

RIDE OR RELOCATE

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ABSTRACT

The American population continues to mature with an impending ‘aging tsunami’ just a few years away. 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 (Cox and O’Toole, 2004). Public transportation proponents believe that it is more desirable for aging Americans in rural areas to remain in their homes and utilize public transportation (APTA, 2008).

The objective of this research was to quantify the cost of living at home and riding transit in North Dakota versus relocating to an assisted living facility. Special attention was paid to three different living situations including homeowners with and without mortgages as well as apartment dwellers.

Overall, simulation results indicated that the cost of assisted living was almost always higher than the other three alternatives. Homeowners without mortgages had the lowest costs followed by apartment dwellers and homeowners with mortgages. Finally, every senior’s situation is unique and other factors such as amenities and safety may be more important than cost in considering quality of life and peace of mind for them and their families.

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1. INTRODUCTION

The American population continues to mature with an impending ‘aging tsunami’ just a few years away. It is projected that by 2030, more than one in five Americans will be 65 years of age or older (Population Research Institute, 2008). 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 (Cox and O’Toole, 2004). Public transportation proponents believe that it is more desirable for aging Americans in rural areas to remain in their homes and utilize public transportation (APTA, 2008). This is a topic that receives a lot of discussion, but very little research has attempted to quantify the actual cost.

1.1 OBJECTIVE

The objective of this research was to quantify the cost of living at home and riding transit in North Dakota versus relocating to an assisted living facility. Special attention was paid to different home living situations such as homeowners with and without mortgages as well as apartment dwellers. The point at which those living at home should consider a move to assisted living was another objective considered in this study.

1.2 ORGANIZATION OF CONTENT

The study begins with a literature review. The exact aim and objective of this research has not been knowingly addressed in previous literature. However, papers highlighted in the literature review deal with overall themes related to the topics of aging Americans, relocation and travel behaviors, and public transportation’s role in dealing with changing demographics. Following the literature review is an introduction to assisted living in North Dakota and the methodology used in this research. Next is the results chapter, followed by a summary that includes results and findings.

2. LITERATURE REVIEW

2.1 AGING IN PLACE

By 2025, the number of Americans aged 65 and older will increase by almost 80% to 62 million (Population Research Institute 2008). Bailey (2004) found that, presently, 21% of Americans age 65 and older do not drive. Further, more than 50% of non-drivers stay home on a given day because they lack transportation options, with the most affected populations being rural communities and sprawling suburbs, households with no automobile, and older African-Americans, Latinos, and Asian-Americans. The author highlights the fact that compared with older drivers, older non-drivers in the United States make 15% fewer trips to the doctor, 59% fewer shopping trips and visits to restaurants, and 65% fewer trips for social, family, and religious activities. Of interest to this study, Bailey notes that for the West North Central region of the country (comprising the states of Kansas, Iowa, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota), 59% of non-drivers age 65 and older stay home on a given day due to lack of transportation options.

The author brings attention to the fact that the Americans with Disabilities Act (ADA) stipulates that public transportation agencies provide complimentary paratransit along fixed routes for people whose disabilities prevent them from using fixed-route services, and that this service, in many instances, along with specialized transportation are the only feasible modes for elderly individuals who don't drive. However, due to the spatial distribution of many elderly individuals, they live away from fixed-route services or are not classified as disabled and do not, therefore, have the option of using paratransit. Rosenbloom (2003) draws attention to the aging-in-place phenomenon which has proven to be the predominant pattern among the elderly who remain in the homes in which they lived before retiring. She refers to the ever-present policy debate on the provision of alternative public transportation options for the elderly (i.e., paratransit or subsidized taxis) and speaks to the fact that, though this debate continues, there is little indication that the use of these options is large or growing among older people. For the period between 1995 to 2001, taxi use among the elderly fell, while the use of paratransit options were too small to break out in national data. However, simultaneously, there has been anecdotal information pertaining to the increasing use of small electric vehicles, motorized scooters, and golf carts among the elderly. Further, the author points out that the number of trips and miles traveled in automobiles by the elderly has been steadily increasing for more than three decades.

Hindering the potential increased use of public transit is the fact that special transit services are only available where regular transit services are available. In many urban areas, elderly individuals do not reside in close proximity to existing transit lines and, as a result, do not qualify for existing specialized transit services (i.e., ADA paratransit). Further, Rosenbloom highlights the fact that regular transit services are almost nonexistent in rural areas which, conversely, are home to more than two-thirds of the elderly.

In 2005, Khil took note of the difficulty for elderly residents in many neighborhoods to access shops, services, and recreational opportunities when not owning an automobile. The absence of public transit is not a main issue in locations where residents can walk easily to shops, services, and recreational activities. Interestingly, as the author notes, these locations tend to be the most cost-effective for transit due to population density and diversity of land uses.

Hansen (2009) observed that nine out of ten Americans age 50 and older exhibit a preference for aging in place. The author simultaneously expresses the concern that many of their homes and communities are not able to meet their needs and requirements as they age, specifically in the areas of mobility and access.

2.2 RELOCATION AND TRAVEL BEHAVIORS

In a study conducted in 1999, Kampfe observed that for many older individuals, residential relocation involves the transitioning from one level of independence to another. The author's literature review shows that research has also found links between residential relocation and psychological well-being. Some of these links tend to be positive, while others are found to be negative.

Kampfe uses the House Model of Social Stress developed in 1974 by House as a framework to analyze the multiple relationships among the variables that comprise a stressful event. The condition conducive to stress in the model was residential relocation which involved the movement from one level of independence to another, characterized by a move into or within a retirement facility.

Kampfe provides detail on the role of perception as a means of inducing stress associated with relocation. The literature on the matter portends that an individual's perception of change is more of a factor of influence than the change itself. Further, studies on the residential relocation of older persons have observed positive relationships between a sense of self control and psychological well-being. This factor, evidently, is embodied in the level of sense of self control derived from driving as opposed to the decreased level of self-control induced by being dependent on transportation from another source.

The author found that when elderly individuals in retirement facilities experienced conditions that encouraged personal control, they became more active, hopeful, and optimistic. Kampfe's study reveals the importance of personal control for elderly persons relocating to or living in a retirement community. Further, it is observed that individuals possess a more optimistic view about relocation after they have lived in their new locations for at least eight months than they did at the time of moving. They are more willing, after this eight month period, to adapt to their environment. This factor is significant as it relates to choosing transit, after being auto dependent for most of one's adult life, and after having moved to a more livable community.

Plane (2009) analyzed U.S. county-to-county data from Census 2000 and observed that when flows are disaggregated by age, substantially varied patterns of net population redistribution are occurring, traversing the national urban hierarchy. The author observes that the elderly are consistently moving from large metropolitan areas and relocating to micropolitan and rural counties that offer climatic and outdoor amenities.

The primary variable of interest in Plane's study was population size (i.e., the size of communities that persons leave and the sizes to which they migrate) relative to key transition stages over the course of life. The author observes that at an advanced age, individuals tend to return to medium-sized locations where perhaps adult children are now rearing their families. The author also found that it was the preference of a significant number of Americans to live in a small town but simultaneously be positioned a couple hours' drive from a major metropolis. Further, the author states that a logical assumption in the literature is that later-in-life moves are substantially influenced by elderly individuals' desire to be closer to adult children.

Bradley (2009) suggests that cost-of-living plays a central role in predicting the volume and direction of later-life migration flows. He states that high living costs "push" individuals 75 and over out of more expensive states. The residential choices of retired individuals are, in most instances, constrained by labor force opportunity. The feasibility of relocating has been shown to substantially depend on the housing market at the place of origin. However, modern transportation and communication technology facilitate a more seamless relocation transition through ensuring continued contact with loved ones and sources of interest after moving.

Harrell (2009) conducted 30 interviews in five U.S. metropolitan areas. Respondents were questioned based on available properties within a quarter mile and within a half mile of quality transit. Results indicated that some of the challenges associated with elderly relocation included long waiting lists, perception of safety and security, increased costs, and personal loneliness along with isolation in some locations.

In a 2003 study, Krizek sought to better understand the relationship among neighborhood scale, urban form, residential location decisions, and travel behavior. The study focuses on the change, if any, on household travel behavior of those that relocate within two consecutive years. Krizek sought to answer three questions: Do households change their travel behavior in two consecutive years? In what manner is a change in travel behavior attributed to different urban form settings as opposed to changes in life cycle or other factors? What does this relationship tell us about the consequences of using land-use planning to manage travel?

Krizek discusses the results of previous research on the interaction between urban form and travel behavior. Previous research suggests that fewer vehicle miles are traveled in neighborhoods with higher density and better access to transit; that there are fewer total trips and slightly higher levels of transit use and pedestrian activity in traditional neighborhoods versus standard suburban ones; and that there is two thirds more vehicle hours of travel per person for households in sprawling-type suburbs versus households in city neighborhoods. In work subsequent to the aforementioned, the author mentions that research adopted a more disaggregate approach to analyzing the travel behavior of individual households within neighborhoods to better understand relationships between travel choices and neighborhood accessibility. A major highlight of this research is the higher occurrences of both transit use and non-motorized trips among residents who live closer to a bus or rail stop, and those who reside in higher-density neighborhoods.

In 2006, Buchanan sought to identify how urban form affects travel patterns. The author's focus was on peripheral residential growth impacts and its effect on individual travel patterns. Pertaining to the existing literature, the author observes that though there has been a wide discourse on the relationships between urban form and transport, fewer definitive conclusions have been made. One of the more frequently cited reasons attributed to the inconsistency in most of the research conducted in this area surrounds the fact that most of this type of research has been conducted in large cities. There is an evident gap in literature addressing medium-sized and small cities. However, the author believes that literature shows travel patterns do depend on location and type of development, and that people will be willing to move into high-density areas, and in so doing, their travel patterns are likely to change.

In a study based in Australia, Buchanan asserts that to fully understand the changes made in individuals' travel behavior after moving to a location, Northwood, it was necessary to consider where residents lived in the previous location, Christchurch. This statement underscores the importance of understanding changes in travel behavior based on where an individual relocates to in relation to where they came from. Key findings of Buchanan's study include the observation that residential location resulted in little change concerning transportation preferences. In the author's study, the majority of people drove a car to and from work or education both before and after the relocation. These results mirror those found by Krizek in 2003 in a U.S. based study where the author observes that travel modes were likely to remain fixed regardless of a change in residential location. The author concludes that a change in residential location is more likely to affect the distance residents travel as opposed to the travel mode used. Of importance, the author notes that the time public transportation is introduced in a community directly influences travel behavior. More definitively, the author observes that if public transport systems are introduced after new residents have already established traveling patterns and behavior, changes between modes are significantly less likely.

Nedwick (2009) asserts that existing affordable housing near transit is increasingly at risk due to upward pressure on housing prices and expiring government subsidies. In relation to this phenomenon, the U.S. Congress directed the Department of Housing and Urban Development (HUD) in collaboration with the Federal Transit Administration (FTA) to conduct a study on expanding affordable housing opportunities near transit. The study is entitled “Better Coordination of Transportation and Housing Programs to Promote Affordable Housing Near Transit.” The author states that it is worth noting that the average American household spends almost 60 percent of its income on combined housing and transportation costs.

Litman (2009) considered the cost tradeoffs between using transit and using automobiles. Some of the costs considered, for both modes, are exogenous to the variables considered in this study and may not be a direct variable of consideration by an individual deciding between the use of transit or the use of a personal automobile. From an absolute perspective, larger benefits accrue when transit improvements or incentives are employed that result in attracting first-time riders or increased transit load factors.

Litman underscored the importance of potential and existing customers’ perception of public transit service quality. The work identified, in addition to other authors’ identification of the same, factors that directly influence a passenger’s perception of public transit. These factors included availability of service, frequency of service, travel speed, reliability, integration with other modes of transport, price structure and payment options, user comfort and security, accessibility, universal design, affordability, service information, and aesthetics.

Brooks (2009) found that when considering and calculating affordability in relocation, housing cannot be the only variable considered. The author states that there are location impacts that include access to services and amenities, mobility options, social network, potential lifestyle, cost of living, and access to quality transit.

2.3 PUBLIC TRANSPORTATION’S IMPORTANCE

As individuals age, their mobility options decrease as they, generally, depend on family members, relocation, or public transportation for transportation and access purposes. Litman stated that the National Institute on Aging estimates that 600,000 drivers, 70 years and older, lose their drivers license annually. HLB Decision Economics Inc. (2003) estimated that the increase in costs for home healthcare in the absence of public transit would amount to \$58.89 million annually in Wisconsin. Further, the corporate author calculated the benefit of public transit to medical purpose transit trips amounted to \$133.92 million in savings annually for users in the state. This figure represents the general increase in costs associated with the full expense of switching to an alternative mode in the absence of public transportation service for the purpose of medical trips.

Using the state of Wisconsin as a study, HLB Decision Economics Inc., in 2006, highlighted the benefits of providing low-cost mobility to transit dependent households. Benefits in such a case are realized through income earned from employment in transit facilities; the economic value garnered by access to services that include healthcare, education, retail, decreased vehicle ownership and operating costs; and government budget savings from welfare and social services due to the availability of public transportation. Additionally, the author highlights that benefits indirectly accrue because individual’s savings in transportation costs are often reallocated for expenditure on housing, food, and associated expenses.

In presenting an experimental, theory-driven evaluation of the effectiveness of an intervention combining a free public transit ticket and schedule information on the use of public transit in an urban area, Bamberg (2006) highlighted that general and abstract information on the benefits of alternative modes of transportation are ineffective in changing travel behavior. Further, the author emphasizes that highly personalized information seems more effective in changing commuting behavior.

3. NORTH DAKOTA ASSISTED LIVING

The definition of assisted living varies dramatically throughout the United States and the world. For this research, the North Dakota definition for assisted living was followed. Assisted living facilities in North Dakota are defined by the North Dakota Department of Human Services (2009) as:

“A building that has at least five separate living units where individualized support services are made available to individuals to accommodate needs and disabilities to enable individuals to remain independent. An entity providing assisted living services to five or more individuals in this type of setting must be licensed as assisted living facility by both the North Dakota Department of Human Services and the North Dakota Department of Health.”

The current licensing requirements for assisted living facilities in North Dakota went into effect as of January 1, 2002. To receive and maintain a license, an assisted living facility must pay an annual fee of \$75 and maintain written agreements with all tenants that include the rates for rents and services provided. They must disclose payment terms, refund policies, rate changes, tenancy criteria, and living unit inspections to all tenants as well. Also, assisted living facilities must provide each tenant with written notice of how a tenant may report a complaint and certify that the operation of the facility is in compliance with federal, state, and local laws. The license must be renewed annually (North Dakota Department of Human Resources 2009).

Currently there are 64 licensed assisted living facilities in North Dakota (Figure 3.1). Numbers in figure 3.1 next to a community name indicate that town has multiple licensed assisted living facilities. Towns without numbers have only one assisted living facility. Twenty-one of these facilities are located in North Dakota’s four largest cities: Fargo, Bismarck, Grand Forks, and Minot. Dickinson has four licensed facilities while Devils Lake, Jamestown, Lisbon, Valley City, and West Fargo all have two licensed facilities. The remaining 29 towns represented in figure 3.1 have one licensed facility per community.

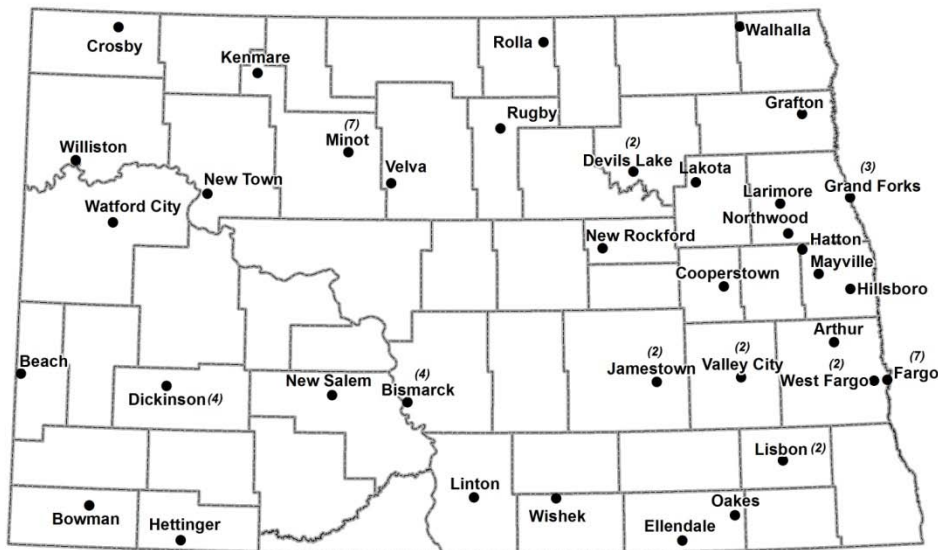


Figure 3.1 North Dakota Assisted Living Facilities

The North Dakota Long Term Care Association (2009) recently surveyed assisted living centers in North Dakota. The focus of the survey was to gather cost and service information for the 2009 North Dakota Legislative Session. Thirty-six facilities were surveyed representing a total of 1,386 assisted living units or apartments. Nearly 90% of the units represented were currently occupied, while only 125 units had more than one occupant. The type of unit most requested by tenants was a one-bedroom unit. Findings also indicated that the rental price for a one-bedroom unit ranged from \$720 to \$2650 per month. The average service package, which is paid in addition to rent, was between \$200 and \$2000 per month. Common features available for tenants included transportation, housekeeping, meals, activities, bathing, medication management, exercise, and cable TV, among others. Some of these features were available within the basic rental package while many were included within the service package.

Further findings from the survey indicated that the average age of a tenant was 85, and 74% of tenants were female. Eighty-four percent of tenants responded that they lived at home prior to admission to assisted living. They indicated that the top three reasons for admission were physical decline, cognitive decline, and social isolation. Also, nearly half of tenants have the assisted living facility manage their medications (North Dakota Long Term Care Association 2009).

4. RESEARCH METHODOLOGY

This research compared the cost of senior citizens living at home while utilizing home-based health services and transit versus moving to an assisted living facility. Particular attention was paid to the trade-offs between the amount of services required for seniors to live at home versus moving and the costs associated with such trade-offs. Obviously, each individual must make his or her own decision as to whether he or she should live at home or move, and each individual situation is unique. Therefore, to account for some of the uncertainty in service and cost that occur, @Risk simulations were conducted. The following discussion highlights the function of @Risk and its applicability to analyzing data that includes uncertainty.

If an individual is confronted with a problem that includes uncertainty, it becomes difficult to use an analytical model that will yield useful information. @Risk, a Microsoft Excel add-in program, contains functions that make it easier to generate observations from random variables. For example, entering RISKNORMAL (5,1) in a cell will generate an observation from a normal random variable with mean 5 and standard deviation 1. Once cells that include uncertainty are replaced with @Risk functions, a simulation is run. The purpose of the simulation is to imitate a real-life situation. Within the model, an @Risk cell is simulated a set number of times, called iterations, to provide an answer. Note that this answer is not exact, but an approximation.

@Risk also allows the user to define 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. Some common distributions include logistic, weibull, triangular, and normal, along with many others. The method of simulation can also be chosen. For this research, monte carlo simulations were used. This type of simulation was thought to best represent the data in question. The random number used for each iteration in a monte carlo simulation is similar to a spin on the roulette wheel at a casino. Like the spins on the roulette wheel, the random numbers used to generate demands within each iteration are independent from one another.

Variables that represented uncertainty for this research included those for 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 represented some of the most important considerations seniors think about when choosing where to live and they also showed substantial variability within the dataset.

Communities studied in North Dakota included Fargo, Grand Forks, and Bismarck. These three were the only communities in North Dakota that offered enough data for a feasible analysis. Most of the other communities in North Dakota had between one and three licensed assisted living facilities. Therefore, it was impossible to conduct a simulation with a mean and standard deviation because only one to two data points were available. However, the rest of the data from North Dakota were grouped into another category defined as 'rest of state.' Combining data from throughout the state allowed for this fourth 'community' to be studied. All of the simulations were run within one of the four communities, yielding unique results based on location and the cost structure for that particular community.

Sensitivity analysis was also performed within two main categories. These included in-home care and transit rides. It is impossible to estimate exactly how much in-home care an individual would need on a monthly basis, as it varies from month-to-month as well as from location-to-location. Thus, sensitivities were conducted at three different levels defined as low, medium, and high need for in-home care. Also, transit ride sensitivities were conducted at low, medium, and high need for transit service as well. The following chapter focuses on simulation modeling and results for all four communities and the sensitivities within those communities as well.

5. SIMULATION RESULTS

Results from @Risk cost simulations are the focus of this chapter. Comparisons were made between three different living situations and assisted living. Living situations included living at home without a mortgage, living at home with a mortgage, and living in an apartment setting. The three communities of Fargo, Bismarck, and Grand Forks were analyzed individually along with the rest of North Dakota as a whole. Fargo, Bismarck, and Grand Forks were the only communities in North Dakota with enough data available to simulate feasible results. Sensitivity analysis was also completed with a focus on in-home care use and transit ridership.

5.1 DATA AND DEFINITIONS

Data used in simulations were collected from a combination of sources including the North Dakota Long Term Care Association (2009), AARP (2009), Genworth Financial (2009), and personal interviews of assisted living and long term care employees. The definition for assisted living facilities used in this research can be found in Chapter 3, and the definitions for in-home care services are as follows:

- **Homemaker Services:** Provides “hands-off” care such as helping with cooking and running errands. These providers are often referred to as “Personal Care Assistants” or “Companions.”
- **Home Health Aide Services:** Provides “hands-on” personal care and sometimes skilled care with a nurse visit to the home. Assist with such activities as bathing, dressing, and transferring.
- **Adult Day Health Care:** Provides social and other related support services in a community-based, protective setting during any part of a day, but less than 24-hour care.

Genworth Financial (2009).

5.2 BASE CASE SETTINGS

The base case scenario was developed to simulate the services a senior citizen would require while living in their home versus moving to an assisted living facility. The amount of service was set at a level comparable to a typical North Dakota assisted living center. A useful comparison can be established with this scenario because while service levels are unique for each individual, someone receiving similar care while living in their home compared to assisted living can determine at what point they should consider a move. For example, the base case settings used for a Fargo homeowner without a mortgage are shown in Table 5.1.

Cost variables used in the simulation based on Table 5.1 included transit fares, transit agency cost per ride, home health aide services, homemaker services, adult day health care, utility costs, home maintenance costs, property taxes and insurance, food, and home appreciation. A cost increase variable was also added to account for fluctuations throughout one calendar year. Variables that used @Risk functions included homemaker services, home health aide services, adult day health care, cost increase/month, and assisted living facility costs. These variables represented uncertainty in the simulation models because they showed substantial variability within the dataset, and they were some of the most important variables senior citizens consider when choosing where to live. The homeownership variables including property taxes, insurance, miscellaneous costs, and home appreciation, represent typical costs for the median home value in Fargo of \$144,000 (Census 2009). Separate simulations were run for assisted living centers. Variables simulated within the assisted living model included assisted

living rent and services, transit fares, and miscellaneous expenses. Transit fares were included because even though most assisted living facilities offer transportation services, these services are often limited. Also, all simulations were done assuming no one was operating their own private vehicle.

Table 5.1 Base Case Settings, Fargo Homeowner

Costs	Cost/Hr/Ride	Monthly Rides/Hours	Cost/Month
Transit (Fare)	\$2.50	40	100
Transit (Agency Cost-Fare)	\$14.71	40	588
Homemaker Services	\$17.64	15	265
Home Health Aide Services	\$20.80	15	312
Adult Day Health Care	\$8.00	30	240
Utilities (Heat, Power, City Services)			150
Lawn Care/Snow Removal			60
Miscellaneous Maintenance			100
Property Taxes	\$144,000 home	\$2500/yr	208
Homeowners Insurance	\$144,000 home	\$840/yr	70
Groceries		\$40/week	160
Home Appreciation	\$144,000 home	5% annually	600
Cost Increases/Month	0.0045		

5.3 OUT-OF-POCKET RESULTS

The following figures show the annual out-of-pocket costs for seniors living in Fargo, Bismarck, Grand Forks, and the rest of North Dakota as a whole. All costs are illustrated within a range including a minimum, mean, and maximum value. Figure 5.1 illustrates the costs for Fargo. Notice that the annual cost of assisted living is more than \$6,000 higher at its mean value compared to homeowners who have a mortgage and those that live in apartments. For homeowners, the cost of assisted living is almost \$14,000 more per year. However, the cost of assisted living at its minimum value is nearly identical to that of homeowners with a mortgage and those that live in apartments. The annual cost for homeowners is still substantially less than assisted living at its minimum value. At the maximum values, assisted living costs \$13,000 more annually compared to homeowners with a mortgage and apartment dwellers and is more than double compared to the cost for homeowners. Also, notice that the results for assisted living contain more variability compared to the others. This is illustrated by a much steeper line representing annual costs.

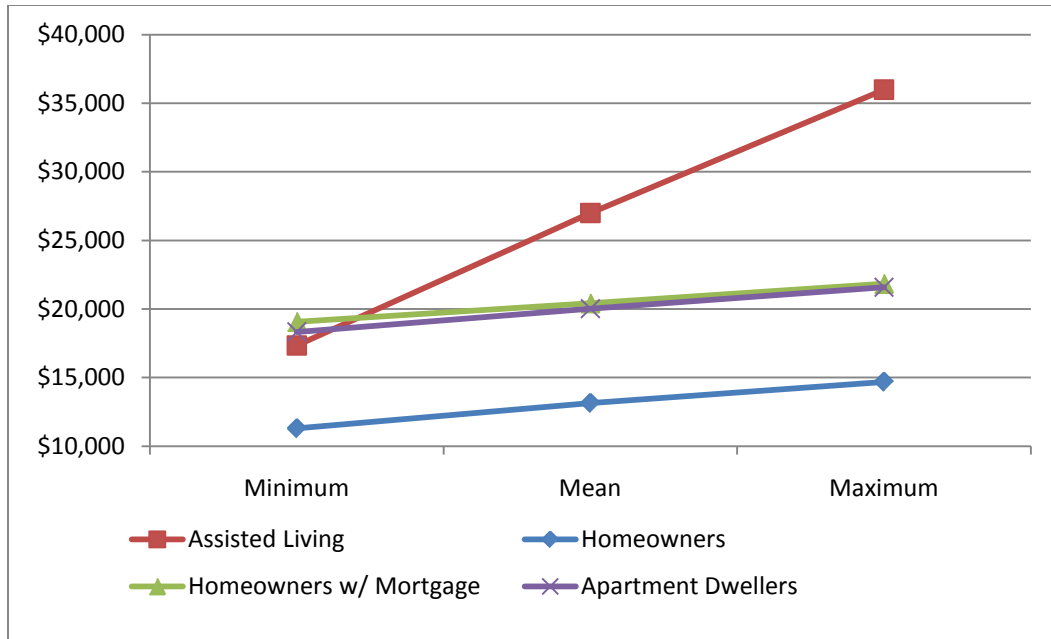


Figure 5.1 Fargo Out-of-Pocket Costs

Figure 5.2 shows out-of-pocket costs for Bismarck. Notice that all of the assisted living costs at the minimum, maximum, and mean levels are higher for Bismarck compared to the other scenarios. At the mean, it costs roughly \$5,000 more per year to live in assisted living than living at home with a mortgage or living in an apartment, while the cost for homeowners is nearly \$12,000 more per year to live in assisted living. Minimum values show that assisted living costs about \$2,000 more annually than living at home with a mortgage or living in an apartment, while homeowners will experience a nearly \$9,000 annual cost increase to move to assisted living. The maximum values illustrate even larger cost disparities between assisted living and the other three scenarios. Finally, the annual assisted living costs contain more variability than the other scenarios, but less when compared to the Fargo results.

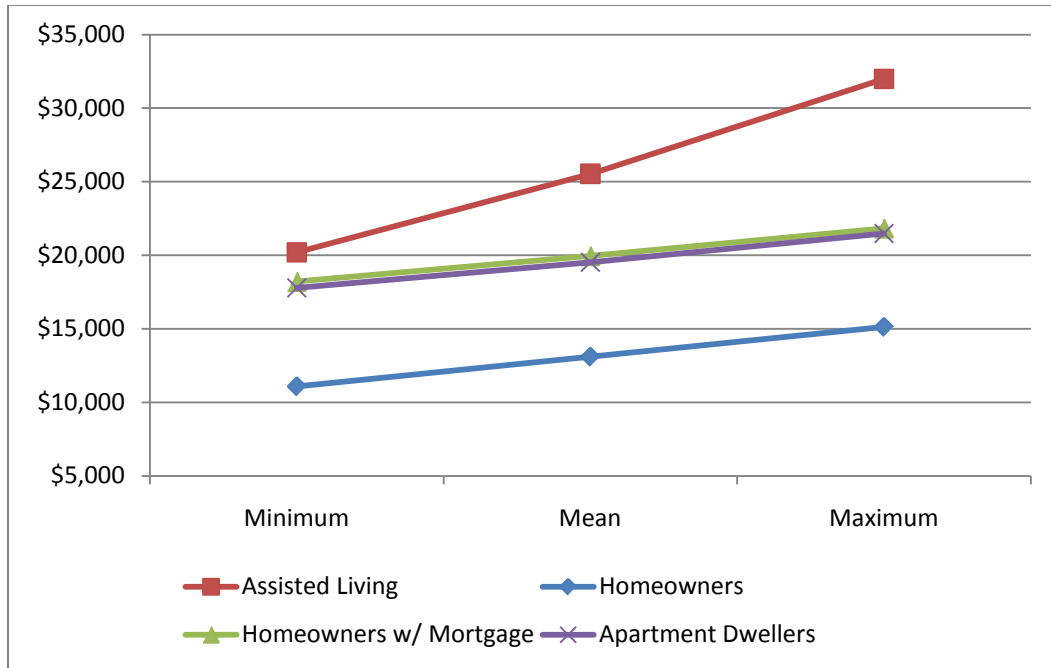


Figure 5.2 Bismarck Out-of-Pocket Costs

Figure 5.3 illustrates out-of-pocket costs for Grand Forks. Assisted living costs showed similar variability in Grand Forks compared to Fargo, but greater variability than in Bismarck. The mean cost for assisted living was still higher than the other three scenarios, but only \$4,000 more annually than homeowners with a mortgage and apartment dwellers. The minimum costs for assisted living in Grand Forks were actually lower than those for both homeowners with a mortgage and apartment dwellers, while homeowner annual costs were still lower compared to assisted living. However, the maximum assisted living costs were substantially higher than all other scenarios. Costs for homeowners with a mortgage and apartments dwellers were both \$11,000 less annually than those for assisted living, and homeowner costs were \$17,000 less annually.

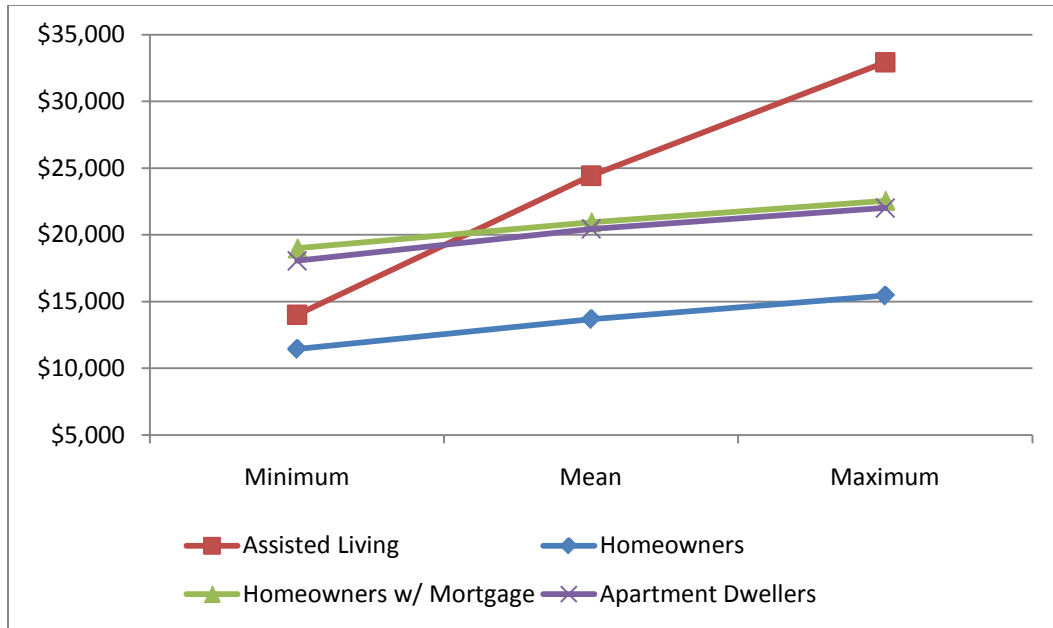


Figure 5.3 Grand Forks Out-of-Pocket Costs

Figure 5.4 shows costs for the rest of North Dakota. When considering the rest of North Dakota versus one community, the range of costs increase dramatically. The standard deviations in these simulations compared to the other three were normally two to three times higher. The mean costs for assisted living were still higher than the other three scenarios, but minimum costs for assisted living were roughly \$3,000 less annually compared to homeowners with a mortgage and apartment dwellers. However, maximum assisted living costs were more than \$10,000 higher compared to the same two scenarios. Homeowners, as expected, still had lower annual costs at all three levels compared to assisted living. Finally, compared to the other three communities simulated, the three scenarios apart from assisted living also have a steeper curve, illustrating that more variability was present within this dataset compared to Fargo, Bismarck, and Grand Forks.

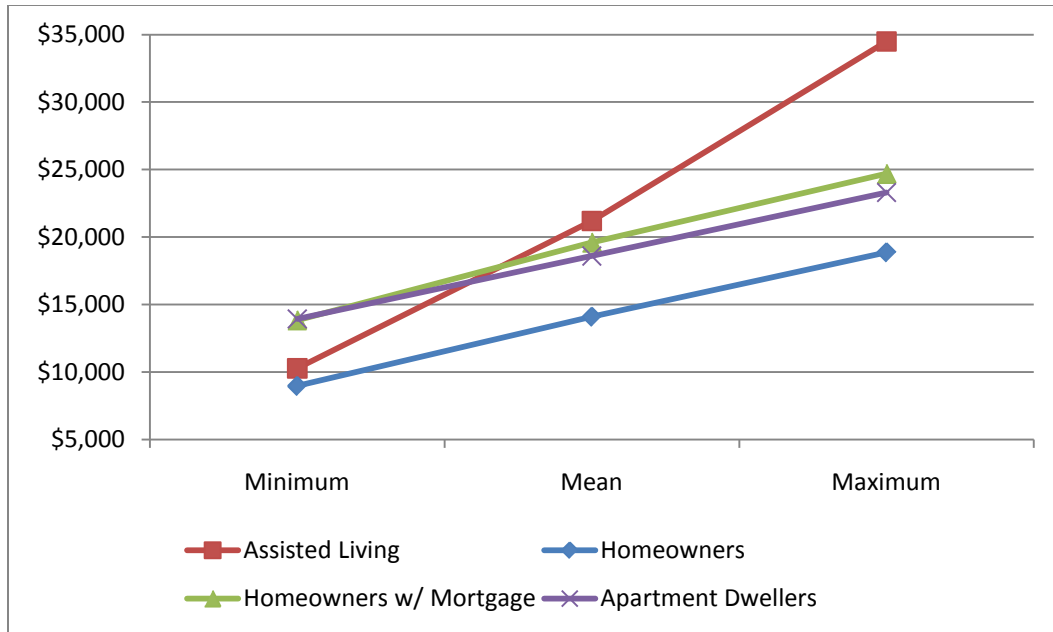


Figure 5.4 Rest of the State Out-of-Pocket Costs

5.4 TOTAL COST RESULTS

The following figures show the total cost for seniors living in Fargo, Bismarck, Grand Forks, and the rest of North Dakota. The difference between these cost results and the out-of-pocket results is that transit operating costs were included to gain a better understanding of the total cost associated with transit use. Figure 5.5 shows the total costs for Fargo. In these scenarios, including transit operating costs results in substantial changes. This was because the cost for Fargo Metropolitan Area Transit (MAT) to provide a one-way trip is over \$17 minus the fare of \$2.50. The mean results indicated that it still costs more than \$3,000 annually to live in assisted living versus living at home with a mortgage or living in an apartment. Homeowners will save nearly \$10,000 annually by living at home versus moving to assisted living as well. Assisted living costs were roughly \$5,000 less per year than living at home with a mortgage or living in an apartment. Results also indicated that homeowners would still save money at the minimum value compared to assisted living, but only a little more than a \$1,000 annually would be saved.

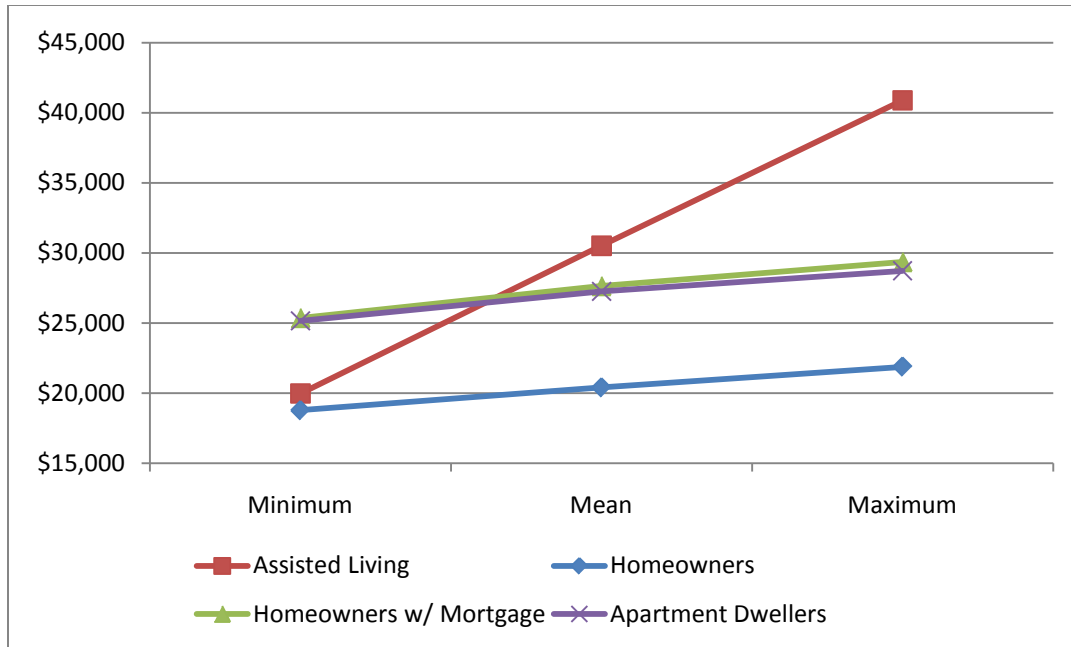


Figure 5.5 Fargo Total Costs

Figure 5.6 shows total costs for Bismarck. Including paratransit transit operating costs for Bismarck did not have a substantial impact on costs compared to out-of-pocket costs for Bismarck. This was because Bismarck transit reported their total operating cost per ride to be \$8.11. When the \$2.50 fare was subtracted from the total, only \$5.61 per ride was added to total costs. The minimum values for assisted living were below those for homeowners with a mortgage and apartment dwellers, but not significantly. Also, homeowners still saved nearly \$4,000 annually compared to assisted living at its minimum cost. Mean level results showed assisted living to remain substantially higher compared to the three other scenarios as well.

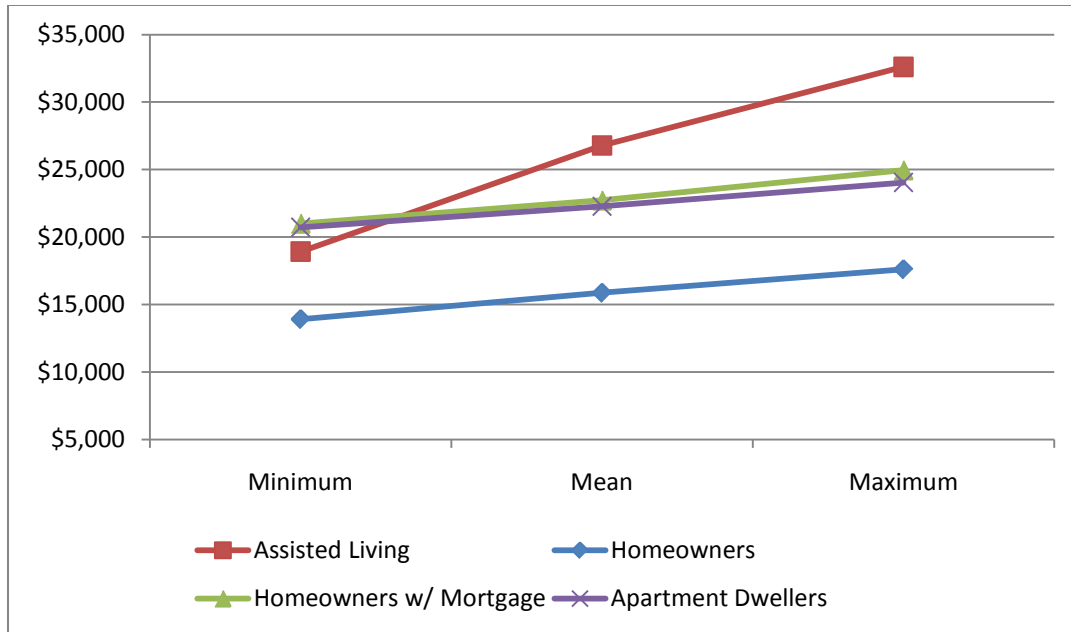


Figure 5.6 Bismarck Total Costs

Figure 5.7 shows total costs for Grand Forks. These results show even less of a change than Bismarck out-of-pocket costs because Grand Forks reported operating costs of only \$7.17 per ride. Assisted living costs were still lower than those for homeowners with a mortgage and apartment dwellers at their minimum values, and home owner costs remained lower than assisted living costs at all three levels. The difference between mean values for assisted living compared to the other three scenarios did diminish by roughly \$1,000 per scenario.

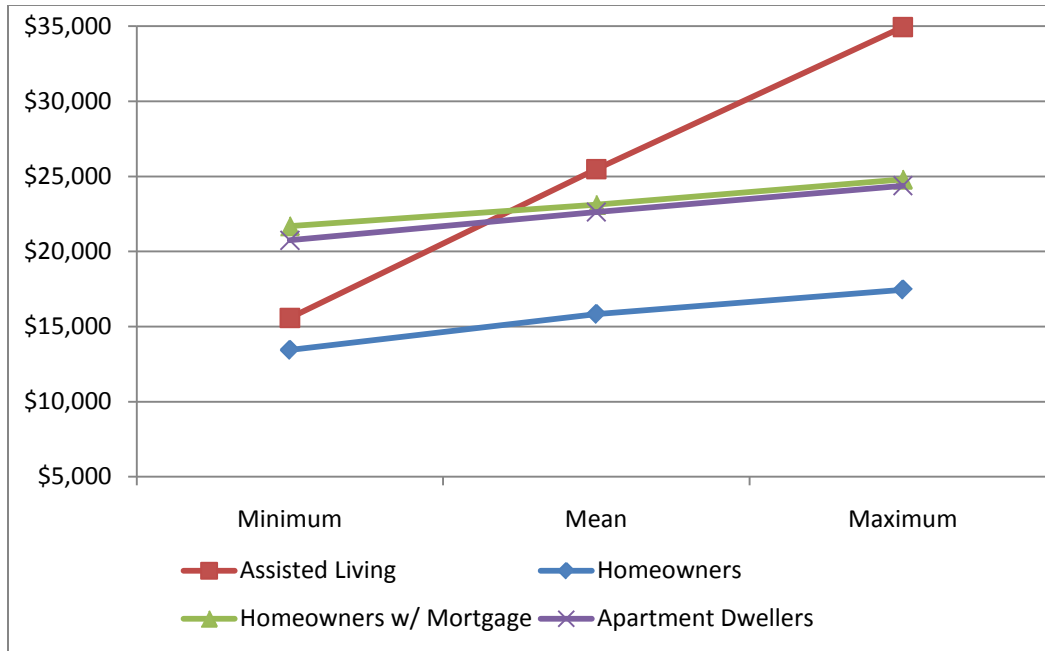


Figure 5.7 Grand Forks Total Costs

Figure 5.8 shows total costs for the rest of North Dakota. The mean values for these scenarios showed that assisted living costs are very similar to those for people living at home with a mortgage and living in an apartment, while living at home was still significantly cheaper. The minimum value for assisted living was less than those for all other scenarios, while the maximum value was significantly higher than those for all other scenarios. This was due to the substantial variability within the data, as the minimum and maximum results are much lower and higher compared to normal North Dakota assisted living costs. However, figure 5.8 does illustrate that when total paratransit operating costs are included in the model, the cost of assisted living is more justifiable from a financial point of view in these parts of the state.

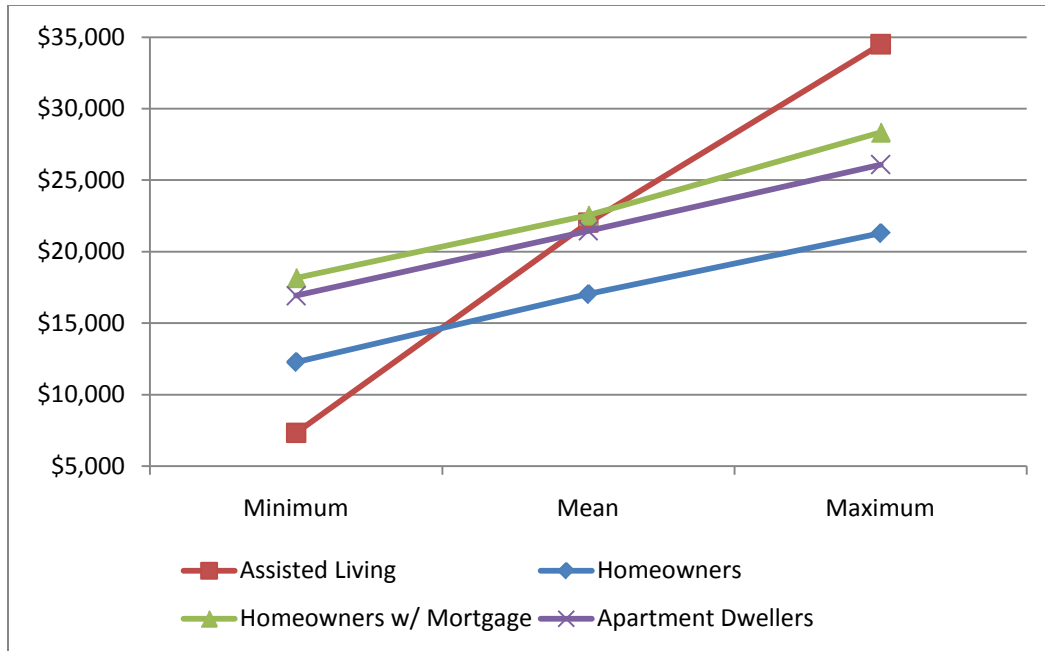


Figure 5.8 Rest of State Total Costs

5.5 SENSITIVITIES

Sensitivity analysis was done on simulations including in-home-care levels and transit service. Figure 5.9 shows in-home care sensitivities for Fargo. Annual assisted living costs were compared to homeowners and homeowners with a mortgage annual costs in these simulations. The level of in-home care provided for each simulation is shown in Table 5.2. All six simulations yielded lower costs at the mean and maximum levels compared to assisted living, while homeowners with a mortgage who received both high and medium levels of in-home-care were more costly at their minimum level compared to assisted living. Both homeowner categories once again showed less cost variability compared to assisted living, as illustrated by the flatter lines in figure 5.9.

Table 5.2 In-Home-Care Service Levels

In-Home Care Services	Hours Per Month		
	Low	Medium	High
Homemaker Services	10	15	20
Home Health Aide Services	10	15	20
Adult Day Health Care	20	30	40

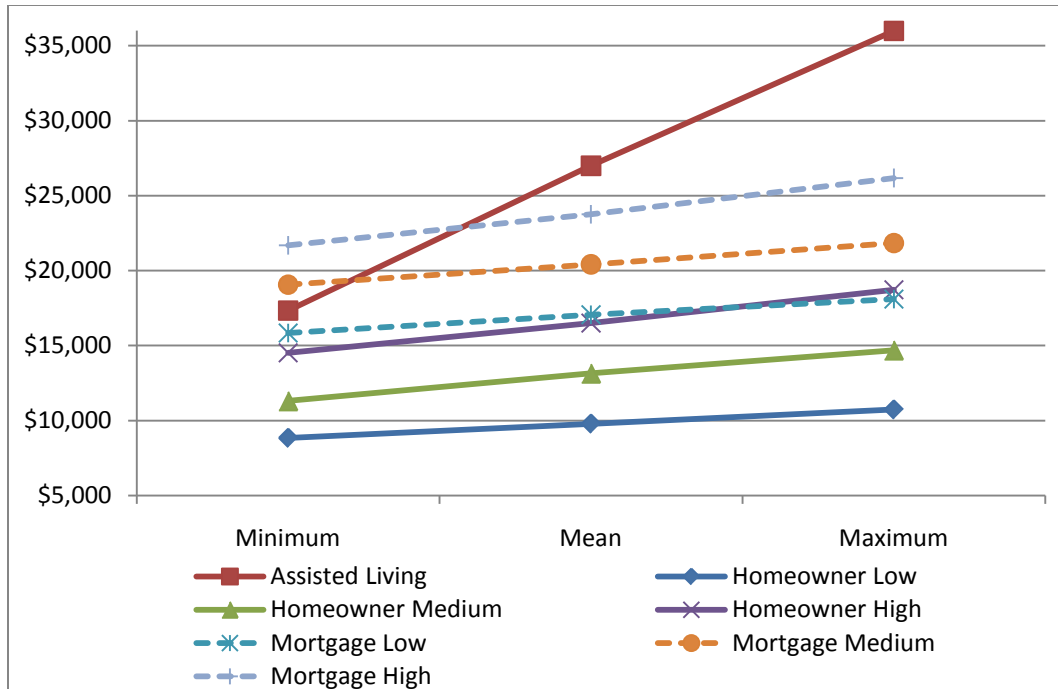


Figure 5.9 Fargo In-Home-Care Sensitivities

Bismarck in-home-care sensitivities are shown in Figure 5.10. These simulations yielded similar results compared to the Fargo simulations with all mean and maximum annual cost levels being higher for assisted living versus both homeowner categories. However, the minimum levels for assisted living costs in Bismarck are also higher than homeowner costs at all levels except one. Homeowners with a mortgage who received a high level of in-home-care showed nearly identical annual costs at their minimum level compared to assisted living. Notice that the slope of assisted living costs in Bismarck is less than that of Fargo. This was due to similar costs among Bismarck assisted living facilities compared to Fargo with the slope being only slightly steeper than both Bismarck homeowner categories.

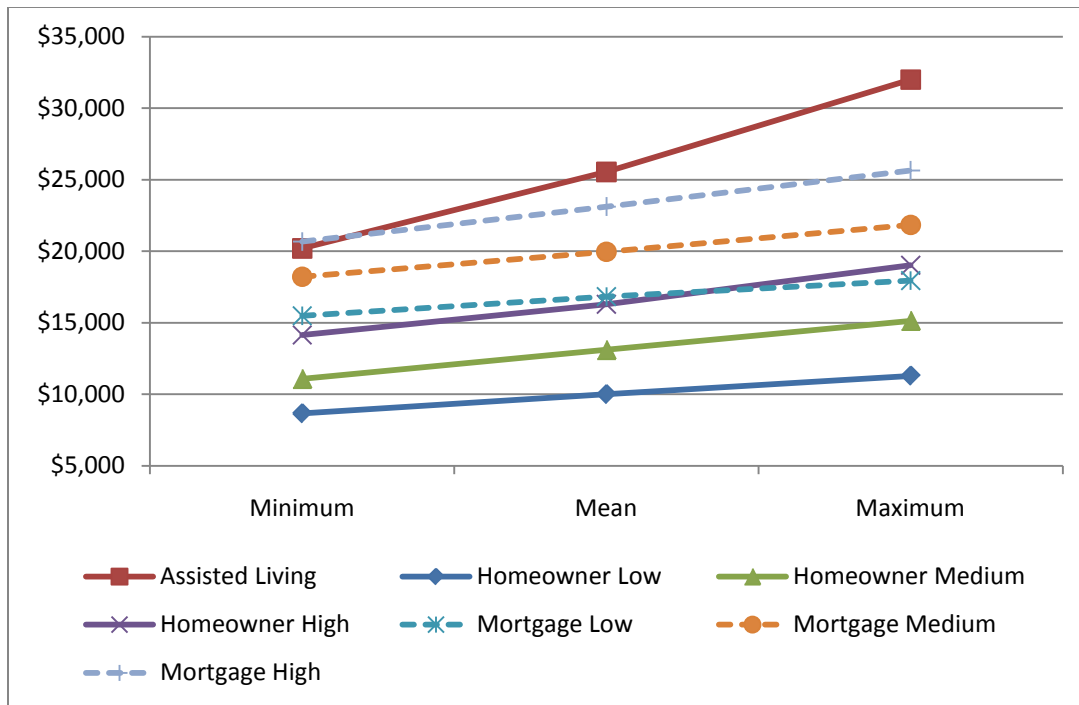


Figure 5.10 Bismarck In-Home-Care Sensitivities

Sensitivities were also performed with respect to transit service levels in Fargo and Bismarck. A low level of transit service was set at 20 one-way trips per month, a medium level at 40 one-way trips per month, and high level of service at 60 one-way trips per month. Figure 5.11 illustrates these results for Fargo. All of the homeowner simulations showed significantly lower annual costs compared to assisted living, while the mean and maximum annual costs for homeowners with mortgages were also significantly lower. At the minimum cost levels, homeowners with a mortgage costs were similar to those of assisted living. Assisted living costs again showed significant variability compared to both homeowner categories.

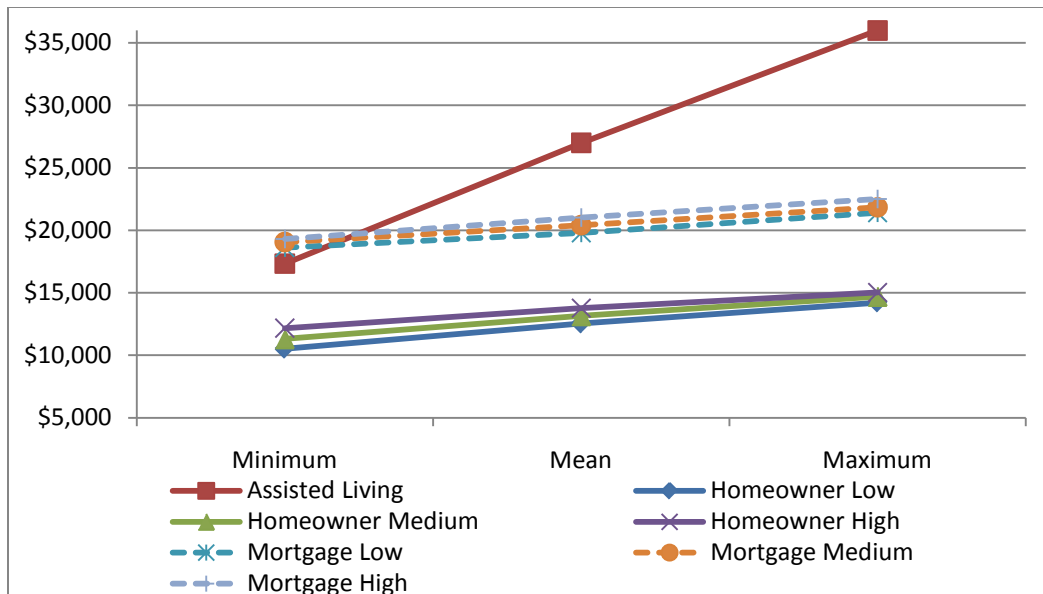


Figure 5.11 Fargo Transit Service Sensitivities

Bismarck transit service sensitivity results are illustrated in Figure 5.12. At all levels, simulations indicated that homeowner costs were lower than assisted living. Also, notice the similarities of the lines in proximity and slope for both homeowner categories. These results showed that the level of transit service one receives has a small out-of-pocket cost impact compared to the impact of in-home-care services.

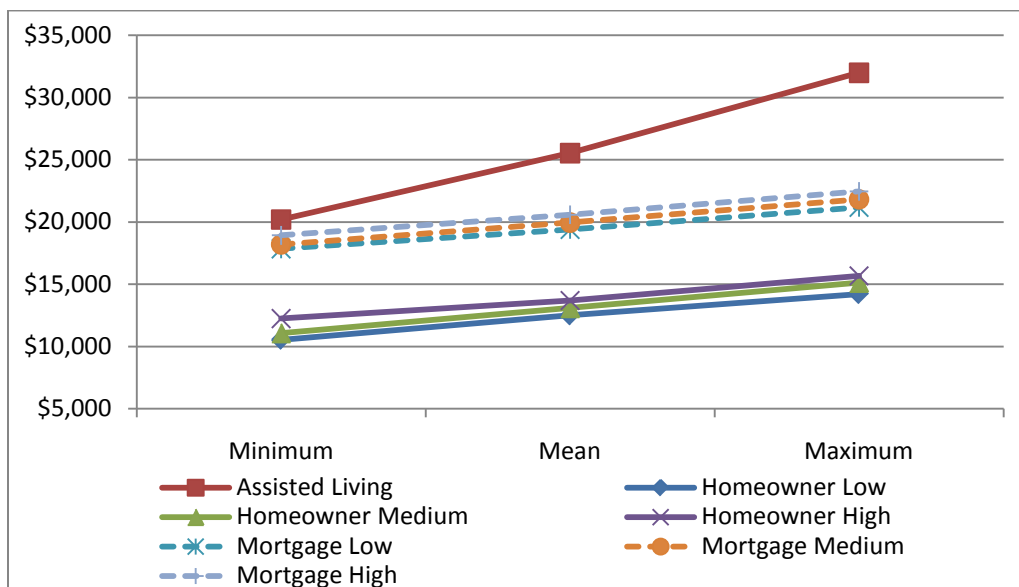


Figure 5.12 Bismarck Transit Service Sensitivities

5.6 SUMMARY

The objectives of the simulations in this chapter were to determine the annual costs of assisted living in North Dakota versus living at home or in an apartment. Assisted living costs were found to be higher in most simulations and showed greater variability compared to other alternatives as well. Although many assumptions were made with both homeowner scenarios as well as the apartment scenario, significant cost differences were evident. When total transit costs were considered in addition to out-of-pocket costs, assisted living became affordable compared to the alternatives, especially in Fargo. This was due to Fargo's paratransit operating costs being more than twice those in Bismarck, Grand Forks, and throughout the rest of North Dakota.

Sensitivity analysis indicated that in-home-care service levels played a much more significant role, with respect to cost, than transit service. It should be noted that all simulations highlighted a range of costs, not just an average. This provides a more real-world situation for seniors to consider trade-offs and feasible service levels. For example, a low-cost assisted living facility may be as affordable as living at home with a mortgage or in an apartment, but an average or above average assisted living center will almost always involve greater cost than the other three living situations considered in this research.

6. SUMMARY AND CONCLUSIONS

The objective of this study was to quantify the costs for North Dakota residents to live at home and ride transit versus moving to an assisted living center. Costs associated with living at home with and without a mortgage and living in an apartment were considered along with assisted living expenses. Assumptions were made in the simulations with respect to variables such as home value, mortgage payment, property taxes, etc. This was necessary for the simulations, but will likely be inaccurate for each individual's unique situation. To address this, simulations were developed that resulted in a range of outcomes, not just one number. This gives an individual the opportunity to compare themselves to the mean and determine what their own costs may be.

Overall, simulation results indicated that the cost of assisted living was almost always higher than the other three alternatives. Homeowners without mortgages had the lowest costs followed by apartment dwellers and homeowners with mortgages. Without a monthly mortgage payment to make, homeowners were in the best position to remain in their current location and ride public transit. They were also gaining equity in their home. Homeowners with mortgages also increased the equity in their homes monthly, but at a lesser level due to the fact they did not own the entire property. Apartment dwellers gained no equity by remaining in their living situation, but had lower overall costs compared to both categories of homeowners. Finally, although cost is important, every senior's situation is unique and other factors such as amenities and safety may contribute more to quality of life and peace of mind for them and their families.

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