 and older population into various subgroups such as age, gender, ethnicity, and income. He found that older people reduced their activities due to the lack of transportation. Further, Kim “...found that older minority females face a greater level of transportation deficiency. In efforts to improve the mobility of the older population, it is necessary to focus on older minority females and areas where there is a high concentration of that cohort. A significant increase in the minority populations in the US will naturally result in a significant increase in older minority females. Determining how to help this transportation disadvantaged group should be a transportation policy priority” (Kim 2011).

Adams-Price (2013) researched the unmet travel needs of older people in nonmetropolitan areas, concluding that some older people will use transit under certain circumstances. She writes the following:

Community leaders interested in implementing driving alternatives need to go through several steps to determine the most efficient and cost-effective alternatives for their community. They should note that older adults are willing to pay for driving alternatives,

as long as the price is reasonable....older adults who still drive do not have to choose between driving and other transportation alternatives, but can be encouraged through education and media campaigns to use transportation alternatives under certain circumstances: at night, when it saves money, etc. (Adams-Price 2013).

In 2016, Rahman, et al. studied the transportation preferences of older people by commissioning a national telephone survey representing 47 states and Washington, D.C. The 1,500 respondents had an average age of 75.5. The survey asked respondents to rate five, non-driving transportation options. The options included volunteer drivers, shuttle buses, senior center-based transportation, prepaid taxis, and bus/rail service (for long distance travel). Respondents preferred volunteer driver programs (Rahman, et al. 2016).

## 2.4 Assisted Living

For the purposes of this literature review, assisted living follows the AARP definition. In 2004, AARP indicated there is no universal definition of assisted living but offered, “Assisted living facilities are defined as facilities that “provide personal care service, including some limited health care services, like monitoring medications and physical therapy, with 24-hour supervision, in an apartment-like setting” (Bridges and Cicero 2003). *A Place for Mom*, an assisted living referral service supported by participating assisted living communities, has a similar definition:

*Assisted living communities* — provide housing and care to seniors who may need some assistance with daily tasks, but who do not require the skilled care provided at a nursing home. Assistance with medications, activities of daily living, meals and housekeeping are routinely provided. Residents live in private apartments that frequently feature kitchenettes. Staff is available 24 hours per day, activities and entertainment opportunities are plentiful and transportation to appointments is available (A Place for Mom 2016).

*A Place for Mom* indicates these terms also apply to assisted living communities:

- Assisted living facility
- Personal care homes
- Assisted living residence
- Adult congregate care
- Residential care facility (A Place for Mom 2016).

A Place for Mom (2016) distinguishes assisted living communities from these other forms of senior living arrangements:

- *Independent senior living communities* — for people who are self-sufficient
- *Memory care* — for people with Alzheimer’s and dementia and require a secure environment
- *Residential care homes* — also known as group homes or adult family care home
- *Nursing homes* — for people requiring continuous monitoring and assistance
- *Home care* — for people living in their own home and receiving minor assistance with day-to-day life (e.g., bathing, dressing, transportation, meal preparation, companionship)

- *Adult day services* — also known as adult day care and typically have partial or full day service with transportation to and from the facility
- *Respite care* — a temporary living arrangement to allow family caregivers a break from caring for older people

Assisted living arrangements may only be a temporary living scenario for seniors before the need for higher levels of care becomes necessary. In some cases, families find that before long, their aging parent requires greater care than is provided in these facilities (Gross 2008).

## 2.5 Living Locations and Relocation

The following discussion explores where senior citizens live, including their relocation tendencies. In 2014, 80% of people 65 and older lived in metropolitan areas, with 53% living outside the principal city and 27% inside the principal city (Administration on Aging 2015). By inference then, 20% live in nonmetropolitan areas.

The Stanford Center on Longevity reported that since 1970, 63% of new households formed in suburban areas with nonmetropolitan areas contributing less than 15% of new households (Hayutin, Dietz and Mitchell 2010). Central cities saw the balance of new household growth. As suburbs have grown, they have also gotten older. The number of older suburban households (65 and over) increased 300% from 1970 to 2007, with older households increasing by 25% in central cities and 20% in non-metropolitan areas. Stanford indicated that the source of this growth should be a subject of future research, i.e., whether this growth in older suburbs is the result from older people moving in and/or people staying in place (Hayutin, Dietz and Mitchell 2010).

This literature review could find no studies or other data on older adults moving from rural to urban areas. However, the previously mentioned MDOT study of transportation in rural Michigan counties found in their review of literature, “(the reason) older adults commonly live in rural areas is that they prefer to age in place. That is, older adults tend to live in rural areas not because they are moving to rural areas to retire, but because they already live in rural areas and prefer to stay where they currently reside.” (Kostyniuk, et al. 2012). This finding is also supported by the U.S. Administration on Aging (2015), which reported, “From 2014 to 2015, only 4% of older persons moved as opposed to 13% of the under-65 population. Older movers (60%) stayed in the same county, and 21% remained in the same state (different county). Only 20% of the movers relocated from out-of-state or abroad.”

However, analysis of the AHS and other U.S. Census information might provide some relocation information relating to senior citizens. In 2013, the U.S. Census Bureau conducted its American Housing Survey (AHS) at the national level and for select metropolitan areas in 2013. Conducted biannually, the bureau surveys people at the national level and samples various metropolitan areas on a rotating basis. The survey provides a host of information about owner- and renter-occupied housing for all age groups and other demographic characteristics, as well as including people living within and outside of metropolitan statistical areas (MSAs). The AHS also surveyed people regarding their relocation tendencies, including reasons for relocating, the type

and quality of housing involved, and the factors used in searching for a new residence. The availability of public transportation was also surveyed (U.S. Census Bureau 2014). This dataset may yield considerable information about older people relocating from nonmetropolitan to metropolitan areas.

The U.S. Census Bureau has other datasets that could potentially help understand the relocation tendencies of older adults. The U.S. Census's *2013 Annual Social and Economic Supplement (ASEC)* of the *Current Population Survey (CPS)* reviews moving tendencies in its *Reason for Moving: 2012 to 2013*. The report includes data about older people but did not highlight their geographic locations (Ihrke 2014). Another U.S. Census report on relocation, *Desire to Move and Residential Mobility: 2010–2011*, provides information about whom and why people move. Unfortunately, the oldest age grouping is for people 55 and older. The report drew information from the *Survey of Income and Program Participation (SIPP)* supplemented by data from the *American Community Survey (ACS)* (Mateyka 2015). Further analyses of these datasets may provide more insight into senior citizens' relocation to larger communities.

## **2.6 Aging in Place Costs**

Costs associated with AIP cover a wide range of possible expenditures. They include routine, day-to-day costs such as utility and grocery bills. They may also include costs to retrofit housing to be more accessible to older people as well as transportation costs. Further, some seniors may need in-home care to enable AIP. This section reviews information sources for these associated costs.

The above-mentioned 2013 American Housing Survey (AHS) provides a host of information about owner and renter occupied housing for all age groups and other demographic characteristics as well as including people living within and outside of MSAs. Financial information indicates monthly housing costs broken down by major categories, including mortgage payments, taxes and insurance, as well as routine maintenance. Further, detailed data tables allow more fine-tuned analyses by demographic group and geography (U.S. Census Bureau 2014). Table 2.1 presents an example of the information contained in the AHS.

**Table 2.1** 2013 American Housing Survey—Financial Characteristics of Owner Occupied Housing Unit

Characteristics	Total	New construction past 4 years	Black alone	Hispanic	Elderly (65+ years)	Below poverty
<b>Median:</b>						
Year mortgage originated	2008	2011	2006	2007	2005	2005
Purchase price (dollars)	116,000	238,000	85,000	108,000	63,900	60,000
Home value (dollars)	160,000	240,000	120,000	140,000	150,000	100,000
Current total loan as percentage of value (percent)	70.0	82.0	76.0	75.0	48.0	67.0
Ratio of value to current income	2.7	2.8	2.5	2.7	4.2	11.4
<b>Percentage with:</b>						
No mortgage, owned free and clear	36.3	19.6	32.6	31.6	65.3	57.2
Regular and/or home equity mortgage <sup>1</sup>	63.1	80.0	66.6	68.0	32.9	41.7
Line-of-credit	5.2	1.8	2.3	3.3	4.6	2.2
Refinanced primary mortgage	22.1	9.5	18.0	17.0	11.1	7.0
Two or more regular and/or home equity mortgages <sup>1</sup>	6.5	2.4	5.5	5.4	2.8	2.3
Missed or late mortgage payment(s)	3.4	1.3	6.6	5.3	1.2	4.1
<b>Median monthly expenditures (dollars)</b>						
Total housing	929	1,435	886	990	539	513
Mortgage payment	997	1,276	870	992	761	650
Property insurance	63	65	63	63	60	50
Real estate taxes	150	192	100	130	125	83
Routine maintenance	33	Z	25	29	17	17
Electricity	111	113	122	105	100	103
Trash removal	23	21	27	33	21	22

Z Rounds to zero.

<sup>1</sup> Regular mortgages include all mortgages not classified as home-equity credit lines or reverse annuity mortgages.

Source: U.S. Census Bureau and U.S. Department of Housing and Urban Development, 2013 American Housing Survey.

(U.S. Census Bureau 2015)

Besides routine living expenses, modifications to residences to make them more accessible to older people represent a potential and significant cost to AIP. In 2014, *MarketWatch*, published by Dow Jones, presented considerations for AIP, including these home improvement factors that, according to one quoted contractor, cost from \$70,000 to \$100,000:

- Moving laundry to main floor
- Roll in shower (\$8,000 to \$10,000)
- Raised toilets
- Install door levers (up to \$50 per knob including labor)
- Roll out shelves in kitchen cabinets
- Widen doorways for wheelchair access (cost \$1,700 to \$2,500)
- Exterior ramps (Hoak 2014)

HUD also presents qualitative information about home modifications in *Aging in Place: Facilitating Choice and Independence* (U.S. Department of Housing and Urban Development 2013).

Another cost associated with AIP relates to in-home caregiver services, both paid and unpaid. For some, AIP is dependent on family caregivers that represent an intangible cost. The AARP Public Policy Institute’s *Valuing the Invaluable: 2011 Update* (Feinberg, et al. 2011) discusses the role of family caregivers that facilitate AIP. The report opines, “Family support is a key driver in remaining in one’s home and in the community, but it comes at substantial costs to the caregivers themselves, to their families, and to society.” According to the report, 42.1 million caregivers provide care to adults, representing a monetized value of \$450 billion in 2009. This

value is based on an average of 18.4 hours of care per week at average “wage” of \$11.16 per hour. The average caregiver is:

- 49 years old
- Female
- Spends 20 hours per week providing care
- Provides care (usually to a mother) for about five years (Feinberg, et al. 2011)

These caregivers provide a range of services, including, but not limited to, companionship, housekeeping, financial management, and providing medical-related transportation. Relating to transportation, “...four in ten (39 percent) Medicare beneficiaries report being accompanied to routine medical visits, typically by spouses or adult children” (Feinberg, et al. 2011). Family caregivers, according to the report, experience various personal and out-of-pocket expenses such as the following:

- 70% make adjustments to their work schedule in order to provide care
- High out-of-pocket costs, where more than 10% of annual income or \$5,531 (in 2007), is attributed to caregiving.
- Long-distance caregivers spend \$8,728 annually
- People with annual incomes under \$25,000 spend more than 20% of their income on caregiving (Feinberg, et al. 2011)

Finally, there is an estimated impact to employers with an estimated \$33.6 billion in annual lost productivity, or \$2,110 per employee/caregiver (Feinberg, et al. 2011).

The MetLife Mature Market Institute (2012) and A Place for Mom (2016) have data on for-hire in-home care. The next section, which addresses assisted living costs, describes these information sources. MetLife estimated the national average cost for in-home care to be \$20 to \$21 per hour (MetLife Mature Market Institute 2012); *A Place for Mom* estimated (A Place for Mom 2016) a range of \$20 to \$39 per hour.

Sivak and Schoettle (2011) presented data about personal transportation expenditures across various age categories. They noted that as people age, the percentage of public transportation expenses to personal transportation increases. People aged 18 to 24 annually spend about \$5,100 on personal transportation and \$230, or 5%, on public transportation. People 75 and older spend \$3,300 on personal transportation and \$300, or 9% on public transportation. Sivak and Schoettle (2011) also presented information on annual vehicle purchases, the types of vehicles acquired, annual miles driven, and modal share of work trips.

While there are costs to AIP, there may be offsetting economies to social programs. In 2013, HUD examined the economics of AIP both for individuals as well as for the public, as reflected in potential savings in governmental programs such as Medicaid. While HUD indicated the need for more research, it also acknowledged the complex and personal aspects of home-based versus institutional living arrangements. Some of the issues that influence this decision include the degree of care needed as well as the availability of family members to provide that care. Further, older adults tend to age in place because it is less expensive to do so because they either own their homes or participate in the Home Equity Conversion Mortgage (HECM) program (also known as “reverse mortgages”). According to HUD, AIP can cost (in 2009 dollars) about \$930

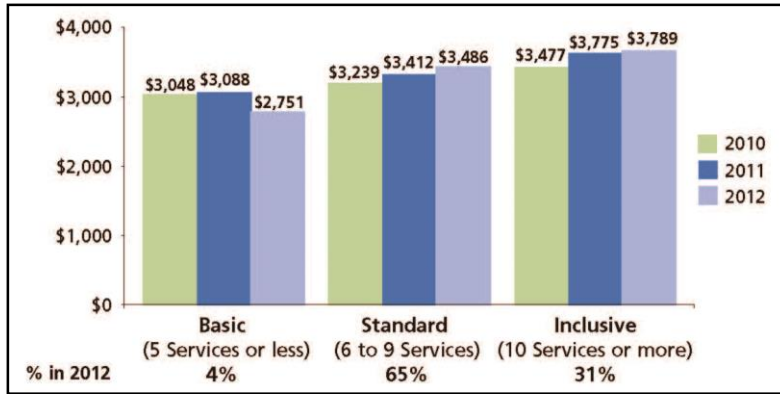
per month compared with about \$5,240 per month for assisted living. HUD also indicated that from 2011 to 2012, the cost of assisted living grew 3.8%, higher than the rate of inflation. In 2009, individuals paid 23% of the \$203 billion spent on nursing homes, with the remaining share paid from Medicaid, Medicare, and/or private insurance sources (U.S. Department of Housing and Urban Development 2013).

HUD also saw potential for savings to Medicaid by allowing more home-based care. HUD noted that annual spending for home and community-based services (HCBS) at \$41.8 billion in 2007, a 95% increase from 1999. While HCBS have eligibility guidelines under Medicaid, the cost effectiveness of home care versus assisted living showed promise in demonstration projects during the 1970s and 1980s. Initially, the demonstration projects found that allowing community-based care did not reduce *total* long-term care costs due to “the woodwork effect,” which became evident as HCBS increased the number of people receiving benefits instead of shifting people from assisted living to home care as was intended. However, HCBS served *more* people, and the woodwork effect was necessary to achieve long-term cost savings. Researchers in Oregon found that 2.6 people needed to be served by HCBS to eliminate one nursing home bed. Therefore, serving more people can result in systematic reform and savings in the number of nursing home beds created and maintained. More recent studies confirm this finding and even demonstrate cost savings (U.S. Department of Housing and Urban Development 2013). For example, a study using 2002 data showed nearly a \$44,000 average reduction in public expenditures per participant. Finally, HUD indicated that non-financial aspects of AIP are worthy of consideration because, as HUD stated, “Those who spend so much time and energy examining how to reduce costs are focusing on the wrong area; instead, they should be emphasizing the emotional, social, and health benefits of HCBS and aging in place” (U.S. Department of Housing and Urban Development 2013).

## **2.7 Assisted Living Costs**

Comprehensive cost data for assisted living appear limited to that collected and disseminated by private entities, including for-profit organizations. In 2012, the MetLife Mature Market Institute (2012) released a report regarding its extensive survey of costs associated with caring for senior citizens. The institute was a part of the MetLife Life Insurance Company. The survey sought cost and other data for nursing homes (including memory care), assisted living communities, home care services, and adult day care services. The definitions of these services generally followed those offered in *A Place for Mom*. Cost information, provided in tabular and graphic formats, represents all states, the District of Columbia, and selected urban areas. The report also includes ancillary information regarding facility features and services. Telephone surveys collected data for various facilities, stratifying the samples based on population. The ability to obtain a representative sample was an additional criterion in selecting cities. Finally, for facilities to be interviewed, they generally needed to be licensed and offer and/or provide private-pay rates. Data from 1,513 assisted living facilities “ranging in size from 2 to 600 beds, were included in the sample; the average number of beds per community was 63 beds” (MetLife Mature Market Institute 2012) were included in the report. Figures 2.1 and 2.2 illustrate some of the cost data found in the report.





(MetLife Mature Market Institute 2012)

**Figure 2.1** Metlife Comparison of Monthly Assisted Living Costs

State	First 3 Zip Code Numbers	Assisted Living Base Rate		
		Low	High	Average
<b>Montana (MT)</b>		\$1,600	\$4,500	\$2,929
Billings	590,591	\$1,900	\$4,500	\$2,937
Rest of State		\$1,600	\$3,640	\$2,925
<b>Nebraska (NE)</b>		\$1,600	\$7,667	\$3,593
Omaha	681	\$1,600	\$5,000	\$3,491
Rest of State		\$2,535	\$7,667	\$3,719
<b>Nevada (NV)</b>		\$2,000	\$4,095	\$3,062
Las Vegas	891	\$2,050	\$4,095	\$3,109
Rest of State		\$2,000	\$4,025	\$2,974
<b>New Hampshire (NH)</b>		\$3,200	\$7,817	\$5,086
Manchester Area	030,031	\$3,200	\$7,817	\$4,909
Rest of State		\$3,900	\$7,270	\$5,370
<b>New Jersey (NJ)</b>		\$3,008	\$7,100	\$4,794
Bridgewater Area	085-088	\$3,802	\$6,175	\$4,749
Cherry Hill Area	080,081	\$3,008	\$6,600	\$4,209
Rest of State		\$3,893	\$7,100	\$5,275
<b>New Mexico (NM)</b>		\$2,050	\$5,100	\$3,330
Albuquerque	871	\$2,050	\$5,100	\$3,416
Rest of State		\$2,795	\$3,500	\$3,043
<b>New York (NY)</b>		\$2,195	\$8,768	\$4,011
New York	100-114	\$3,000	\$7,000	\$4,631
Rochester	144-146	\$2,387	\$4,300	\$3,301
Syracuse	130-132	\$2,195	\$4,995	\$3,651
Rest of State		\$2,825	\$8,768	\$4,165
<b>North Carolina (NC)</b>		\$2,645	\$4,990	\$3,728
Charlotte	282	\$2,800	\$4,275	\$3,770
Raleigh/Durham	276,277	\$2,700	\$4,106	\$3,544
Rest of State		\$2,645	\$4,990	\$3,783
<b>North Dakota (ND)</b>		\$1,579	\$4,563	\$2,617

(MetLife Mature Market Institute 2012)

**Figure 2.2** Sample Monthly Assisted Living Costs (2012)

*A Place for Mom*, introduced earlier, provides a number of resources to determine the cost of assisted living. While not as comprehensive as the MetLife survey, these resources may provide additional insight into costs. A summary of features and costs for various senior living

arrangements is shown below in Table 2.2. In addition, *A Place for Mom* provides web-based cost information through a senior living cost index and a senior care calculator. The data purport to represent 2,000 locations nationally.

**Table 2.1** *A Place for Mom* Comparison of Senior Citizen Living Arrangements

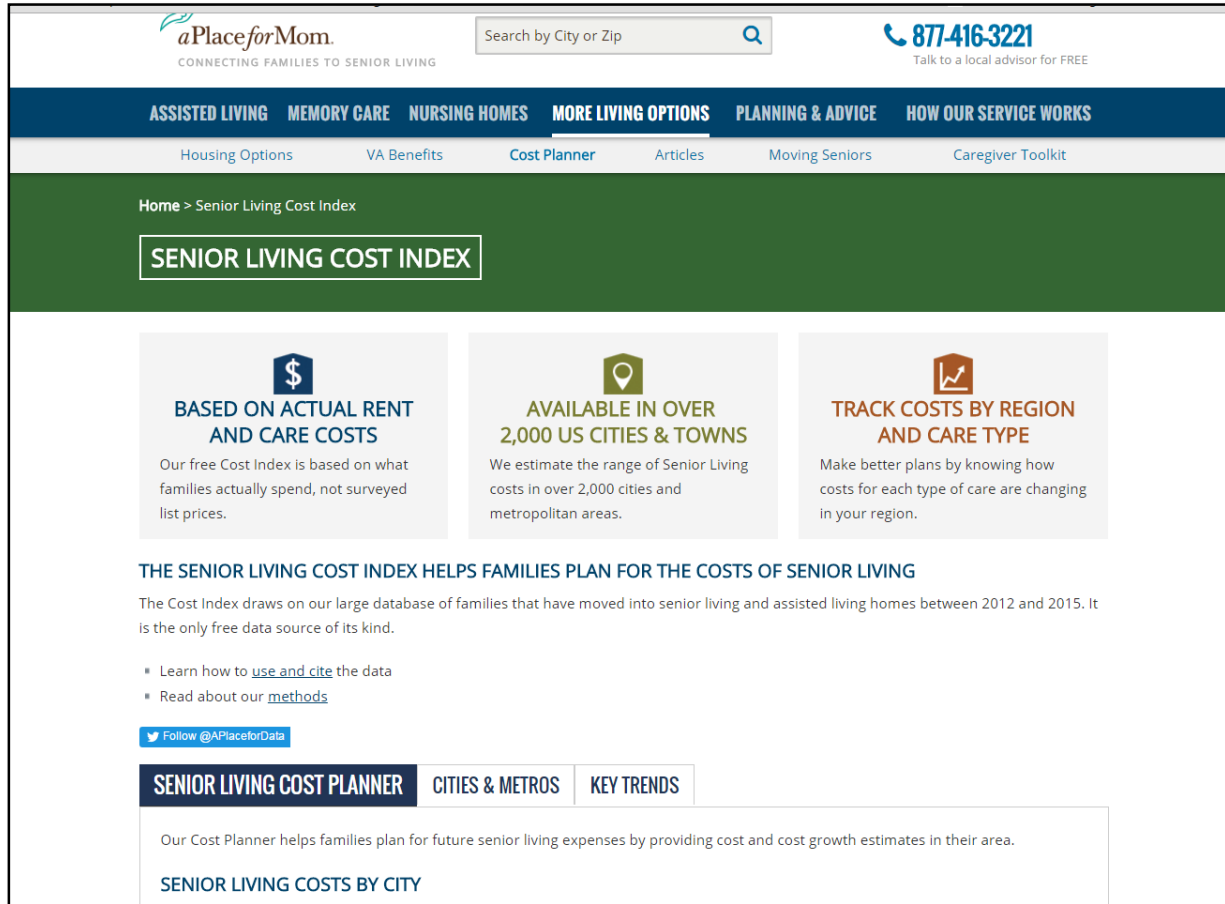
	INDEPENDENT LIVING COMMUNITIES	SENIOR APARTMENT BUILDINGS	ASSISTED LIVING COMMUNITIES	MEMORY CARE/ DEMENTIA CARE	RESIDENTIAL CARE HOMES	SKILLED NURSING	IN-HOME CARE	ADULT DAY SERVICES	RESPIRE CARE
AVERAGE AGE	75	65	80	80	80	Varies	Varies	Varies	Varies
COST	\$2,000-\$5,000 per month	\$400-\$1,900 per month	\$3,500-\$10,412 per month	\$3,500-\$6,600 per month	\$1,000-\$8,000 per month	\$6,000-\$13,000 per month	\$20-\$39 per hour	\$60-\$215 per day	\$90-\$250 per day
MEALS PER DAY	Meal Plan Options	None	3+	3+	3+	3+	None	1+	1-3
MEDICATION MANAGEMENT	No*	No	Yes	Yes	Yes	Yes	Varies	Varies	Yes
DIABETES MANAGEMENT	No	No	Varies	Varies	Varies	Yes	Varies	No	Most Yes
INCONTINENCE CARE	No	No	Most Yes	Yes	Most Yes	Yes	Yes	Varies	Yes
PERSONAL CARE	No*	No	Yes	Yes	Yes	Yes	Yes	Varies	Yes
ALZHEIMER'S CARE	No	No	Varies	Yes	Varies	Varies	Yes	Yes	Varies
NURSES ON-SITE	No	No	Varies	Varies	Varies	Yes	Varies	Varies	Varies
MOBILITY ASSISTANCE	No	No	Most Yes	Yes	Most Yes	Yes	Yes	Yes	Most Yes
ACCEPTS WHEELCHAIRS	Varies	Varies	Most Yes	Yes	Most Yes	Yes	Yes	Yes	Most Yes
TRANSPORTATION	Yes	No	Yes	Yes	Varies	No	Varies	Varies	Varies
HOUSEKEEPING	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Most Yes
PERSONAL LAUNDRY	No	No	Yes	Yes	Yes	Yes	Yes	No	Most Yes

(A Place for Mom 2016)

*A Place for Mom* provides an online senior cost index (A Place for Mom 2016) as well as data for select areas of the country. Figures 2.3 and 2.4 show screenshots of the site. *A Place for Mom* notes these limitations of the data:

- Data are based on move-in information for participating facilities. The sample is relatively small when spread across the country.
- Not all cities/states are represented.
- Not all senior living arrangements were sampled.
- There is a high variability of both data medians and averages. (A Place for Mom 2016)

A Place for Mom also provides a senior care calculator that enables a user to make cost comparisons between AIP and assisted living (A Place for Mom 2016). Figure 2.4 shows a screenshot of the calculator.



(A Place for Mom 2016)

**Figure 2.3** A Place for Mom Senior Cost Index Screenshot

## SENIOR CARE CALCULATOR

### ASSISTED LIVING VS HOME CARE COST COMPARISON

Compare the cost of assisted living in your city to the costs of maintaining a home and employing a full-time home care aide. All costs are based on data from the U.S. Census Bureau and U.S. assisted living costs.

Select State  Select Area

Enter your current at home monthly expense or use the US national average:

Rent / Mortgage or Senior Living Fees	<input type="text" value="0"/>	
Property Tax and Insurance	<input type="text" value="0"/>	
Home or Renter's Insurance	<input type="text" value="0"/>	<a href="#">Use Average</a>
Utilities (Electricity, Gas, Water, Sewer, Trash Removal)	<input type="text" value="0"/>	<a href="#">Use Average</a>
Telephone and Cable	<input type="text" value="0"/>	<a href="#">Use Average</a>
Yard Care and Landscape Maintenance	<input type="text" value="0"/>	<a href="#">Use Average</a>
24-Hour Security	<input type="text" value="0"/>	
Housekeeping, Laundry, Home Maintenance and Repairs (plumbing, electric, roof)	<input type="text" value="0"/>	<a href="#">Use Average</a>
Transportation (gas, insurance, maintenance, taxi service)	<input type="text" value="0"/>	<a href="#">Use Average</a>
Recreation and Entertainment	<input type="text" value="0"/>	<a href="#">Use Average</a>
Three Meals Daily	<input type="text" value="0"/>	<a href="#">Use Average</a>
Exercise, Health and Wellness Programs	<input type="text" value="0"/>	<a href="#">Use Average</a>
24-hour Emergency Call Service	<input type="text" value="0"/>	<a href="#">Use Average</a>

### HAVE QUESTIONS? FREE HELP IS AVAILABLE!

1. Enter Location:

2. Select Care Type:

**REQUEST INFO** >

Call toll-free:  
**877-516-0849**  
8 a.m.-9 p.m.

#### RESOURCES

Long-term care guides and articles

- Aging, Dementia & Health Articles
- Caregivers
- Checklists, Guides & Tips
- Elder Law
- Paying for Senior Care
- Senior Housing Options
- Senior Moving

(A Place for Mom 2016)

**Figure 2.4** *A Place for Mom* Senior Care Calculator Screenshot

## 2.8 Summary

This chapter examined research relating to Aging in Place (AIP) and related transportation issues. The research included statistics and trends regarding the living arrangements of older people as well as their tendencies to relocate to larger communities. Also presented were costs associated with AIP, assisted living, and travel behavior of older people.

### 3. RESEARCH METHODOLOGY

This research compared the cost of senior citizens living independently while utilizing home-based health services and transit as opposed to moving to an assisted living facility. Specific attention was paid to the trade-offs between the amount of services required for seniors to live independently versus moving and the costs associated with such trade-offs. Clearly, individuals must use their own judgment as to whether they should live independently or not, and every individual situation is unique. Therefore, to explain some of the uncertainty in services and costs that ensue, @Risk simulations were conducted. The following discussion focuses on the functionality of @Risk and its applicability to studying data that includes variability. This methodology is similar to that developed in previous research (Peterson and Scott 2010).

If someone is confronted with a problem that includes uncertainty, it becomes challenging to use an analytical model that will return useful results. @Risk, a Microsoft Excel add-in program, contains functions that yield results generated from random variables. For example, entering RISKNORMAL (10,3) in a cell will produce an observation from a normal random variable with a mean of 10 and a standard deviation of 3. Once cell values that potentially include uncertainty are replaced with @Risk functions, a simulation is run. The simulation imitates a real-life situation. Within the model, an @Risk cell is simulated a set number of times, called iterations, to provide an outcome. Note that this answer is not exact, but rather a calculation based on the data variability included within the model.

@Risk also permits the user to describe different probability distributions based on data for uncertain variables. Therefore, decision makers have the option of using various probability distributions that best fit their data. Common distributions include logistic, triangular, and normal, among others. The technique of simulation can also be chosen. For this research, Monte Carlo simulations were used. This type of simulation was thought to best represent the available data. The use of random numbers for each iteration in a Monte Carlo simulation is similar to a spin on the roulette wheel at a casino. Similar to the spins on the roulette wheel, the random numbers used to produce results within each iteration are independent from one another. Variables that represented uncertainty for this research included those for home values, real estate taxes, homeowners' insurance, utility costs, homemaker services, home health aide services, adult day health care, assisted living facility costs, and home value appreciation. These variables were chosen to represent uncertainty in simulation models because they signify some of the most important concerns seniors consider when deciding where to live, and they also exhibited substantial variability within the datasets.

States studied included Pennsylvania, Montana, Maine, Mississippi, North Carolina, Wisconsin, Missouri, and New Mexico. These eight states were chosen because substantial data were available to yield a feasible analysis, and they represented different regions of the country with either large rural populations or a large percentage of rural residents compared with their overall state population. Many other communities in rural states had too few licensed assisted living facilities to allow for sufficient analysis. Therefore, it was impossible to conduct a simulation with a mean and standard deviation because limited data points were available.

Sensitivity analysis was also performed within two main categories. These included in-home care and transit rides. It is impossible to estimate the exact amount of in-home care an individual would need on a monthly basis, as it varies by person and location. Therefore, sensitivities were conducted to determine at what frequency of service it would be financially advantageous for seniors to quit living independently and relocate to an assisted living facility. Also, transit ride sensitivities were conducted at low, medium, and high demand for available transit service. The following chapter focuses on simulation modeling and results for all eight states highlighting the unique variability present within each location.

### **3.1 Data and Definitions**

Data used in simulations were collected from a combination of sources, including The American Eldercare Research Organization (2017), Genworth Financial (2016), Zillow (2017), and the Rural National Transit Database (2015). The definitions used for assisted living facilities as well as in-home care services in this research are as follows:

- **Assisted Living Facility:** Residential arrangements providing personal care and health services. The level of care may not be as extensive as that of a nursing home. Assisted living is often an alternative to a nursing home, or an intermediate level of long-term care.
- **Homemaker Services:** Services providing help with household tasks that cannot be managed alone. Homemaker services include “hands-off” care such as cooking, cleaning, and running errands.
- **Home Health Aide Services:** Home health aides offer services to people who need more extensive care. It is “hands-on” personal care, but not medical care.
- **Adult Day Health Care:** These are social and support services offered in a community-based, protective setting. Various models are designed to offer socialization, supervision, and structured activities. Programs may also offer medical management and meals.

Genworth Financial (2017)

### **3.2 Simulation Settings**

Scenarios were developed to simulate the amenities a senior citizen would necessitate while living independently at home in a small urban or rural community compared to moving to an assisted living facility. The amount of service was set at a level comparable to customary services one would receive at a typical assisted living center. A useful evaluation can be estimated with these scenarios because, while service levels are unique for every senior, an individual receiving similar care while living at home compared to assisted living can determine at what financial point they should consider a move. For example, simulation settings for a Pennsylvania homeowner without a mortgage are shown in Table 3.1.

Cost variables utilized in the simulation based on Table 3.1 included demand response rural transit fares, demand response rural transit agency cost per ride, home homemaker services, home health aide services, adult day health care, home upkeep and maintenance costs, utility costs, property taxes and insurance, groceries, and home value appreciation. A cost increase variable was also added to account for cost variations throughout one calendar year.

Variables that added @Risk functions included demand response rural transit costs, homemaker services, home health aide services, adult day health care, utilities, property taxes, and homeowner’s insurance. The mean and standard deviation was used for each variable. These variables represented uncertainty in the simulation models because they showed significant variability within the dataset, and are some of the most important variables senior citizens consider when choosing where to reside. Home ownership variables represent typical, although variable, costs for the median home value in small urban and rural Pennsylvania communities (Zillow 2017). Variables simulated within the assisted living model included assisted living rent and services along with miscellaneous expenses. Also, all simulations assumed that senior citizens had outlived their ability to drive, and as a result, were not operating their own private vehicle. Seniors were also assumed to require demand response transit as they would be physically unable to ride fixed route service. All other state simulation settings can be found in the Appendix.

**Table 3.1** Pennsylvania Homeowner Settings

<b>Costs</b>	<b>Average Unit Cost</b>	<b>Monthly Total</b>	<b>Average Cost/Month</b>
Transit (Fare)	\$3.50 per ride	40 rides	\$140
Transit (Agency cost-Fare)	13.75 per ride	40 rides	550
Homemaker Services	21.50 per hour	30 hours	645
Home Health Aide Services	21.55 per hour	20 hours	431
Adult Day Health Care	7.65 per hour	40 hours	306
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			250
Miscellaneous maintenance			100
Property Taxes <sup>1</sup>			200
Homeowners Insurance <sup>2</sup>			70
Groceries <sup>3</sup>			250
Home Appreciation <sup>4</sup>			625
Cost Increases/month	0.0045		

<sup>1</sup> Based on an average of \$2,400/yr. for a \$160,000 home

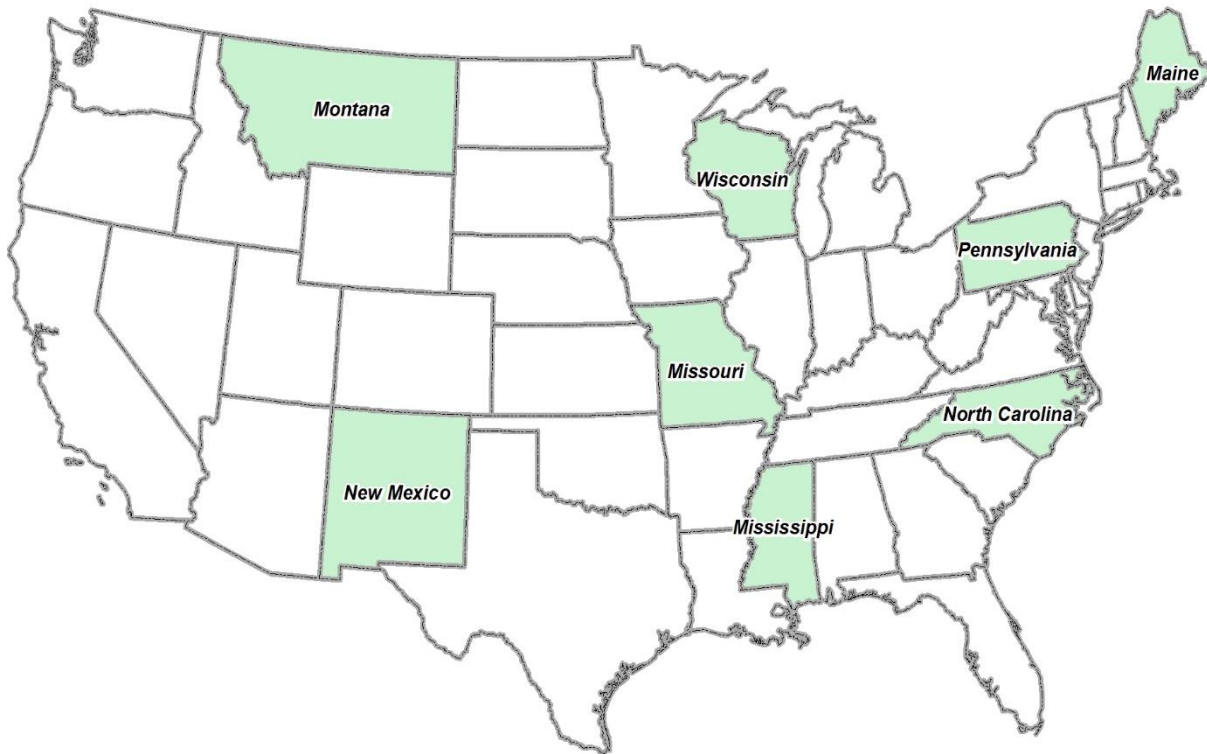
<sup>2</sup> Based on an average of \$840/yr. for a \$160,000 home

<sup>3</sup> Based on an average of \$60/week

<sup>4</sup> Based on an average of 5% annually for a \$160,000 home

## 4. SIMULATION RESULTS

Cost simulation results are the focus of this chapter. Assisted living costs were compared with three other living situations. These included senior citizens from small urban and rural communities living at home without a mortgage, living at home with a mortgage, and living in an apartment. Eight states were studied individually (Figure 4.1). These included Montana, New Mexico, Wisconsin, Missouri, Mississippi, Maine, Pennsylvania, and North Carolina.



**Figure 4.1** States Studied

States were chosen because they either had a large rural population or a large percentage of rural residents (Table 4.1). Also, states were chosen to provide specific results from different regions throughout the country. Notice that North Carolina and Pennsylvania rank second and third among all 50 states in rural population. Maine, Mississippi, and Montana rank in the top five among states in percentage of state populations that live in rural areas. Total cost savings were also estimated along with sensitivities focusing on in-home care usage and transit ridership.



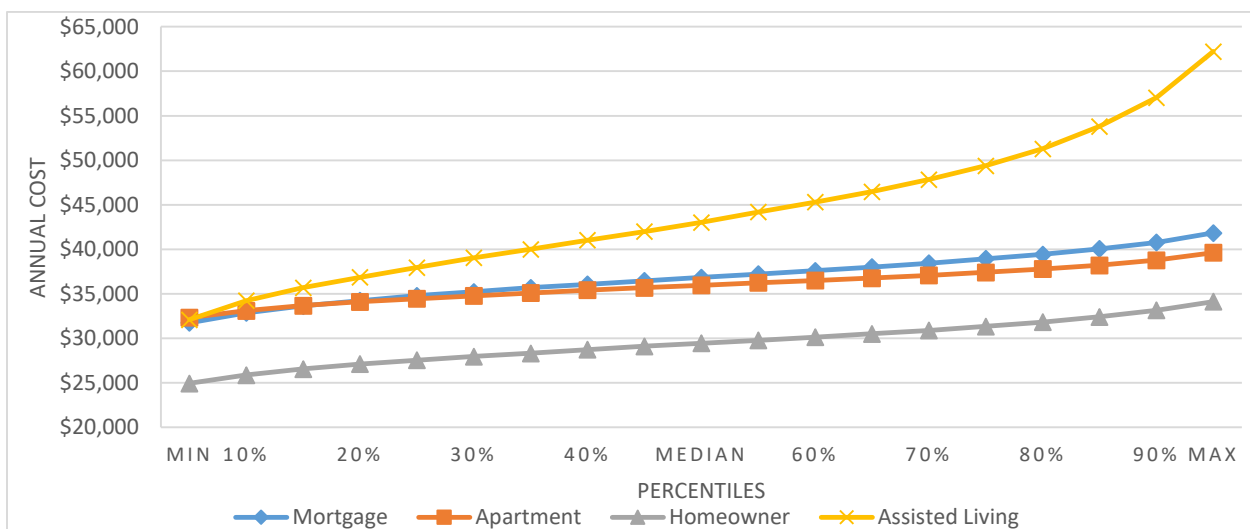
**Table 4.1** Rural State Statistics

State	State's Total Population	Rural Population	Rural Population Rank	Percent Rural Population	Percent Rural Population Rank
North Carolina	9,535,483	3,233,727	2	34%	15
Pennsylvania	12,702,379	2,711,092	3	21%	32
Missouri	5,988,927	1,770,556	13	30%	20
Wisconsin	5,686,986	1,697,348	14	30%	19
Mississippi	2,967,297	1,503,073	17	51%	4
Maine	1,328,361	814,819	26	61%	1
New Mexico	2,059,179	464,818	36	23%	30
Montana	989,415	436,401	38	44%	5

U.S. Census (2010)

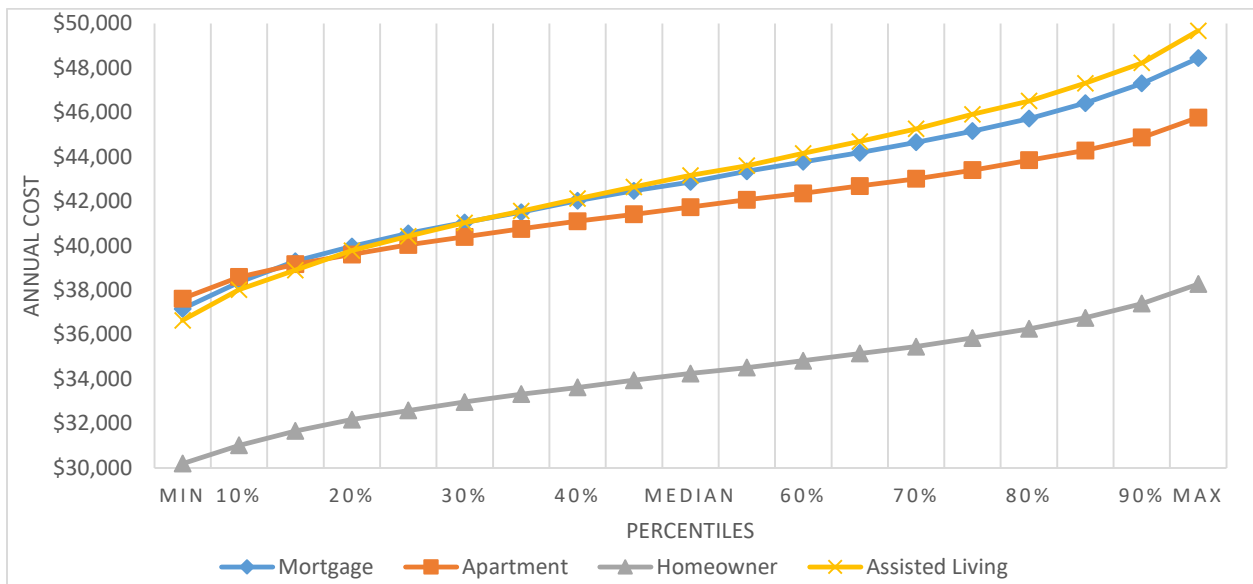
### 4.1 State Level Simulation Results

Simulation results for the eight states of Pennsylvania, Montana, Maine, Mississippi, North Carolina, Wisconsin, Missouri, and New Mexico are shown in the following figures. All costs are illustrated within a range, including a minimum, median, and maximum value along with every 10<sup>th</sup> percentile. Figure 4.2 shows the costs for Pennsylvania. Notice that the annual cost of assisted living is nearly \$7,000 higher at its median value compared with homeowners who have a mortgage and those who live in apartments; and for homeowners with no mortgage, the annual cost of assisted living is more than \$13,000 higher. However, the cost of assisted living at its minimum value is nearly identical to that of homeowners with a mortgage and those who live in apartments. The annual cost for homeowners is still more than \$7,000 less than assisted living at its minimum value. At the maximum values, assisted living costs \$20,000 more annually compared with homeowners with a mortgage and apartment dwellers and is \$28,000 more compared with the cost for homeowners. Also note that the results for assisted living contain greater variability than the other three. This is illustrated by a steeper curved line representing annual costs.



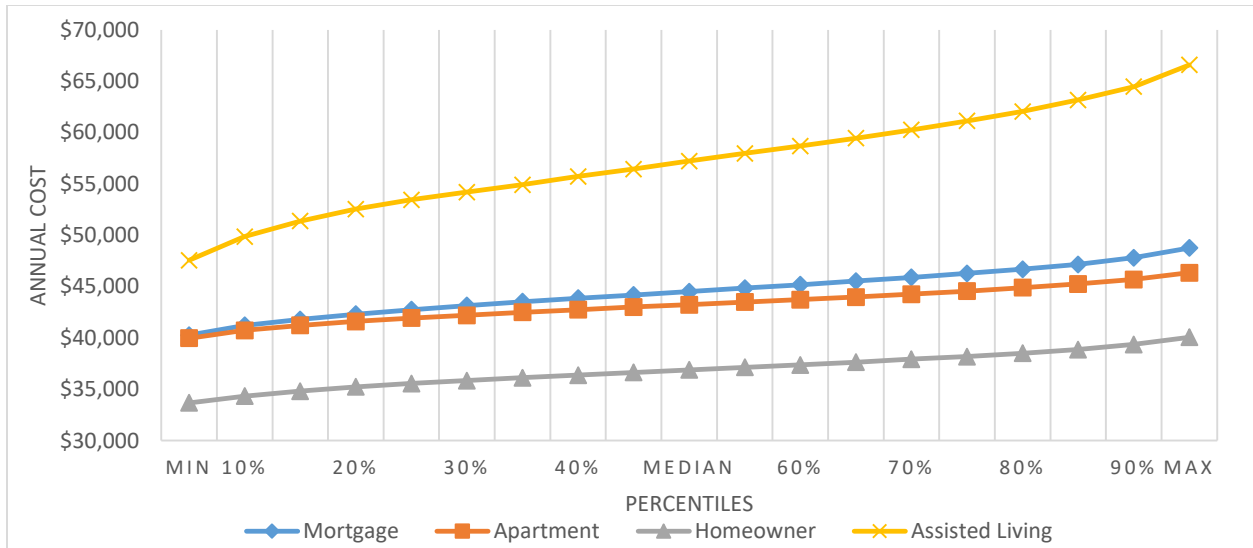
**Figure 4.2** Pennsylvania Simulation Costs

Figure 4.3 shows simulation costs for Montana. Notice that assisted living costs are comparable to those of both homeowners with a mortgage and apartment dwellers. These similarities are due primarily to the relative higher cost of both housing and demand response transit costs compared with reasonably priced assisted living facilities. However, homeowners with no mortgage show a substantial cost advantage of roughly \$9,000 annually at the mean level. Thus, without either the monthly expense of a mortgage payment or apartment rent, older adults still save substantially by living at home and riding demand response transit. Finally, the variability of assisted living costs was comparable to the three other scenarios because a primarily rural state like Montana had fewer assisted living options compared with more populated states, while nearly all assisted living facilities charged similar rents and fees.

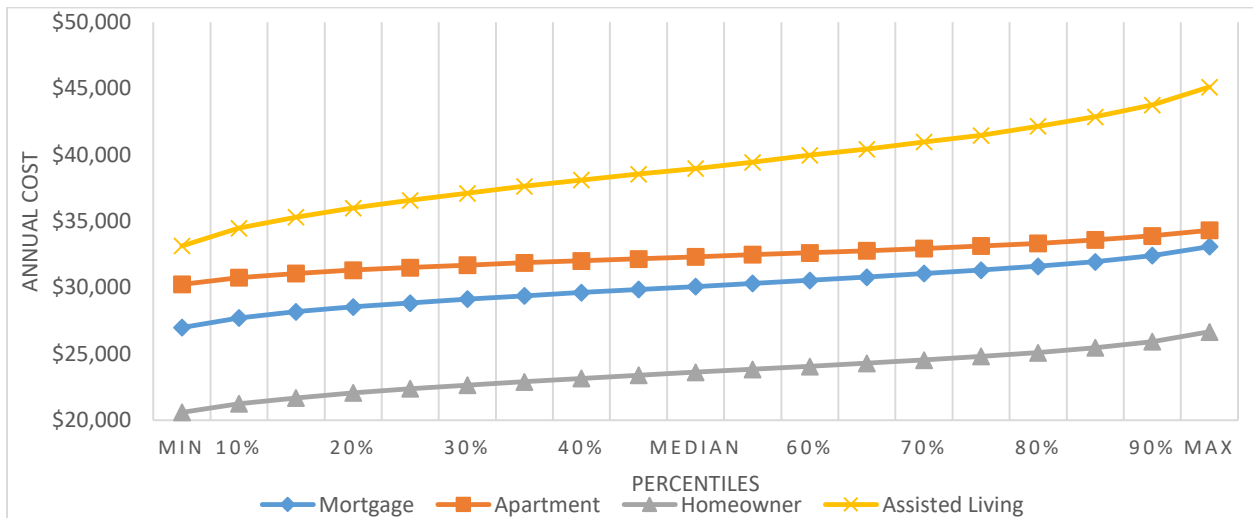


**Figure 4.3** Montana Simulation Costs

Figure 4.4 illustrates the simulation costs for Maine. Notice that all of the assisted living costs at the minimum, maximum, and median levels are higher for Maine compared with the other living scenarios. At the median, it costs \$12,000 to \$13,000 more per year to live in assisted living than living at home with a mortgage or living in an apartment, while the cost to homeowners is more than \$20,000 annually to live in assisted living. Minimum values show that assisted living costs about \$7,000 more annually than living at home with a mortgage or living in an apartment, while homeowners could experience a nearly \$13,000 annual cost increase by moving to assisted living. The maximum values show an even larger cost disparity between assisted living and the other three scenarios. A very similar result occurred when the simulation was run in Mississippi (Figure 4.5). However, notice that overall annual costs are substantially lower compared with those in Maine. This is due to a much lower cost of living in Mississippi than in Maine and the entire Northeast portion of the country.

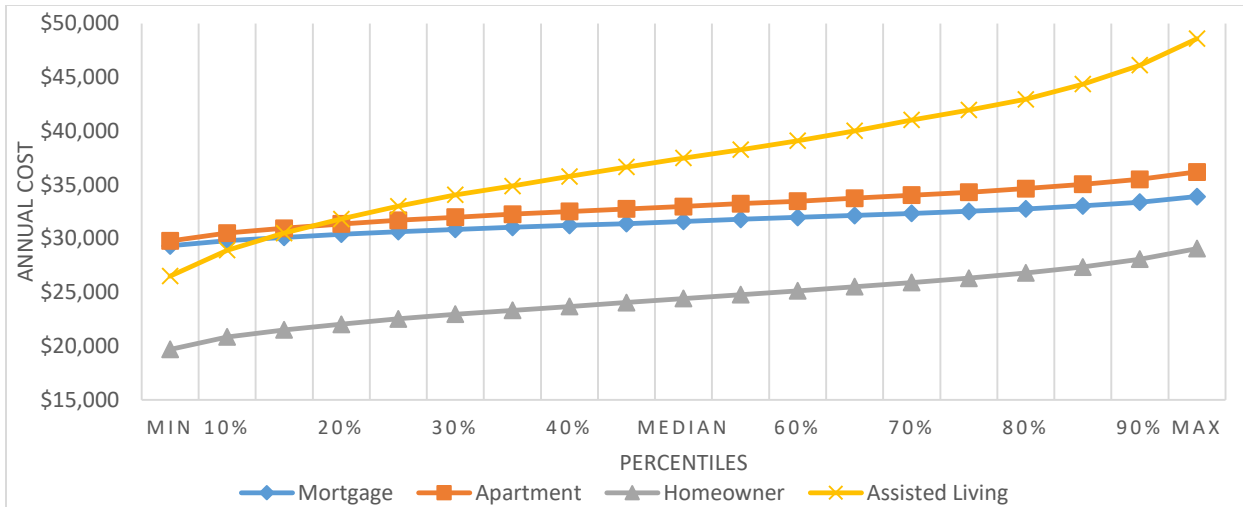


**Figure 4.4** Maine Simulation Costs

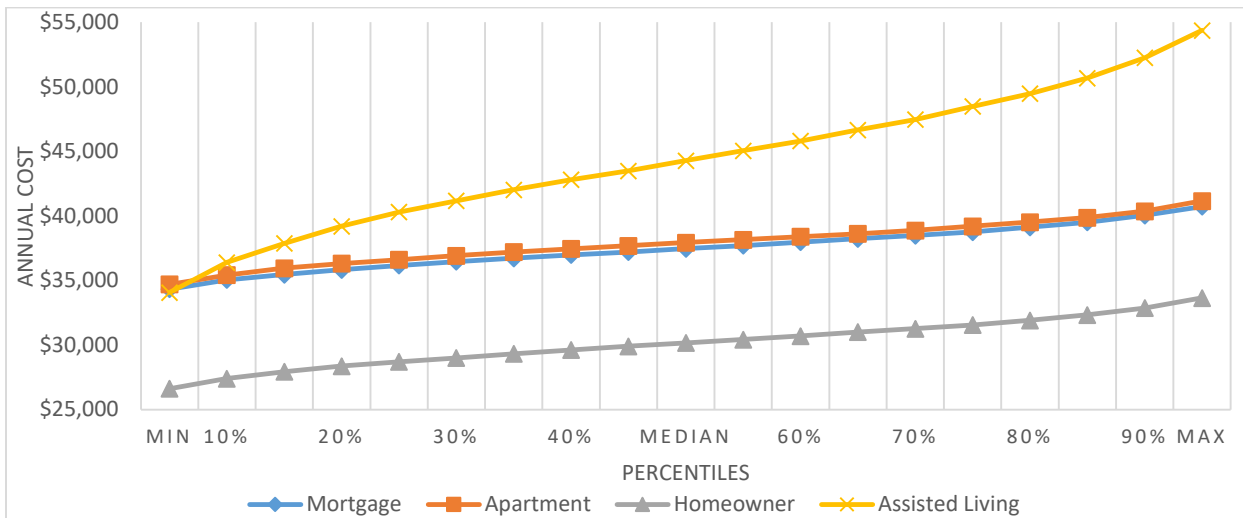


**Figure 4.5** Mississippi Simulation Costs

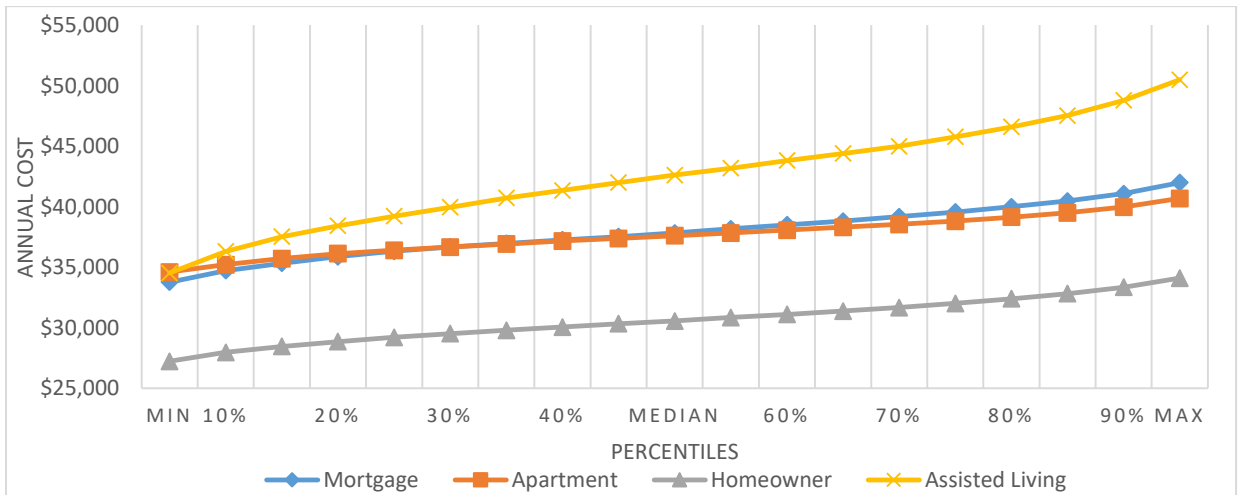
Figure 4.6 shows simulation costs for North Carolina. Assisted living costs had similar variability in North Carolina compared to Pennsylvania, but greater variability than in Maine and Mississippi. The median annual cost for assisted living was still higher than the other three scenarios, but only \$4,000 to \$5,000 more annually than homeowners with a mortgage and apartment dwellers. The minimum costs for assisted living in North Carolina were lower than those for homeowners with a mortgage and apartment dwellers, while homeowners' annual costs were \$5,000 less compared with assisted living. However, the maximum assisted living costs were substantially higher than all other scenarios. This illustrates the high level of variability among assisted living costs compared with the other living arrangements. Wisconsin and New Mexico simulation costs (Figures 4.7 and 4.8) yielded results similar to North Carolina with minimum values for assisted living at or near the minimum values for homeowners with a mortgage and apartment dwellers. Overall costs were also similar for both Wisconsin and New Mexico.



**Figure 4.6** North Carolina Simulation Costs

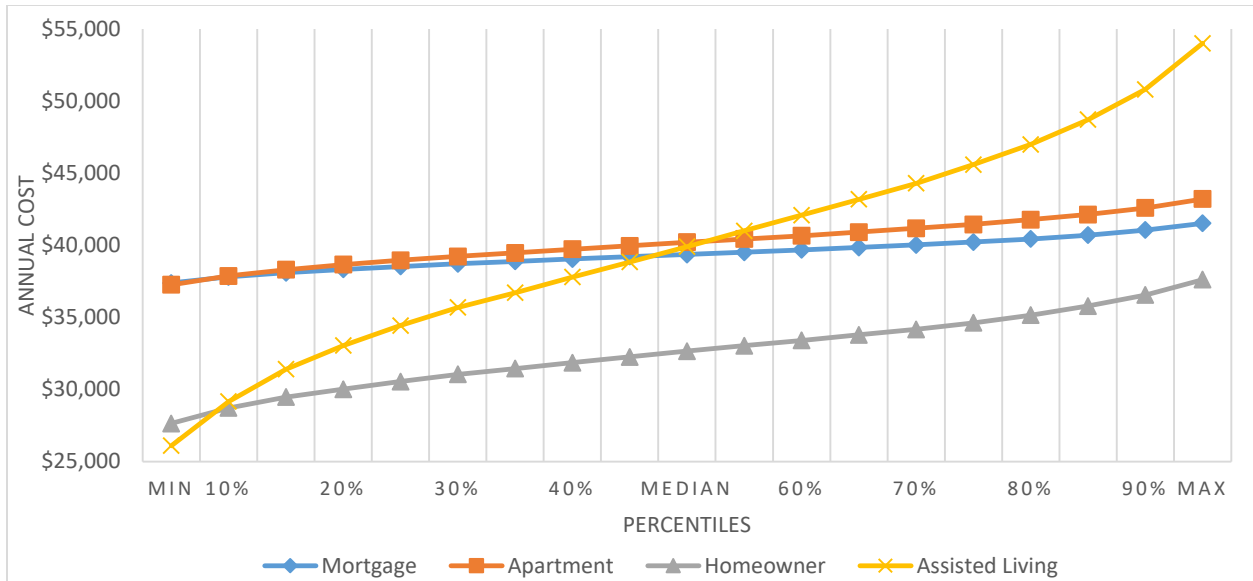


**Figure 4.7** Wisconsin Simulation Costs



**Figure 4.8** New Mexico Simulation Costs

Figure 4.9 shows simulation results from Missouri, which was a definite outlier compared with other states. Assisted living costs at the median level were found to be nearly identical to those for homeowners with a mortgage and apartment dwellers, while homeowners showed a \$7,000 cost advantage compared with the other three scenarios. However, due to the extreme variability of assisted living costs throughout the state, cost differences at the minimum and maximum levels were difficult to quantify. This was due to \$20,000 annual cost differences among assisted living centers in small urban areas of southern and southeastern Missouri compared with those in the St. Louis area. This was far and away the greatest variability of assisted living costs found during this research.



**Figure 4.9** Missouri Simulation Costs

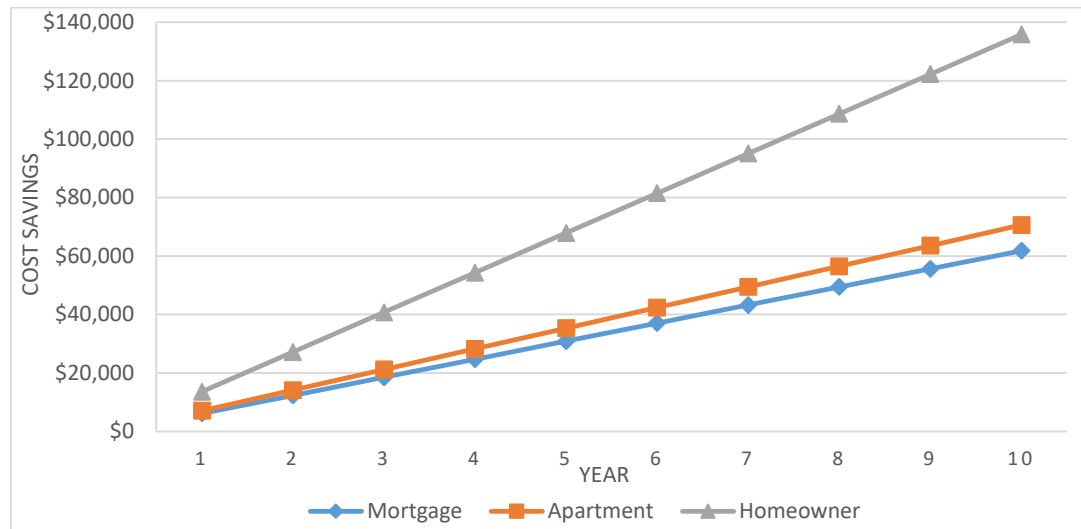
Table 4.2 summarizes annual homeowner costs by state. The lowest and highest minimum, median, and maximum costs are in bold. North Carolina showed the lowest minimum homeowner cost due to comparably low homemaker and home health aide services and reasonable transit costs as well. This was also the case for Mississippi, which had the lowest homeowner costs at both the median and maximum levels. Maine, on the other hand, due to its comparably high home health aide and transit costs showed the highest homeownership costs at all three levels. Notice that the cost differences among the other states varied by only a few thousand dollars per year.

**Table 4.2** Homeowner State Simulation Comparison

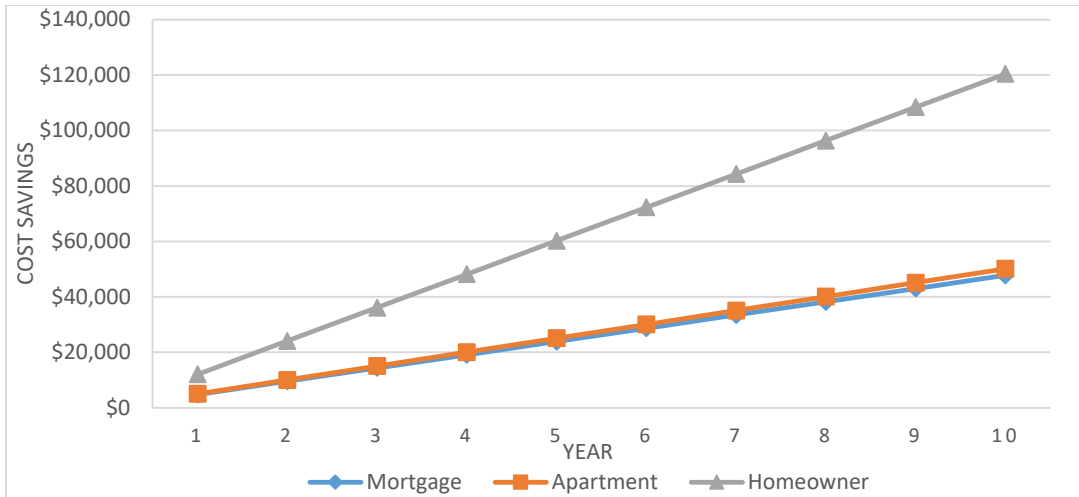
State	Minimum	Median	Maximum
New Mexico	\$27,243	\$30,574	\$34,111
Missouri	\$27,644	\$32,654	\$37,616
Wisconsin	\$26,613	\$30,164	\$33,647
North Carolina	<b>\$19,684</b>	\$24,424	\$29,053
Mississippi	\$20,594	<b>\$23,624</b>	<b>\$26,657</b>
Maine	<b>\$33,683</b>	<b>\$36,893</b>	<b>\$40,078</b>
Montana	\$30,192	\$34,245	\$38,270
Pennsylvania	\$24,944	\$29,452	\$34,129

## 4.2 Aging in Place Cost Savings Forecasts

The following figures show potential cost savings by state for seniors who decide to age in place rather than move to an assisted living facility. Savings are by year and focus on the three living scenarios used in the previous section. The states of Pennsylvania, New Mexico, and Montana are highlighted below as the other states showed similar results to these three. Figure 4.10 shows potential cost savings for Pennsylvania. Over a 10-year period, substantial savings from AIP can be realized. Homeowners could recoup well over \$100,000 in total savings while homeowners with a mortgage and apartment dwellers could save from \$60,000 to \$70,000 during that same time frame. Even delaying a move to assisted living by two or three years can yield \$15,000 to \$40,000 in total savings depending on a senior’s current living situation. Figure 4.11 illustrates similar savings in New Mexico. While overall potential savings are slightly less in New Mexico compared with Pennsylvania, AIP can save seniors an estimated \$20,000 to \$60,000 in total savings over a five-year period depending on current living arrangements.

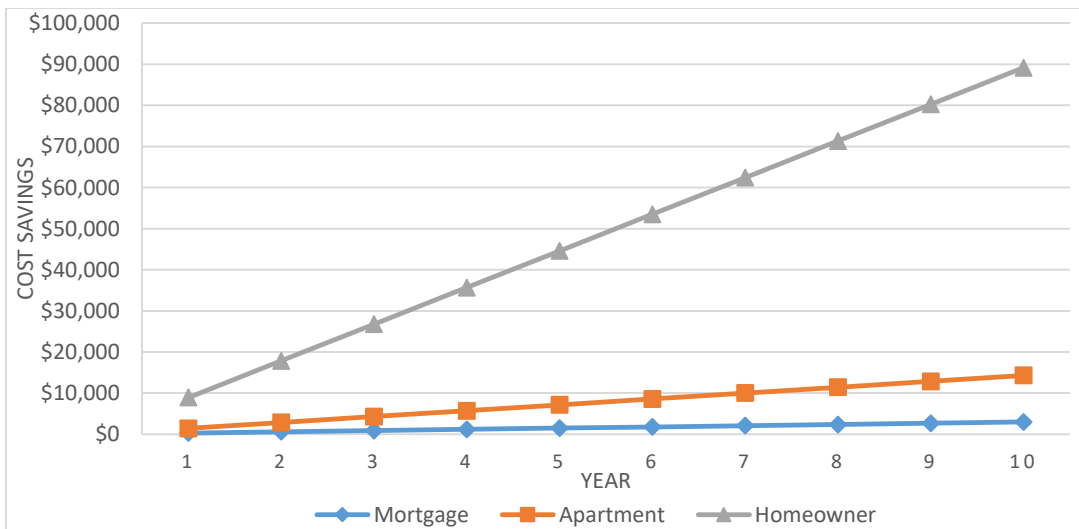


**Figure 4.10** Pennsylvania Aging in Place Cost Savings



**Figure 4.11** New Mexico Aging in Place Cost Savings

Potential cost savings for Montana show a slightly different outcome (Figure 4.12). While savings for homeowners were estimated at nearly \$90,000 over a 10-year period and between \$40,000 and \$50,000 during a five-year time frame, savings for homeowners with mortgages and apartment dwellers were substantially less. However, over a 10-year period, an apartment dweller could save almost \$15,000 while a homeowner with a mortgage could save nearly \$3,000. The lower cost savings compared with Pennsylvania and New Mexico are due primarily to higher housing and demand response transit costs in Montana.

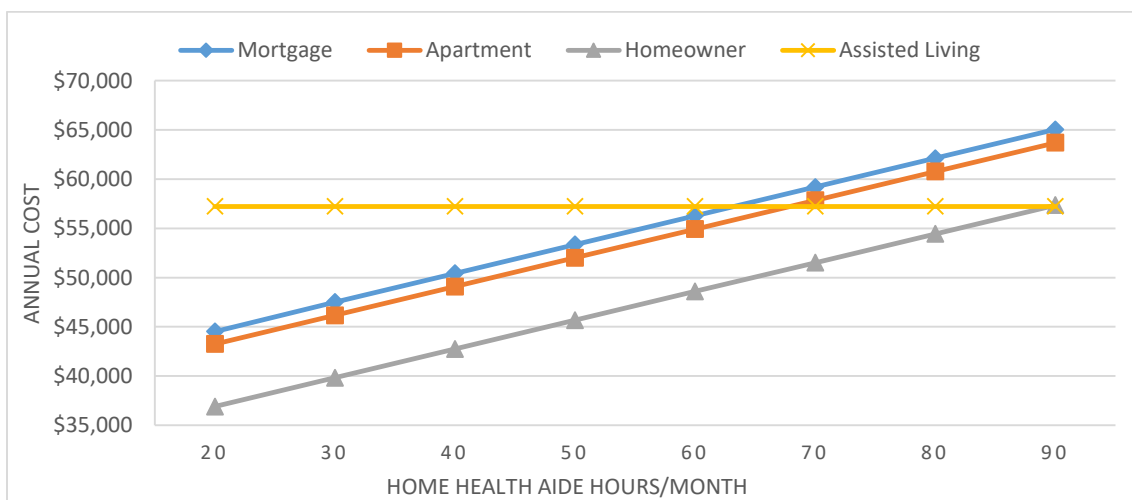


**Figure 4.12** Montana Aging in Place Cost Savings

### 4.3 Break-Even Analysis

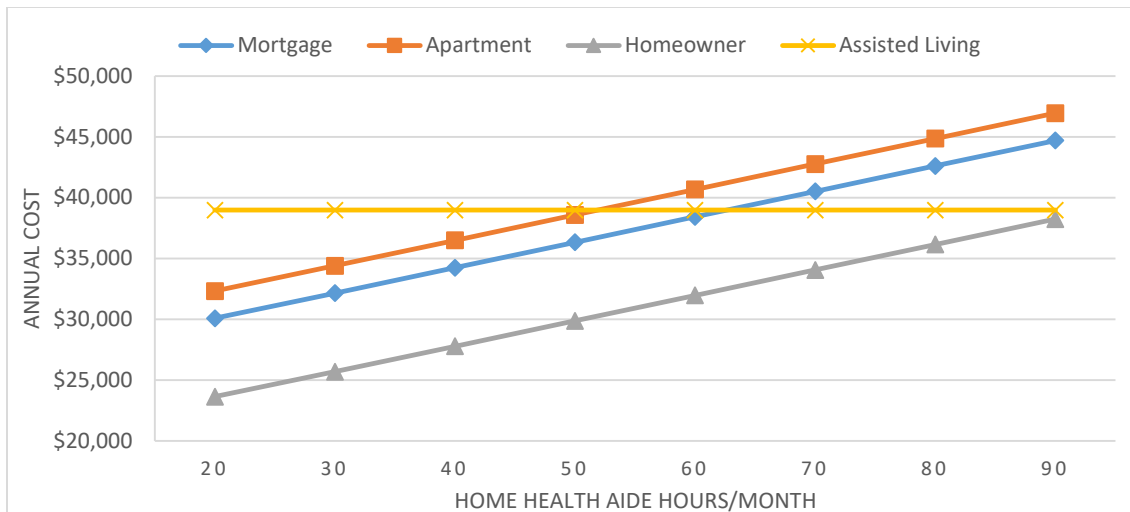
Analysis was also completed to determine at what financial point seniors should consider moving from their current home into an assisted living facility. Home health aide services were used to illustrate this analysis, and were used because they often account for the necessary services seniors require and cannot perform on their own. Services can include bathing, medication management, and basic daily hygienic activities. Also, these are often the main services seniors and their families consider when deciding whether or not an assisted living facility move may be necessary. Therefore, home health aide services varied from 20 to 90 hours per month, while holding all other variables constant, to determine what quantity of care would financially equal or exceed the cost of assisted living.

Figure 4.13 shows this scenario for Maine. Results show that at approximately 65 hours of home health aide services per month, costs for homeowners with a mortgage and apartment dwellers would equal those of assisted living. However, homeowner costs for home health aide services would not equal assisted living costs until their services increased to 90 or more hours per month. Mississippi (Figure 4.14) results were similar for homeowners but not for apartment dwellers and homeowners with a mortgage. Between 50 and 60 hours of home health aide services per month would be required for the latter two scenarios to equal assisted living costs in Mississippi. North Carolina (Figure 4.15) showed a slightly lower break-even point for all three living scenarios considered. Apartment dwellers must require at least 40 hours of home health aide services per month for their costs to equal those of assisted living, while homeowners with a mortgage must require more than 45 hours per month. Finally, homeowners would need to require 80 or more hours of home health aide services per month for their costs to equal or exceed those of assisted living.

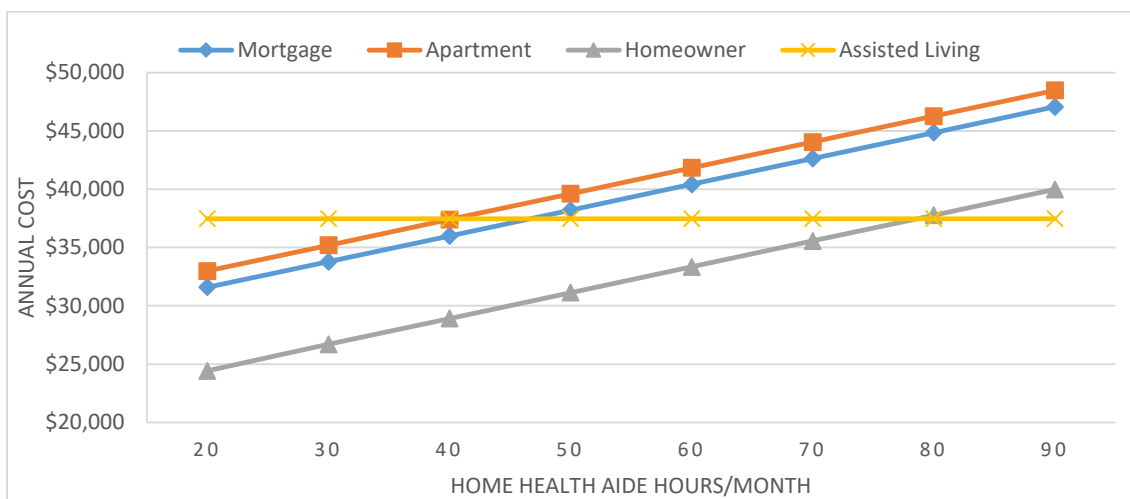


**Figure 4.13** Maine Break Even Results





**Figure 4.14** Mississippi Break Even Results



**Figure 4.15** North Carolina Break Even Results

#### 4.4 Transit Use Sensitivity Analysis

Sensitivities were conducted with respect to transit service levels. A low level of transit service was set to 20 one-way trips per month, and a high level of transit service was set to 60 one-way trips per month. All other variables were held constant within the simulations. Figures 4.16 and 4.17 illustrate the results for Wisconsin and Mississippi. At the median level, all of the simulations showed lower annual costs compared with assisted living. However, at the minimum level, both homeowners with a mortgage and apartment dwellers who required 60 one-way trips per month had annual costs higher than assisted living in Wisconsin. Mississippi apartment dwellers requiring a high level of transit service was the only simulation that yielded higher costs than assisted living at the minimum level. At the maximum level, all costs regardless of living situation or transit service level were lower compared with assisted living.

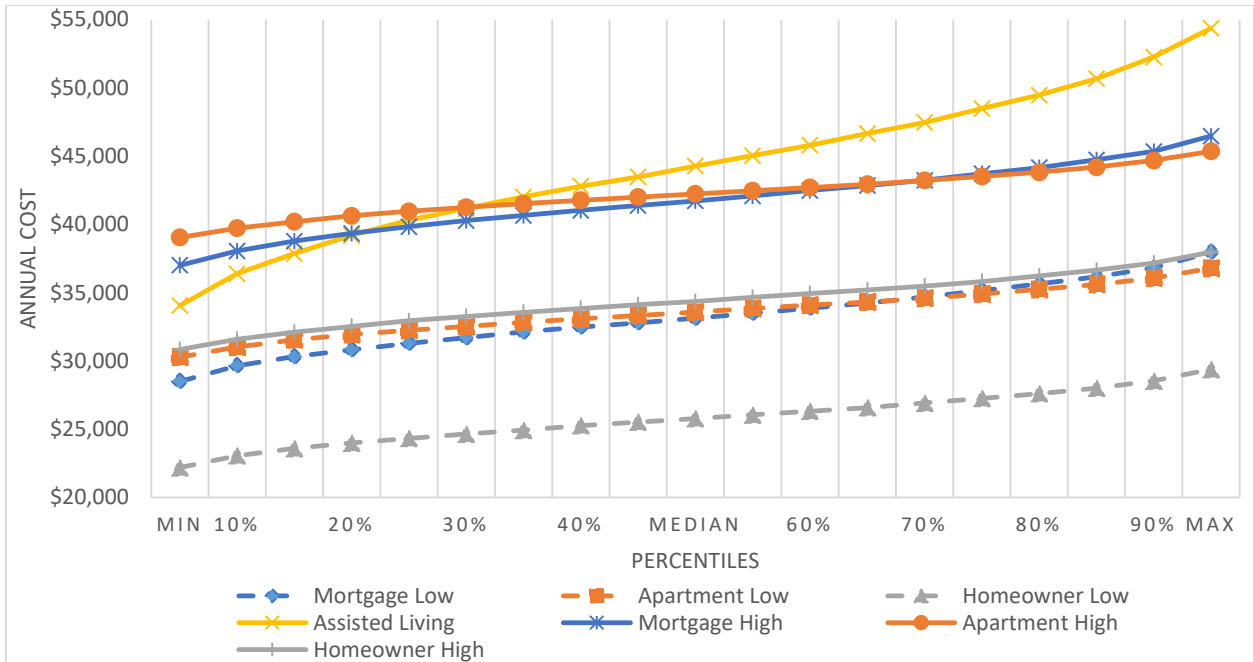


Figure 4.16 Wisconsin Transit Usage Sensitivity Results

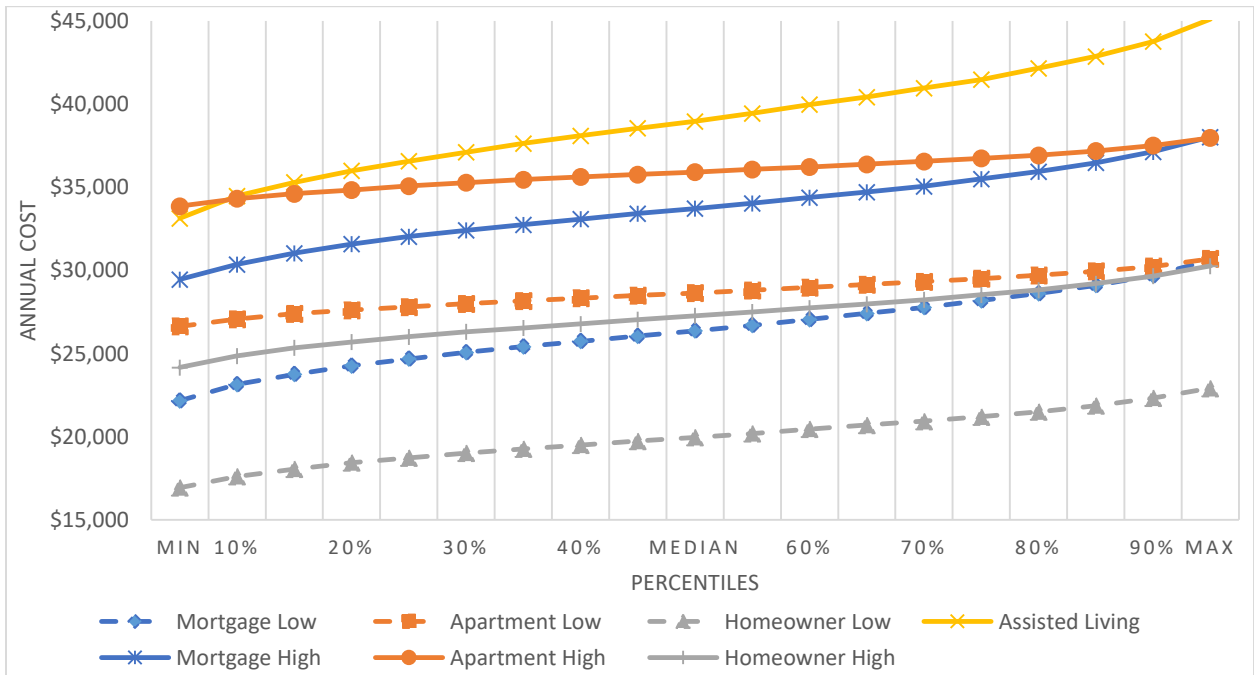
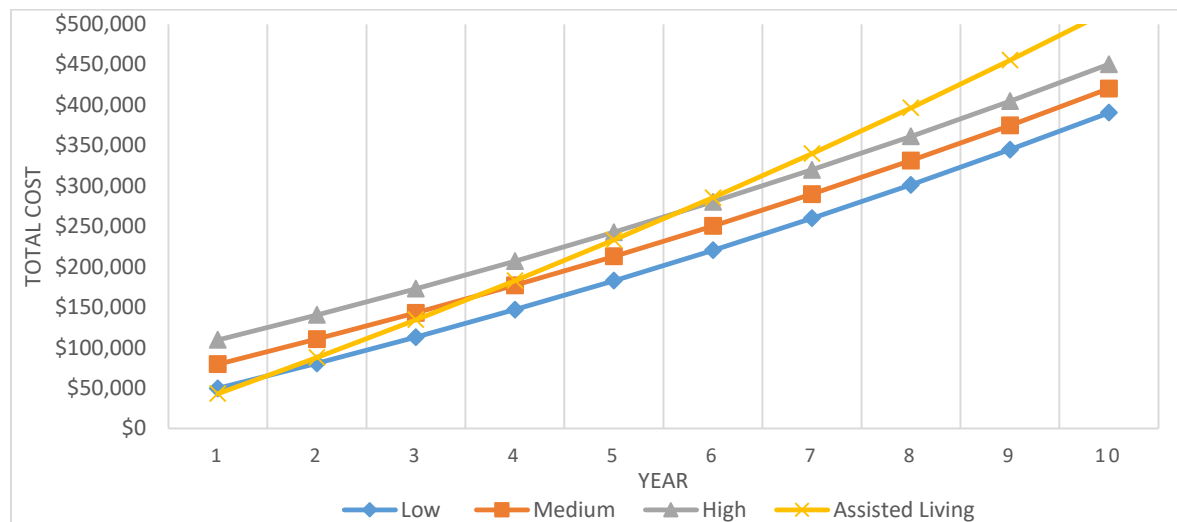


Figure 4.17 Mississippi Transit Usage Sensitivity Results

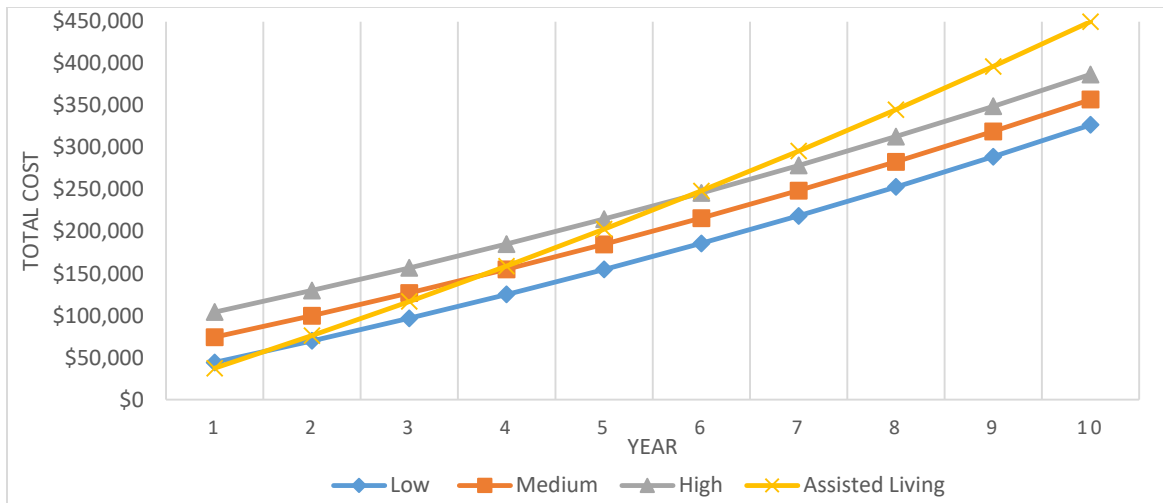
## 4.5 Home Modification Analysis

Another AIP cost is the potential modification of a current home to make them more accessible to a senior's needs. Examples of potential needs include roll-in showers, raised toilets, widened doorways, and external ramps for wheelchair use. These costs can vary substantially, from as little as a \$1,000 or less up to \$100,000 (Market Watch 2014). For the purpose of this simulation, home improvement needs were set at \$20,000 for a low level modification, \$50,000 for a medium level modification, and \$80,000 for a high level modification. Total costs over a 10-year period were then compared with assisted living.

Figures 4.18 and 4.19 show the total costs over a 10-year period for a homeowner with different levels of home modifications compared with assisted living costs in Pennsylvania and North Carolina. Notice that, initially, costs are higher for homeowners versus those in assisted living, but the one-time modification cost was assumed to occur in year one, and the lower cost of homeownership compared with assisted living quickly diminishes the overall cost for seniors choosing to age in place. For homeowners in Pennsylvania with a low level home modification, total costs are recouped by the second year compared with assisted living, while modification costs are recouped by the fourth and sixth year for medium and high level modifications. North Carolina results illustrated that costs for home modifications are also recouped within the same time period.



**Figure 4.18** Pennsylvania Home Modification Results



**Figure 4.19** North Carolina Home Modification Results

## 4.6 Summary

The main objective of the simulations in this chapter was to determine the annual cost of living at home or in an apartment versus residing in an assisted living facility. Results showed that assisted living costs were higher in most simulations and showed greater variability compared with the other living scenarios. Although assumptions were made with both homeowner scenarios as well as the apartment living scenario, significant costs differences were apparent. When overall cost savings were considered over a 10-year period, seniors could potentially save between \$10,000 to more than \$100,000 during that time. Costs savings varied primarily due to the specific living arrangement simulated, with homeowners without a mortgage realizing the largest cost savings overall. The relative cost of assisted living compared with other living scenarios and the total cost to provide demand responsive transit and home health care services in small urban and rural areas were significant cost drivers as well.

Break-even analysis showed how increased demand for home health aide services could affect a senior's decision to age in place versus moving to assisted living. Home health aide services varied from 20 to 90 hours per month, while holding all other variables constant, to determine what quantity of care would financially equal or exceed the cost of assisted living. Simulation results showed that anywhere from 40 to 90 hours of home health aide services would be required for those aging in place to meet or exceed the cost of assisted living. Hours varied due to both living scenario and home health aide cost fluctuations based on location and frequency.

Transit use sensitivities and home modification analysis both showed the effect of increased needs for travel and home accessibility from a senior's perspective. While considering both needs, simulations showed that living at home and aging in place was almost always the most cost effective living arrangement. However, as both transportation and home modification needs increased, results showed that assisted living becomes a more viable option as the costs to age in place escalate.

## 5. SUMMARY AND CONCLUSIONS

The objectives of this study were to determine the current state of aging in place in small urban and rural settings throughout the country and quantify the costs for residents to live at home and ride public transportation versus moving to an assisted living facility. Costs associated with living at home with and without a mortgage and living in an apartment were analyzed along with the equivalent assisted living expenses. Assumptions necessary for simulation purposes, such as home values and insurance premiums, were addressed by developing simulations that yielded a range of outcomes. This gives individuals the ability to compare their unique circumstances to a range of results rather than a single scenario or outcome.

Overall, simulation results showed that the cost of assisted living was almost always higher compared with the other three alternatives. Homeowners without mortgages had the lowest costs followed by apartment dwellers and homeowners with mortgages. The last two living scenarios showed very similar costs among most simulations. By not having a monthly mortgage payment, these homeowners were in the best position to remain in their current location and utilize public transit along with home health aide services. Homeowners with mortgages increased the equity of their homes monthly, but at a lesser overall level because they did not own their properties outright. Apartment dwellers gained no equity by remaining in their current living situation, but experienced lower out-of-pocket costs than both categories of homeowners.

Policy makers should consider the potential cost savings from aging in place found in this study. Older adults and their families can potentially save thousands of dollars annually by remaining at home and utilizing home health and public transportation services. Policies that increase the availability and accessibility of public transportation should be considered as these will increase the likelihood of older adults aging in place and utilizing important amenities within their local communities. Without available transportation, many seniors are forced to relocate well before they either want to or have to due to poor access to local services. Policies that will increase the availability and lower the cost of home health aide services should be considered as well. By making these services more readily available and less costly, seniors can maintain active lifestyles and forgo the substantial cost of relocating as long as possible, while the need for subsidies to support older adults living in senior living facilities will be lowered as well.

Because 90% of older adults want to age in place and 80% plan to live out their lives in their current homes, (Farber et al. 2011), the emotional cost of moving before it is entirely necessary should also be considered. Change can be difficult, especially for older adults who have often lived for decades in the same small urban or rural community and highly value their friends and available services. They want to continue to support their local communities. Policies that save important financial resources and help older adults remain vibrant and active should be considered.

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## APPENDIX

### Montana Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$4.50 per ride	40 rides	\$180
Transit (Agency cost-Fare)	21.00 per ride	40 rides	840
Homemaker Services	23.00 per hour	30 hours	690
Home Health Aide Services	23.00 per hour	20 hours	460
Adult Day Health Care	10.50 per hour	40 hours	420
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			250
Miscellaneous maintenance			100
Property Taxes			150
Homeowners Insurance			70
Groceries			200
Home Appreciation			655
Cost Increases/month	0.0045		

## Maine Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$3.50 per ride	40 rides	\$140
Transit (Agency cost-Fare)	18.00 per ride	40 rides	720
Homemaker Services	22.00 per hour	30 hours	660
Home Health Aide Services	23.75 per hour	20 hours	475
Adult Day Health Care	13.00 per hour	40 hours	520
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			325
Miscellaneous maintenance			125
Property Taxes			250
Homeowners Insurance			60
Groceries			250
Home Appreciation			600
Cost Increases/month	0.0045		

## Mississippi Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$2.50 per ride	40 rides	\$100
Transit (Agency cost-Fare)	12.25 per ride	40 rides	490
Homemaker Services	17.00 per hour	30 hours	510
Home Health Aide Services	17.00 per hour	20 hours	340
Adult Day Health Care	8.40 per hour	40 hours	336
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			200
Miscellaneous maintenance			100
Property Taxes			125
Homeowners Insurance			42
Groceries			200
Home Appreciation			583
Cost Increases/month	0.0045		

North Carolina Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$3.00 per ride	40 rides	\$120
Transit (Agency cost-Fare)	11.70 per ride	40 rides	468
Homemaker Services	17.75 per hour	30 hours	533
Home Health Aide Services	18.00 per hour	20 hours	360
Adult Day Health Care	6.25 per hour	40 hours	250
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			200
Miscellaneous maintenance			100
Property Taxes			175
Homeowners Insurance			60
Groceries			250
Home Appreciation			600
Cost Increases/month	0.0045		

## Wisconsin Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$3.00 per ride	40 rides	\$120
Transit (Agency cost-Fare)	14.64 per ride	40 rides	586
Homemaker Services	22.50 per hour	30 hours	675
Home Health Aide Services	23.00 per hour	20 hours	460
Adult Day Health Care	8.45 per hour	40 hours	338
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			200
Miscellaneous maintenance			100
Property Taxes			183
Homeowners Insurance			60
Groceries			250
Home Appreciation			600
Cost Increases/month	0.0045		

## Missouri Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$3.00 per ride	40 rides	\$120
Transit (Agency cost-Fare)	25.51 per ride	40 rides	1020
Homemaker Services	18.60 per hour	30 hours	558
Home Health Aide Services	19.00 per hour	20 hours	380
Adult Day Health Care	9.21 per hour	40 hours	368
Lawn care/Snow removal			75
Utilities (Power, Heat, etc.)			200
Miscellaneous maintenance			100
Property Taxes			150
Homeowners Insurance			60
Groceries			220
Home Appreciation			600
Cost Increases/month	0.0045		

## New Mexico Settings

Costs	Average Unit Cost	Monthly Total	Average Cost/Month
Transit (Fare)	\$3.00 per ride	40 rides	\$120
Transit (Agency cost-Fare)	13.97 per ride	40 rides	559
Homemaker Services	20.75 per hour	30 hours	623
Home Health Aide Services	21.00 per hour	20 hours	420
Adult Day Health Care	13.50 per hour	40 hours	540
Lawn care/Snow removal			50
Utilities (Power, Heat, etc.)			200
Miscellaneous maintenance			100
Property Taxes			125
Homeowners Insurance			50
Groceries			200
Home Appreciation			500
Cost Increases/month	0.0045		