

## Cognitive and Functional Disability Trends for Assisted Living Facility Residents

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Of course the contents of this report are the sole responsibility of its authors. Any errors are their own.

## **Background**

Assisted living facilities typically offer a combination of housing, health care, personal assistance and supportive services. The term “assisted living” refers to a type of care that combines housing and services in a homelike environment that strives to maximize the individual functioning and autonomy of the frail elderly and other dependent populations. Most definitions of Assisted Living include 24-hour supervision, housekeeping, meal preparation, and assistance with activities of daily living<sup>1</sup>. In 2002, there were approximately 36,000 assisted living residences in the U.S. housing about one million people<sup>2</sup>: the typical assisted living resident is 80 years old, female, and slightly disabled, having limitations in 2.25 activities of daily living.<sup>3</sup>

There are substantial variations in the range of services that assisted living facilities provide and in the type of populations they serve. For the most part, individuals living in assisted living facilities are medically stable and do not require 24 hour nursing care. Most facilities provide or arrange for some level of personal care services for those individuals who may require them. In fact, about 70% of assisted living residences contract with a home health agency to provide skilled nursing and 65% of residences contract with a hospice provider for hospice services<sup>4</sup>.

The growth in assisted living facilities reflects consumer demand for supportive living environments that closely parallel a “home-like” atmosphere. In addition, the growth in the sub-acute market may have begun to create a vacuum in the provision of traditional low-technology facility-based long-term care that assisted living beds are designed to fill. Assisted living costs can range from 30% up to 100% of skilled nursing care costs; a 2007 report by the MetLife Mature Market Institute found that estimates of the average cost of assisted living was approximately \$3,000 a month.<sup>5</sup> Moreover, research suggests that transferring certain Alzheimer’s patients from nursing homes to assisted living facilities could save up to 14% of long-term care costs.<sup>6</sup> These facilities may also achieve economies of scale in the delivery of home health care to frail elders that would be difficult to achieve if living alone in their own homes. Because elders overwhelmingly prefer to stay in their own homes or reside in congregate living situations compared to nursing homes, the assisted living modality is likely to continue to grow and expand.

Assisted living facilities have grown rapidly in the U.S. and are now an integral part of the long-term care provider landscape. Thus, it is not surprising that a growing number of individuals with long-term care insurance are accessing assisted living facility services. In fact, a recent study showed that 31% of privately insured individuals making claims on their long-term care insurance policy did so for assisted living care.<sup>7</sup> As the number of policyholders continues to increase, use of this service modality will also grow. It is therefore important to begin to learn how individuals use this service. To that end, we explore the profile of privately insured individuals using assisted living facilities.

## **Purpose**

The purpose of this research is to better understand functional and cognitive trends among assisted living facility residents. Specifically, we examine the following key research questions on a sample of long-term care (LTC) policyholders who are making claims on their policies. For these claimants we seek to know the following:

1. What are the functional, cognitive and medical profiles of assisted living residents and how has this changed over time?
2. What is the functional profile of a cohort of new entrants to assisted living and how does this profile change over a two-year period?
3. How do the functional and cognitive profiles of assisted living residents differ from service users in nursing home settings and in home health care settings?
4. What are the factors associated with using an assisted living facility compared to using home health care or nursing home care?
5. What is the mortality rate among assisted living facility residents and how does this compare to what is observed in nursing homes and home care settings (for privately insured claimants).

## **Method**

In order to answer these research questions we rely on secondary data analysis of two innovative and unique datasets: (1) 2000 National Claimant Database and (2) 2007 Admissions Cohort Database. Both of these datasets were developed with the participation of major long-term care insurance companies accounting for the bulk of claims activity in the United States.

### *2000 National Claimant Database (Resident Sample)*

Developed in 2000, this nationally representative database consists of 700 home and community-based care claimants and 480 residential care claimants (both assisted living and nursing home residents) with long-term care insurance policies (both tax-qualified and non-tax qualified). Detailed information about the service use of these individuals as well as the associated costs (charges) of care are available and this data is linked to detailed socio-demographic information including (but not limited to) age, gender, marital status, disability level and income and education status. The companies who contributed a sample of claimants to the study include: Aegon; American Travellers (Conseco); Bankers Life and Casualty; CNA Insurance; Fortis Long-Term Care; G.E. Capital Assurance; John Hancock; and UNUM. The total sample size is 108 assisted living residents. On average these individuals were interviewed roughly 13 months into their residency.

### *2007 Admissions Cohort Database (Admissions Sample)*

This longitudinal database, developed over a three-year period (2004-2007) consists of in-person and telephone interviews with roughly 1,400 long-term care insurance policyholders (who had both tax-qualified and non-tax qualified policies) at the time they began using paid services in both community and residential care settings. Over the study period we collected detailed information about baseline functional, cognitive and medical status as well as any changes over the two-year follow-up period. In addition, we obtained detailed socio-demographic information and

information regarding the long-term care decision-making process. The companies that contributed a sample of potential claimants to this study include: Aegon; Aetna; Bankers Life and Casualty; Conesco Senior Health Services; Genworth Financial; John Hancock; MedAmerica; Penn Treaty; Prudential; and UnumProvident. The total sample size is 345 new entrants to assisted living facilities.

We examine the functional and cognitive profiles of ALF residents in 2000 and compare them to the profile of privately insured ALF residents in 2007. We also use the 2007 Admissions Cohort Database to understand how a longitudinal cohort of ALF residents changes over the roughly two-year study period. This database also allows us to examine the mortality rate of ALF residents.

There are a number of analytic techniques that we employ. In addition to descriptive statistics, we conduct multivariate analyses to identify the factors associated with use of various service modalities. More specifically, we employ multinomial logistic regression to identify the independent effect of variables on the choice of service-setting – home care, nursing home care or assisted living.

## Findings

### **A. Characteristics of an Assisted Living Admissions Cohort and Resident Cohort**

Table 1 summarizes the socio-demographic profile of new entrants and current residents of assisted living facilities. As shown, the average age is roughly comparable at about 82 years old. The data suggest that compared with eight years ago, new entrants today are about a year older – 82 compared to 81. The age distribution also shows that a much higher percentage of current new entrants are over age 85. Females are far more likely to be in assisted living facilities than are males and this is not surprising given that the majority – more than 60% -- are also widowed.

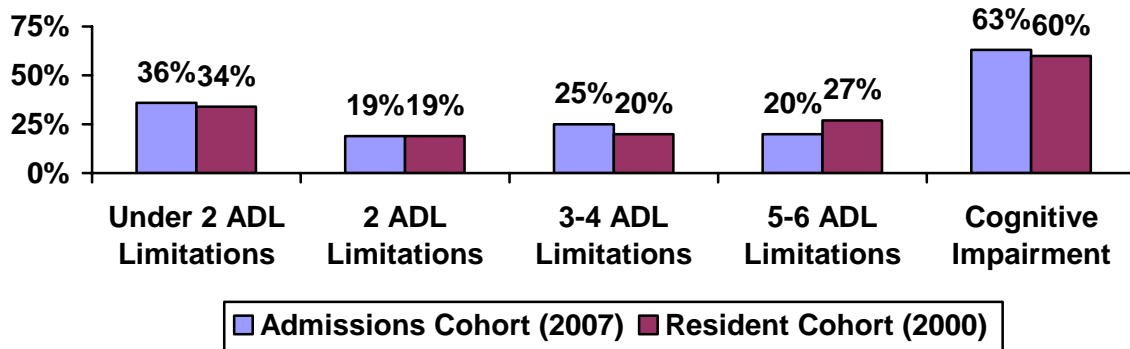
Table 1: Socio-Demographic Characteristics of New Entrants and Residents to Assisted Living Facilities

<b>Socio-Demographic Characteristics</b>	<b>Admissions Cohort (2007) n=345</b>	<b>Resident Cohort (2000) n=111</b>
Age		
Average Age	82	81
Below 65	1%	-
65-74	10%	11%
75-79	19%	23%
80-84	35%	41%
85 or above	35%*	25%
Gender		
Male	26%	27%
Female	74%	73%
Marital Status		
Married	24%	27%
Widowed	65%	60%
Single	5%	7%
Divorced-separated	6%	3%
Education Level		
Less than high school	6%	6%
Some high school	6%	7%
High School graduate	34%	31%
Technical/Trade/Vocational School	10%	5%
Some college	15%	21%
College graduate	22%	21%
Graduate degree	8%	10%

*Note: \*indicated results significant at the p=.05 level.*

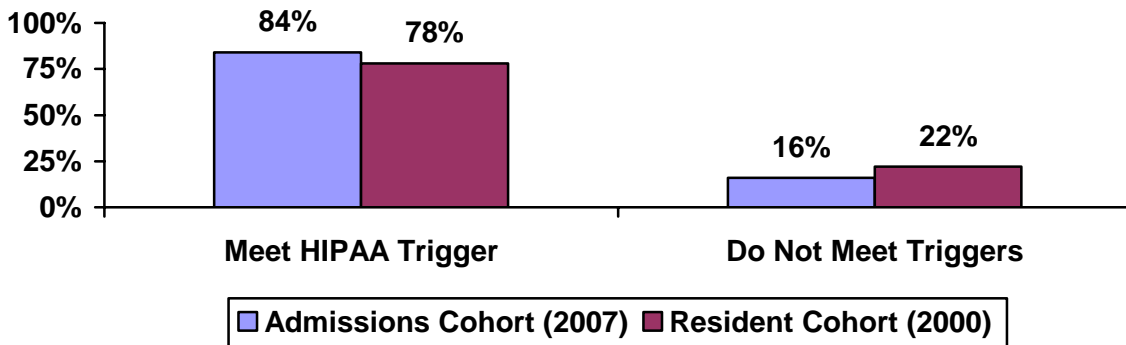
Figure 1 summarizes the functional profile of the assisted living admissions cohort and the resident sample. Functioning is measured in terms of an individual's ability to perform a certain number of activities of daily living (ADLs) independently. These ADLs include bathing, dressing, eating (not to include cooking), toileting (defined as getting to and from the bathroom), transferring (defined as getting in and out of bed or a chair) and continence (defined as getting to and from the bathroom on time). Again, the cohort represents individuals who have recently begun using the ALF (i.e. within a four month period) and as mentioned, the resident sample represents individuals who on average have been living in the facility for roughly 13 months.

**Figure 1: ADL and Cognitive Profile of ALF Admissions Cohort and Resident Sample**



What is particularly striking about Figure 1 is the relative similarity in profile between the admissions cohort and resident cohort. In fact, the average number of ADL limitations of both samples is 2.6. More than one-in-three have fewer than two ADL limitations and roughly three in five are cognitively impaired. A key question is the extent to which individuals entering ALFs, or residing in them meet the Health Insurance Portability and Accountability Act (HIPAA) eligibility triggers; that is, have at least two ADL limitations or have a cognitive impairment resulting in the need for ongoing supervision or assistance.

**Figure 2: HIPAA Status of ALF Admissions Cohort and Resident Sample**



Among **new entrants** to assisted living facilities, 16% do not meet HIPAA triggers and slightly more than 20% **of residents** do not meet triggers. This suggests that a meaningful proportion would not be eligible for benefits under tax qualified long-term care policies at the time they were observed and that many individual may be entering assisted living facilities for precautionary or safety concerns.

## **B. Changes in the Functional Status of an Admissions Cohort**

The 2007 admissions cohort enables us to track the functional status of new ALF entrants over time. As part of that study, individuals were assessed at four-month intervals over a 28 month period. The focus was on activities of daily living as well as on instrumental activities of daily living (IADLs). The IADLs typically include housework, laundry, meal preparation, shopping for groceries, managing money, using the telephone, transportation and medication management. The table on the next page shows the change in functional status of new ALF entrants over the study period. A number of trends are noteworthy. First, on average the number of ADL limitations increases over the first year and then stays relatively constant at about 3.2 limitations. Second, and closely related, the proportion of individuals with 5-6 limitations increases significantly over the period, which suggests that ALFs serve an increasingly disabled population. The same pattern holds true for Instrumental Activities of Daily Living (IADLs).

The mortality rate is fairly high as well, and this is not surprising given the advanced age and disability status of residents. After one year, roughly 19% of assisted living entrants had died and by two years, this figure has increased to a cumulative death rate of 32%.

While Table 2 shows the functional profile and mortality rate of ALF residents at each wave (regardless of how they were classified at a previous wave), Table 3 examines the same for the group of baseline ALF residents and follows that group through the two-year period. As shown, for the 36% of the sample (n=345) who were receiving care in an ALF at baseline, the trend is to remain at or above the same disability level over time. For example, of the residents who had 2 ADL limitations at baseline, 26% still had 2 ADL limitations at 12 months and 32% had 3 or more at 12 months. We see that mortality seems to be lowest for the 2 ADL group over time, although this may be explained by the fact that those with less than 2 ADL limitations may be experiencing acute episodes (such as Cancer that have a shorter survival time), whereas those with 2 limitations have chronic issues and then the most disabled have the highest mortality rate, as expected. For clarity's sake, we also included the percent of participants who were not included in the ongoing calculations (because they refused to answer the question, refused to participate altogether or we were unable to locate them).



Table 2: Change in Functional Status over 28 Month Period of an Admissions Cohort of ALF Residents

<b>Health Characteristics</b>	<b>2007 baseline</b>	<b>4 months</b>	<b>8 months</b>	<b>12 months</b>	<b>16 months</b>	<b>20 months</b>	<b>24 months</b>	<b>28 months</b>
ADL Limitations	n=345	n=279	N=213	n=186	n=142	n=96	n=62	n=45
Under 2 ADL limitations	36%	29%	27%	20%	27%	26%	28%	32%
2 ADL limitations	19%	18%	13%	17%	14%	16%	12%	13%
3-4 ADL limitations	25%	25%	30%	24%	25%	17%	18%	15%
5-6 ADL limitations	20%	28%	30%	39%	34%	41%	42%	40%
Average ADL Limitations	2.6	2.9	3.0	3.3	3.1	3.3	3.3	3.2
IADL Limitations	n=268	n=129	n=95	n=67	n=40	n=17	n=16	n=13
Under 5 IADL limitations	7%	10%	1%	3%	1%	2%	-	10%
5-6 IADL limitations	20%	14%	6%	3%	13%	5%	23%	18%
7-8 IADL limitations	73%	76%	93%	94%	86%	93%	77%	72%
Average IADL Limitations	6.8	7.0	7.7	7.6	7.4	7.6	7.4	6.9
<hr/>								
Percent of Baseline Surviving				81%			68%	

Table 3: Change in Functional Status of Baseline Assisted Living Facility Residents at 12 and 24 months

	12 months				
	<2 ADL Limitations	2 ADL limitations	3 or more limitations	Death	Non-responders
<2 ADL Limitations	34%	6%	21%	17%	22%
2 ADL Limitations	12%	26%	32%	6%	24%
3 or more ADL Limitations	4%	2%	54%	20%	21%

	24 months				
	<2 ADL Limitations	2 ADL limitations	3 or more limitations	Death	Non-responders
<2 ADL Limitations	14%	6%	10%	28%	42%
2 ADL Limitations	9%	11%	17%	12%	51%
3 or more ADL Limitations	1%	1%	20%	37%	40%

**C. Factors Associated with Entering an Assisted Living Facility rather than a Nursing Home or Home Care Setting.**

The individuals comprising the admissions cohort held policies that enable them to access care in a variety of settings including home care and nursing home care. Table 4 highlights the socio-demographic characteristics of the admissions cohort by service setting. Each service setting is labeled with a different letter. For example, individuals receiving paid home care are in column (A), whereas those in assisted living facilities are marked with a C. These letters are assigned so that we can analyze the extent to which there are statistical differences between findings across service settings. If a finding has the letters (BC) by it, this suggests that the prevalence rate is statistically greater than the rate in columns B and C. If a finding has a letter (A) by it, this means that the prevalence rate is statistically greater than the rate in column A. We report differences that are significant at the .05 level.<sup>1</sup>

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<sup>1</sup> Note that the descriptive information in this section is drawn from a report that was completed for the Department of Health and Human Services entitled: Service Use and Transitions: Decisions, Choices and Care Management among an Admissions Cohort of Privately Insured Disabled Elders, submitted May 2006.

Table 4: Socio Demographic Characteristics of Admission Cohort by Service Setting (Baseline Status)

<b>Socio-Demographic Characteristics</b>	<b>Receiving paid care at home (A)</b>	<b>Nursing home (B)</b>	<b>Assisted living (C)</b>
Age			
Average Age	77	80A	82AB
Below 65	8%BC	2%	1%
65-74	21%C	15%	10%
75-79	27%C	28%	19%
80-84	27%	28%	35%
85 or above	18%	27%	35%A
Gender			
Male	32%	41%C	26%
Female	68%	59%	74%B
Marital Status			
Married	49%BC	36%C	24%
Widowed	40%	54%A	65%A
Single	2%	4%	5%
Separated/Divorced	8%	7%	6%
Spouse's Employment Status			
Yes-full time	4%	1%	1%
Yes-part time	7%	8%	3%
No	89%	91%	97%
Living Arrangement			
Alone	41%	-	-
Spouse or Spouse and Child	46%BC	1%	4%
Daughter/Son	9%BC	1%	1%
Education Level			
Less than high school	3%	6%	6%
Some high school	4%	3%	6%
High School graduate	19%	28%A	34%A
Technical/Trade/Vocational School	7%	12%	10%
Some college	22%	14%	15%
College graduate	26%	23%	22%
Graduate degree	20%C	13%	8%

Table 4: -- continued

<b>Socio-Demographic Characteristics</b>	<b>Receiving paid care at home (A)</b>	<b>Nursing home (B)</b>	<b>Assisted living (C)</b>
Presence of Children			
Yes	91%BC	83%	85%
No	9%	17%A	15%A
Any Children Living within 25 miles			
Yes	68%	73%	82%A
No	32%C	27%	18%
Income			
Less than \$50,000	63%	82%A	86%A
\$50,000 or more	37%BC	19%	14%
Income			
Less than \$25,000	34%	41%	50%A
\$25,000-\$34,999	17%	19%	22%
\$35,000-\$49,999	14%	22%	14%
\$50,000-\$74,999	20%BC	9%	9%
\$75,000-\$99,999	8%C	4%	2%
\$100,000-\$149,999	4%	4%	1%
\$150,000 or above	2%	1%	2%
Homeownership			
Yes	88%BC	71%	62%
No	12%	30%A	38%A
Home Modification within the last year			
Yes	38%		
No	62%		
Housing Assets			
Less than \$50,000	2%	10%	5%
\$50,000 - \$99,999	18%	25%	26%
\$100,000 - \$199,999	33%	46%	45%A
\$200,000 - \$299,999	14%B	4%	14%B
\$300,000 - \$399,999	8%	8%	5%
\$400,000 - \$499,999	11%C	5%	1%
\$500,000 - \$799,999	7%	2%	3%
\$800,000 and above	8%	-	-

*Age, Gender and Marital Status*

With respect to age, the results show that individuals newly admitted to assisted living facilities are older than individuals entering all other settings. Over one-third of new entrants to assisted living facilities are over age 85. This service modality typically serves a less disabled population than what is found in nursing homes. Thus, it may be the case that many of these new entrants are making a life-changing move when they are physically able to do so and are preparing for the time when they gradually become more disabled and may require more care. Also, many ALFs now have specialized Dementia Care Units, so that individuals who may be showing early stages of cognitive decline prefer to age in place at an ALF rather than having to move to a nursing home at

later stages of dementia. New entrants to nursing homes tend to be older than individuals in home care.

In terms of gender, one statistics stands out: overwhelmingly the insureds entering the formal service system are female, even in the home care setting. Males are less likely to make claims on their policies; while a higher percentage of females have policies –roughly 55% compared to 45% -- most of the difference in service use cannot be explained by policy ownership. Differential mortality and morbidity rates, as well as the availability of family supports likely account for these patterns of formal service use. Compared to other service settings, the admissions cohort entering the nursing home tends to have the highest percentage of males. On the other hand, women represent the highest percentage of new entrants to assisted living facilities. These facilities provide a highly social, as well as protected, environment to individuals capable of independent living.

Regarding marital status, people living at home are more likely to be married than are individuals entering institutional settings. This is not surprising, given that married individuals are able to provide care to each other and the formal service system typically supplements a level of care already being provided by family members. Those newly admitted to assisted living facilities are least likely to be married and in fact, less likely to be married than those in nursing homes. Two-thirds of them report being widowed. This further supports the notion that many individuals entering assisted living facilities are doing so to meet both social and “protection” needs; given their advanced age, they may be frail, but as shown, they tend to be the least disabled of the claimant population.

Those who have living children are more likely to enter the service system through the home care setting. Somewhat surprisingly, however, among those who have children **living within 25 miles**, the highest percentage is entering assisted living facilities. This may suggest that when children are able to see their parents often, rather than just speak to their parents, they are more likely to encourage them to consider assisted living. This service modality provides an attractive way for frail independent elders to age in place and access services from the facility, as they need them. Concerns about safety, falls, and social isolation are addressed in assisted living facilities, and nursing homes are still viewed as serving a population that is already highly dependent.

### *Education and Wealth Status*

In general, individuals who purchase long-term care insurance tend to have higher levels of education and are wealthier than elders in the general population. Individuals receiving care at home tend to be higher educated than those receiving care in alternative settings. In fact, 46% of home care recipients have at least a college degree compared to 36% of those entering nursing homes and 30% of those entering assisted living facilities. Higher income, homeownership, and greater home values are all positively associated with individuals receiving paid care at home. Whereas half of individuals newly entering assisted living have incomes less than \$25,000, for those in home care, the figure is closer to one-third. (Given the relatively high cost associated with assisted living facilities, it is surprising that such a high percentage has incomes less than \$25,000; on the other hand, it is likely that insurance is financing the bulk of the costs of care for these individuals.)

The findings regarding income status are particularly interesting. Among people purchasing policies in the early to late 1990s – the individuals who would likely comprise the bulk of claimants in this sample – roughly 60% had incomes less than \$35,000. This is roughly comparable to the income distribution of claimants in this sample. In non-insured environments, the evidence suggests that individuals with lower incomes are more likely to need to access the formal service system. Here it would appear that the presence of insurance mitigates the impact of income on service use and there is an equal likelihood of service use among high and low-income insureds.

### *Functional and Cognitive Characteristics*

As part of the baseline interview, the trained nurses assessed the functional and cognitive status of the claimants. The ADL's included bathing, dressing, toileting, transferring, eating and continence. The IADL's included housework, laundry, meal preparation, shopping for groceries, managing money, using the telephone, transportation and medication management.<sup>2</sup> Cognitive impairment was measured by administering the Short Portable Mental Status Questionnaire (SPMSQ) – a standard test designed to detect dementia.<sup>3</sup> Table 5 highlights the functional and cognitive profile by service setting. Figure 5 summarizes key aggregate findings in graphic form.

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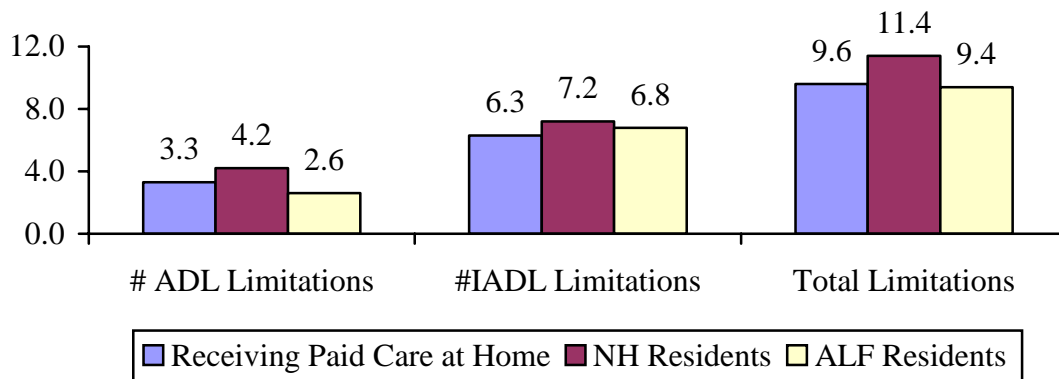
<sup>2</sup> It is often the case that facility policy requires medication be given to all residents, regardless of their level of dependence with medication management. Those who indicated that this was the case were removed from the sample (33% of people in NH and 24% of people in ALF). Therefore, medication management is truly those who require assistance with it.

<sup>3</sup> If it was determined that a person was cognitively impaired (by failing the SPMSQ or a diagnosis of Dementia or Alzheimer's) the interviewer terminated the interview with the insured and continued with their designated proxy.

Table 5: Functional and Cognitive Characteristics of Admissions Cohort by Service Setting

<b>Health Characteristics</b>	<b>Receiving Paid Care at Home (A)</b>	<b>Nursing Home (B)</b>	<b>Assisted Living (C)</b>
ADL Limitations			
Under 2 ADL limitations	18%	12%	36%AB
2 ADL limitations	18%	11%	19%
3-4 ADL limitations	34%BC	20%	25%
5-6 ADL limitations	30%C	57%AC	20%
<b>Average ADL Limitations</b>	<b>3.3C</b>	<b>4.2AC</b>	<b>2.6</b>
IADL Limitations			
Under 5 IADL limitations	8%	7%	7%
5-6 IADL limitations	43%BC	8%	20%B
7-8 IADL limitations	49%	85%AC	73%A
<b>Average IADL Limitations</b>	<b>6.3</b>	<b>7.2A</b>	<b>6.8A</b>
Mobility-inside Limitation			
Yes	52%	78%AC	45%
No	49%B	22%	55%B
Mobility-outside Limitation			
Yes	87%	96%AC	82%
No	14%B	4%	18%B
Cognitive Impairment			
<b>Yes</b>	<b>28%</b>	<b>64%A</b>	<b>63%A</b>
No	72%BC	36%	37%
Use of Assistive Technology			
Yes	86%C	88%C	77%
No	14%	12%	23%AB

**Figure 3: Average Number of Functional Limitations by Service Setting: ADLs and IADLs**



### *Functional Limitations*

As expected, those receiving paid care in a nursing home are the most disabled in their activities of daily living (ADLs), with an average of 4.2 limitations. It is important to note that participants were asked if they were able to perform an activity independently, with partial assistance or with total assistance. Those who reported that they were anything other than independent are considered to have a limitation in an ADL. Those living at home and currently receiving paid services have more ADL limitations than both those in ALF’s and those not yet receiving paid care. It is also interesting to note that those living in ALF’s are most likely to have fewer than two ADL limitations.

In terms of IADL limitations, those in assisted living and in nursing homes have significantly more limitations than those living at home. Moreover, of those who are living at home, the ones who are currently receiving paid care have more IADL limitations than do those who have not yet commenced service use. In terms of total limitations, the most physically disabled are those in nursing homes, followed by those receiving paid care at home, then by assisted living facility residents. Taken together, these findings suggest that individuals entering assisted living facilities are doing so in large part to compensate for deficiencies in IADLs – which are also related to dementia status -- whereas those receiving care at home, receive services to compensate for physical disabilities.

### *Cognitive Limitations*

A high proportion of those living in nursing homes and assisted living facilities are cognitively impaired – close to two-thirds in each setting. While it is not surprising that this number is higher than it is for those living in the community, it is somewhat surprising that the proportion is so high for the ALF. This undoubtedly reflects the fact that most people prefer to be in a home like setting and in response, ALF’s are providing more services – including dementia care. It supports the trend in caregiving away from the more “*medical*” nursing home toward the more “*home-like*” assisted living facility. Also, the fact that the rate of cognitive impairment is relatively low among home care claimants suggests that family caregivers are much more adept at dealing with physical



limitations than they are with dementia-related limitations. The latter often requires more intensive and ongoing monitoring than the former, which is often confined to providing assistance with a discrete number of tasks during the course of a day.

### *Multivariate Modeling of Service Choice*

An important issue is the extent to which one can discern the independent effect of certain socio-demographic, function and medical characteristics on the probability of making a particular service choice. That is, holding other variables constant, we would like to know the magnitude of the independent impact of a specific characteristic on the relative risk of using an assisted living facility. To address this, we use Multinomial Logistic Regression. Much like logistic regression, which is used to predict the probability of a certain event or outcome when there are only two possibilities (such as using paid care or not using paid care), multinomial logistic regression (also called multinomial logit) is used to predict the probability of a certain event or outcome in situations where there are more than two possibilities (such as is the case here, where someone can choose home care, nursing home care or assisted living care).<sup>4</sup>

Table 6 displays the results of the analysis. The analysis was run with the assisted living variable as the removed dependent variable. Thus, the original results highlighted the impact of having a characteristic on the probability of choosing home care or nursing home care compared to assisted living. We have taken the inverse of the coefficients so that they can now be interpreted to show the impact of choosing assisted living compared to each of the service modalities. For example, when focusing on the choice between assisted living and home health care, the coefficient on the variable “Number of ADL limitations,” which is shown in the **EXP(B)** column is .819. This can be interpreted to mean that for each additional ADL limitation, the relative risk of choosing assisted living over home care declines by .819. The same relationship holds for nursing home care: as people become more disabled, they are less likely to choose assisted living, and the relative risk per additional ADL limitation declines by .58. The pseudo  $R^2$  for the model (which measures how well the model fits the data) is 41 percent.

The variables that are statistically significant are shown in bold and starred (\*\*\*) . The relative risk coefficient for a particular characteristic – which is displayed in the **EXP(B)** column – can be interpreted as follows: If the coefficient is less than one, this suggest a decrease in the relative risk of assisted living use. If the coefficient is greater than one, this suggests an increase in the relative risk of using assisted living.

With respect to the choice between assisted living and home care, people who are married, have increasing ADL loss, use a care manager, have incomes in excess of \$50,000, and own a home have a lower relative risk of choosing assisted living. In contrast, individuals who are cognitively impaired, want to feel safe where they are, and have available someone to help them if they need it, are more likely to choose assisted living. Moreover, increasing age and having visited other service settings before making a decision are also associated with choosing assisted living.

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<sup>4</sup> For a more detailed explanation of multinomial logit, see “Econometric Analysis of Cross Section and Panel Data.” Jeffrey M. Wooldridge. MIT Press, 2002.

When the choice is between assisted living and nursing home care, increasing ADLs and having fractures reduces the relative risk of choosing assisted living care. In contrast, increasing age, being female and having visited other service settings before making a decision increase the relative risk of using assisted living care compared to nursing home care.

Table 6: Multinomial Logistic Regression on Service Choice: Assisted Living versus Home Care and Nursing Home Care

	EXP(B)	B	Std. Err.	Wald	Sig.
<b>Choice: Assisted Living versus Home Health Care</b>					
Number of ADL limitations	<b>0.819***</b>	-0.200	0.058	11.839	0.001
Insured's age	<b>1.083***</b>	0.080	0.015	29.026	0.000
Insured is female	1.062	0.060	0.236	0.065	0.799
Insured is married	<b>0.609***</b>	-0.496	0.240	4.279	0.039
Cognitive impairment	<b>3.987***</b>	1.383	0.218	40.212	0.000
Maintaining personal privacy	1.294	0.258	0.657	0.154	0.694
Feeling safe where I am	<b>4.121***</b>	1.416	0.552	6.570	0.010
Having someone available to assist me when needed	<b>5.366***</b>	1.680	0.539	9.700	0.002
Having control over my own schedule/daily routines	1.383	0.324	0.654	0.246	0.620
Insured is a home owner	<b>0.572***</b>	-0.558	0.231	5.851	0.016
Income is \$50,000 or more	<b>0.441***</b>	-0.819	0.261	9.877	0.002
Used a care manager	<b>0.281***</b>	-1.270	0.291	18.972	0.000
Fractures/other bone problems	0.705	-0.349	0.277	1.585	0.208
Visited other service settings before deciding where to go	<b>3.043***</b>	1.113	0.215	26.701	0.000
Constant		-4.240	2.099	4.080	0.043
<b>Choice: Assisted Living versus Nursing Home Care</b>					
Number of ADL limitations	<b>0.576***</b>	-0.551	0.074	55.325	0.000
Insured's age	<b>1.057***</b>	0.055	0.017	10.352	0.001
Insured is female	<b>2.328***</b>	0.845	0.262	10.417	0.001
Insured is married	1.504	0.408	0.288	2.009	0.156
Cognitive impairment	0.935	-0.067	0.261	0.066	0.797
Maintaining personal privacy	0.196	-1.629	1.246	1.710	0.191
Feeling safe where I am	0.404	-0.906	1.128	0.645	0.422
Having someone available to assist me when needed	0.501	-0.691	1.120	0.380	0.537
Having control over my own schedule/daily routines	0.552	-0.595	1.301	0.209	0.647
Insured is a home owner	1.035	0.034	0.253	0.018	0.892
Income is \$50,000 or more	0.628	-0.465	0.330	1.981	0.159
Used a care manager	1.188	0.172	0.433	0.157	0.692
Fractures/other bone problems	<b>0.381***</b>	-0.964	0.292	10.922	0.001
Visited other service settings before deciding where to go	<b>1.533*</b>	0.427	0.237	3.235	0.072
Constant	0.008	-4.780	3.769	1.608	0.205

Number of obs=781

Pseudo R2=0.41

\*\*\* Significant at the 95% level.

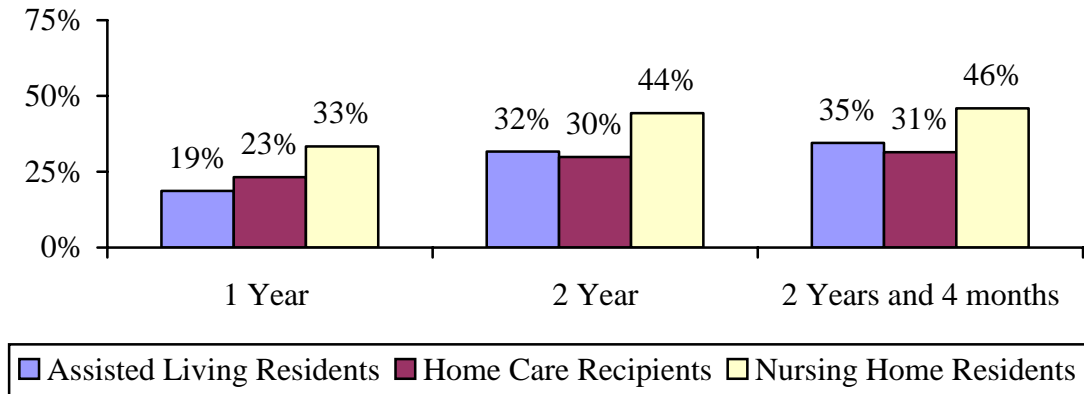
\* Significant at the 90% level

#### D. Mortality Among new Entrants to Assisted Living Facilities

In previous analyses we have shown that individuals entering assisted living facilities tend to be less disabled than their counterparts in home care, but are also older and tend to be somewhat more frail and concerned about their own safety. In order to estimate mortality rates among residents, we combined information gleaned from our series of four-month follow-up phone calls and also linked information to the Social Security Master Death File. The latter contains information on all individuals who have died in the United States along with their specific date of death. This way, if we were not able to reach an individual, or a family member refused to continue to participate in the telephone follow-ups, we could still determine whether the individual interviewed at baseline was alive or deceased.

Figure 4 shows the mortality rates by service modality of 1,158 policyholders just entering the long-term care service system.

**Figure 4: Mortality Rates by Service Modality**



As shown, mortality rates are highest in the nursing home and lowest in home care, even though assisted living residents have the fewest ADL limitations. After a single year in assisted living, roughly one-in-five residents die. At the end of two years, the number approaches one-in-three. Regarding nursing homes, nearly half of all residents die within two-and-a-half years of admissions.

Because we are interested in understanding the factors associated with mortality, we employ a logistic regression model which has a dichotomous dependent variable that can have a value 1 with a probability of death ( $\theta$ ), or the value 0 with probability of continued survival ( $1-\theta$ ). The independent or predictor variables in logistic regression can take any form. The relationship between the independent (predictor) variables and the dependent variable is not a linear function but a logistic function of ( $\theta$ ) which is given as:

$$\theta = \frac{e^{(\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_i x_i)}}{1 + e^{(\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_i x_i)}}$$

Where  $\alpha$  = the constant of the equation and,  $\beta$  = the coefficient of the predictor variables.

Our baseline data provides rich information for us to investigate the factors related to the individual's death over the study period. We focus on varying levels of disability, medical conditions, and specific socio-demographic characteristics as well as service modality. Table 7 summarizes the results. Presented in the table is the Odds Ratio for each variable tested. The Odds ratio is a measure of the relative impact of a variable on the probability of the event (in this case, death) occurring. Thus, for example, holding all other variables constant, an individual with three or more ADL limitations is 1.92 times more likely to die over the study period than is an individual with fewer than three ADL limitations. Aside from the relatively high number of significant independent variables, the model itself fits the data well as evidenced by a relatively high Hosmer Lemeshow test statistic of .113.<sup>5</sup>

Many of the variables tested in the equation were shown to have an effect on mortality. Not surprisingly, individuals with more ADL limitations (3+) have a higher probability of dying during the study period. Also, compared to individuals accessing the service system who are younger than age 75, individuals 85 and older were much more likely to die. An 85 year old is 1.93 times more likely to die during the study period than is someone younger than age 75.

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<sup>5</sup> The Hosmer-Lemeshow statistic evaluates the goodness-of-fit by creating 10 ordered groups of subjects and then compares the number actually in each group (observed) to the number predicted by the logistic regression model (predicted). Thus, the test statistic is a chi-square statistic with a desirable outcome of non-significance, indicating that the model prediction does not significantly differ from the observed. The 10 ordered groups are created based on their estimated probability; those with estimated probability below 0.1 form one group, and so on, up to those with probability 0.9 to 1.0. Each of these categories is further divided into two groups based on the actual observed outcome variable (death and survival). The expected frequencies for each of the cells are obtained from the model. If the model is robust, then most of the subjects who die are classified in the higher deciles of risk and those who survive are classified in the lower deciles of risk.

Table 7: Logistic Regression Results for Predicting Mortality

	<b>B</b>	<b>S.E.</b>	<b>Sig</b>	<b>Exp(B)</b>
Having 3+ ADL Limitations	0.652	0.157	0.000	<b>1.919***</b>
Being age 75 to 84	0.258	0.196	0.188	1.295
Being age 85+	0.659	0.223	0.003	<b>1.933***</b>
Have Arthritis	-0.431	0.190	0.023	<b>0.650***</b>
Have a Cardiac condition	0.358	0.149	0.016	<b>1.431***</b>
Have a Respiratory condition	0.796	0.237	0.001	<b>2.216***</b>
Have Cancer	1.148	0.201	0.000	<b>3.153***</b>
Is Cognitively Impaired	0.381	0.159	0.017	<b>1.464***</b>
Female	0.509	0.161	0.002	<b>1.664***</b>
Married (yes)	0.187	0.164	0.255	1.205
Is a home care recipient at Baseline	-0.035	0.177	0.842	0.965
Is a nursing home resident at Baseline	0.119	0.209	0.570	1.126
Constant	-2.055	0.254	0.000	0.128

\*\*\* Significant at the 95% level.

The particular medical condition that individuals had also affected whether or not they died during the study period. For example, people with arthritis are only .6 times as likely to die as individuals without these conditions. On the other hand, those with cardiac or respiratory problems had a higher chance of death during the period. Individuals with cancer are three times more likely to die than are those without this condition. Having a cognitive impairment is also associated with somewhat higher mortality. Finally, being female is associated with somewhat higher mortality, holding all other variables constant.

In this equation, we are controlling for medical condition, physical and cognitive disability status, age, gender, marital status, and prognosis. Thus, the “care setting” variable to some extent captures the impact of living condition and service on mortality rates. In the table, the variable left out of the equation is Assisted Living Resident at Baseline. Therefore, we are focusing on the impact of initially choosing home care or nursing home care on the probability of death, when compared to someone who chose assisted living care. The findings show that when controlling for all of these variables, a person’s choice of service setting at baseline has no significant impact on the probability of dying over the study period.

## **Conclusions**

Data presented here suggest that many people enter assisted living facilities to “age safely in place”. That is, they may need a minimal amount of service at the time that they enter the facility, but recognize that they may need care at some future date. The longitudinal analysis also bears this out and shows that over the course of a little over two years, the profile of residents’ changes as more individuals experience limitations in activities of daily living. Even so, in general, the disability and health profile of new residents is superior to individuals in home care settings as well as those in nursing homes.

The profile of residents in assisted living differs from what is found in other service settings in other ways including age, gender, marital status, living arrangement and others. Thus, residents do represent a fairly differentiated group of long-term care service users. There are many variables associated with the choice of assisted living as a service modality compared to others. Some of the variables are related to the characteristics of the service modality itself (having visited other types of service settings) whereas others are intrinsic to the individual (i.e. desire to feel safe, disability status, etc.). Finally, mortality rates across all service settings are high. When controlling for all other variables, choosing an assisted living facility at the outset - compared to choosing a nursing home or home care – does not seem to have an impact on mortality, while other likely factors such as disability, age and medical condition, do.

## **Endnotes**

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<sup>1</sup> Hawes, C., C.D. Phillips and M. Rose. High Service or High Privacy Assisted Living Facilities. Their Residents and Staff: results from a National Survey, November 2000.

<sup>2</sup> National Academy for State Health Policy, State Assisted Living Policy, 2002, November 2002.

<sup>3</sup> National Center for Assisted Living,, Facts and Trends: The Assisted Living Sourcebook, 2001.

<sup>4</sup> Hawes, Philips and Rose, 2000.

<sup>5</sup> MetLife Mature Market Institute. Market Survey of Nursing Home and Assisted Living Costs, September 2007.

<sup>6</sup> Leon, J. and Moyer, D. (1999). Potential Cost Savings in Residential Care for Alzheimer’s Disease Patients. The Gerontologist, Volume 39, No. 4.

<sup>7</sup> Cohen, M., Miller, J. and Shi, X. (2006) “Service Use and Transitions: Decisions, Choices and Care Management among an Admissions Cohort of Privately Insured Disabled Elders.” Department of Health and Human Services, Office of Disability, Aging and Long-Term Care Policy. December.