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Abstract

Nationally representative estimates of the prospective risk of entry into a nursing home and the likelihood of residing in a nursing home are obtained using data from the Longitudinal Study of Aging: 1984-1990. The roles of demographic characteristics, kin availability, and health status in determining entry into and residence in nursing homes is examined. Caregivers facilitate community residence and reduce the risk of nursing home entry for those with functional limitations. Dementia in combination with functional limitations increases the risk of nursing home entry.

1. Introduction

The literature describing the caseload of nursing homes as well as the literature describing characteristics associated with the risk of entry to those facilities contain conflicting accounts of related factors. Although there is some uniformity across these studies, a problem exists in reconciling the conflicting estimates since the majority are based on samples which are not nationally representative. Here, a nationally representative data set, the Longitudinal Study of Aging: 1984-1990 (LSOA), is used to examine the relationship of demographic, kin, and health characteristics to residential choices of Americans aged 70 and older. Estimates are provided of the likelihood of residing in a nursing home as well as of the prospective risk of entry into a nursing home for those residing elsewhere. To our knowledge, these data have not been used before in this context.

The underlying interest of studies of the risk of institutionalization as well as those of residential choice is to understand what factors are associated with residing in nursing homes. At approximately $25,000 per year in 1990 dollars, nursing home care is expensive and constitutes the largest out of pocket expense for health care among the elderly (Cohen, Tell, and Wallack 1986; Kemper and Murtagh 1991; and Kemper, Spillman, and Murtagh 1991). Nursing home expenditures also constitute more than half of all Medicaid outlays (Harrington and Swain 1984). Among individuals who turned 65 in 1990, it is estimated that their total lifetime expenditures on nursing home care will amount to $60 billion (Kemper, Spillman, and Murtagh 1991). Because the cost for an individual and their family is large and the social costs are enormous and growing, research has focused on understanding the factors which are associated with either entering or residing in nursing homes and skilled care facilities.

Clearly, the goal of this research is to find factors which are related to residence or entry into a nursing home and manipulable at low cost to achieve lower rates of entry or reduced spells of residence. The most obvious substitute for nursing home residential care would be home based or community care systems. Although the statement is often made that such systems, including the availability of paid help in the home, would provide a less costly alternative to traditional nursing homes, research does not support this conclusion. A recent survey of 27 experimental community based programs concluded that the provision of these services typically raised overall health care costs by 10 to 20 percent (Weissert and Cready 1989). Although some argue that these cost increases might be overcome by better management, this has yet to be demonstrated in practice (Weissert and Cready 1989; and Greene, Lovely, Miller, and Ondrich 1995).

The other alternative to community care is the help of kin. In the context of the evidence on community care experiments, it seems fair to conclude that if significant savings or moderations in nursing home care costs are to be achieved through alternative care delivery, they are most likely to materialize if kin take on a larger role in caretaking of the elderly. It is not clear, however, that demographic trends will lead to additional kin involvement. Increased rates of divorce as well as reduced rates of childbearing may lead to less future involvement of children in care of their parents rather than more.

Beyond issues of cost and the availability of kin caregivers, health is often argued to play an important role in nursing home use. While many researchers find that limitations in the ability to perform activities of daily living (ADL) and diagnoses of acute and chronic conditions play an important role in institutionalization, descriptive evidence generated by other researchers indicates that older patients residing in the community are as ill as those in institutions, if not more so (Doty

1986). Although those with functional limitations may indeed be at greater risk of entering a nursing home, the majority of those with a limitation do not reside in a nursing home.

Conflicting accounts of the factors associated with both residence in a nursing home and risk of entry are common. One factor which no doubt contributes to these conflicting accounts is the broad variety of data used in the various studies in these literatures. The research undertaken here concerning the factors associated with nursing home residence as well as the prospective risk of entry into a nursing home is meant to provide additional estimates based on national data in order to better understand the roles of demographic characteristics, kin availability, and health status in determining entry into and residence in nursing homes.

The remainder of the paper proceeds as follows. First, the relevant literature will be discussed. Second, the data will be described. Third, the techniques used will be outlined followed by a presentation of the estimation results. Finally, a contrast will be drawn between our estimates and the prior literature.

2. Background

Much of the literature describing the living arrangements of older Americans has been prompted by the current costs and estimated future costs of formal care. While private sources account for the majority of dollars spent on nursing home care, Medicaid expenditures on nursing home care accounted for about three quarters of total outlays in 1980 (Harrington and Swain 1980). Thus, the concern about the financial burden imposed by formal care has both a private and a public dimension.

Evidence of the governmental concern regarding costs of formal care is found beyond the Medicaid program. Medicare offers prospective payments to nursing homes for postoperative

convalescence if they qualify as a skilled nursing facility (Morrisey, Sloan, and Valvona 1988; Liu, Coughlin, and McBride 1991). Prospective payment was adopted as a reform measure to provide care institutions with an incentive to shorten stays. While this consideration is not that different than the same issue faced by a private household, the policy encourages short-term nursing home stays associated with convalescence following treatment for acute medical conditions. In addition to its intended impact on the length of formal care during convalescence, the policy has an impact upon the caseload mix at a typical nursing home, and thus is likely to affect the types of observable factors associated with nursing home entry and residence.

These cost pressures on both private and public financial resources provide individuals with an incentive to stay in formal care arrangements as little as possible. By and large, descriptive accounts are consistent with this perspective. 57 percent of all individuals will never reside in a nursing home at any point in their life (Kemper, Spillman, and Murtagh 1991; Murtagh, Kemper, and Spillman 1990). Of those who are aged 65 and older, the expected nursing home usage in a two year period is 16 days (Liu, Coughlin, and McBride 1991). Of those who ever use a nursing home, over half have a total usage of less than a year. 17 percent have a usage of more than five years (Kemper and Murtagh 1990). It is reported that this 17 percent of nursing home entrants generate 64 percent of the costs (Kemper, Spillman, and Murtagh 1991).

Because of the difference in the types of people who generate most of the nursing home costs as opposed to the average user, a tension exists between descriptions of all potential nursing home entrants as opposed to long stayers who generate the majority of the costs. While it is often argued that the results from analyses that start with samples that are screened to contain only individuals who already have functional limitations are useful in understanding characteristics of long-term nursing home residents, it is not clear that these results can be generalized to the population as a

whole. It is also not clear that they are generalizable to the population of long-term residents if functional limitations are not the dominant cause of entry. This issue of noncomparability of results across surveys is apparent in both the literature on the risk of institutionalization and the cross-sectional caseloads of long-term care and nursing facilities. Each of these literatures will be discussed below with emphasis being placed on those studies which have employed national level data.

Risk of Institutionalization

The risk of institutionalization has been widely studied from both prospective and retrospective viewpoints. The prospective studies seek to find factors which are predictive of future entry into a nursing home while the retrospective studies typically seek to identify the lifetime risk of ever entering a nursing home. Regardless of the perspective of the study, the majority use samples which are not national in scope.

For some of the studies, particularly those which have used samples of particular communities, it is clear that their results should only be used as a rough gauge of what happens in the population as a whole because their relationship to it is unclear. This observation applies to the studies of Branch and Jette (1982), Jette, Branch, Sleeper, Feldman, and Sullivan (1992), Wingard, Jones, McPhillips, Kaplan, and Berrett-Connor (1990), Palmore (1976), Shapiro and Tate (1988), Vicente, Wiley, and Carrington (1979), and Cohen, Tell, and Wallack (1988). Briefly, Branch and Jette and Jette et al. used a panel of data from the state of Massachusetts; Wingard et al. use a sample from the general area of San Diego, California; Palmore draws data from North Carolina in the Duke First Longitudinal Study of Aging; Shapiro and Tate have data from Manitoba, Canada; Vicente et al use data from Alameda County, California; and Cohen et al. have information on residents of six different community care systems. While it is certainly reasonable to look across

disparate studies such as these and attempt to draw common patterns of factors that are associated with increased use of nursing homes, it is perhaps no surprise that the only factor uniformly reported to be associated in these studies with an increased risk of nursing home entry is functional limitations. Wingard, Jones, and Kaplan (1987) provides a detailed review of many of these papers and discusses other general patterns in their findings.

Other studies of the risk of institutionalization have made use of national level data. Cohen, Tell, and Wallack (1986) use data from the 1977 Current Medicare Survey and use payment records of doctor visits to measure stays in a nursing home. Due to high rates of Medicare coverage for those aged 65 and over and regular doctor visits to nursing homes, these estimates are likely to be reasonably accurate. They estimate that at age 65, the lifetime risk of nursing home entry is 43.1 percent. The risk of entry at age 65 is 0.049 for the next five years. The risk of entry, in their study, is found to increase with age and being a woman. The distribution of nursing home spells is skewed (Cohen, Tell, and Wallack 1986, p. 1161) such that "13 percent of the elderly account for 90 percent of all nursing home expenditures." Unfortunately, the data used do not have detailed information regarding demographic or risk related factors, and this prohibits investigations of the relationship of health limitations and kin availability to the risk of nursing home usage.

Similarly, Kemper and Murtagh (1991) contains estimates based on the 1986 National Mortality Followback Survey. In that survey, kin of deceased individuals or others who knew them are asked about their lifetime usage of nursing care. They report that women, whites, and the unmarried use nursing home care proportionately more than men, minorities, and the married. This data set does not contain information on individual health characteristics so the role of health was not considered.

Other studies have examined the risk of institutionalization using national level data which contain screens in the survey design which limit the sample to individuals who are already functionally impaired. Liu, Manton, and Liu (1990), Murtagh, Kemper, and Spillman (1990), and Headen (1993) use the National Long-Term Care Survey (NLTCS) which requires Medicare recipients to report difficulty with at least one ADL in order to be surveyed. The potential problem with conditioning the sample in this manner can quickly be seen when one notes that only 15 percent of those who qualify for Medicare pass the screen (Headen 1993, p. 86). The advantage of these data is that they contain detailed personal characteristics.

The researchers who have used the NLTCS provide conflicting accounts of the factors associated with nursing home entry. For example, Liu et al. (1990) report that ADL difficulties are significantly associated with the risk of nursing home entry while Headen does not. Murtagh et al. report that women have proportionately higher usage of nursing home care than men while Headen finds the opposite. Headen also reports that Medicaid eligibility is not significantly associated with the risk of entry. Headen includes a larger set of regressors than the other two studies so omitted variable bias or collinearity may account for some of the differences observed. There are, however, two common findings in the papers based on the NLTCS. First, advanced age is associated with increased risk of being in a nursing home. Second, being unmarried is always indicative of increased risk of usage.

Similarly, Greene and Ondrich (1990) use data from the National Long-Term Care Channeling Demonstration which employs a screen with respect to unmet needs for individuals with difficulty performing ADL. Greene and Ondrich investigate the association of predisposing characteristics, enabling attributes, and individual needs to the risk of nursing home entry. They report that being male, living alone, IADL difficulties, cognitive impairment, and IV drug use are

associated with a greater likelihood of exiting the community and entering a nursing home. Factors associated with a reduced risk included being a minority, owning a home, and home visits by a physician.

While advanced age and access to a spouse as a caregiver appear important in samples of persons with functional limitations in predicting nursing home usage, it is simply unclear if this finding generalizes to random samples of the population. This specific issue will be explored in the empirical section of the paper.

Cross-Sectional Estimates

In discussing the cross-sectional estimations of factors associated with community and nursing home residence, it is important to remember that these are descriptive of a stock while the hazard estimates identify those likely to make a transition from the stock. As in the hazard literature, some of the cross-sectional examinations of the attributes of nursing home residents relative to those residing elsewhere have also been based on nonnational samples (Brody, Poulshock, and Masciocchi 1978; Borsch-Supan, Hajivassilou, Kotlikoff, and Morris 1991). In these two studies, for example, conflicting accounts are also found of factors associated with nursing home residence. In particular, the role of functional limitations is unclear. Brody et al. (1978, p. 588) conclude that "differential levels of functioning ability did not predict placement of the chronically ill/disabled elderly in institutions or in the community." Borsch-Supan et al. conclude that functional limitations are the most important predictor of nursing home residence in their data from Massachusetts.

Other descriptive papers regarding the attributes of nursing home residents relative to others have been based on nationally representative data. Doty (1986) makes use of data from the 1979 Health Interview Survey and 1982 Long-Term Care Survey to examine characteristics of the aged who live in the community relative to those who live in nursing homes. Doty concludes that (p. 35)

"only one in five of these elderly with long-term care needs are cared for in nursing homes; the remaining four-fifths are able to go on living in the community primarily because family and friends provide all or most of the assistance they require."

Similarly, Weissert (1985) makes use of the 1977 National Nursing Home Survey along with the 1977, 1979, and 1980 NHIS, and the 1980 Census to examine characteristics associated with those living in long-term care facilities relative to the community. Weissert finds that by every standard of functional limitation examined, the majority of the individuals who are impaired reside outside nursing homes. With respect to individuals ages 65 and older, he notes that (p. 90) "11.8 percent lived in the community and were dependent in personal care, mobility, and household activities, or home-administered health care services; another 4.8 percent, most of whom suffered personal care dependency, were institutionalized." It might be noted that the summation of these two groups to 15.6 percent of those age 65 and over who are found to be functionally dependent is almost identical to the proportion (15 percent) reported by Headen (1993) to be functionally dependent among Medicare recipients.

Dolinsky and Rosenwaike (1988) use information from the 1980 Census to examine characteristics of those aged 75 and over who reside in institutions versus elsewhere. They report that the absence of a spouse, absence of a child, and advanced age are all associated with an increased risk of residing in a nursing home. The only measure of health used, a disability which prevents use of public transportation, is also associated with a greater risk of institutionalization.

While these cross-sectional studies differ somewhat in their conclusions about the importance of functional limitations in explaining nursing home residence, they do have some common findings. Where examined, advanced age is always associated with a greater likelihood of residing in a nursing

home. The number and types of caregivers available is also uniformly found to reduce the likelihood of residing in a nursing home.

3. Data

Data Sources and Structure

The data used in this study are drawn from the Longitudinal Study of Aging:1984-1990 (LSOA). The LSOA sample was drawn from the 1984 Supplement on Aging (SOA) which in turn is based on a subsample of the National Health Information Survey (NHIS). The NHIS is designed to produce information for the civilian noninstitutional population of the United States. The SOA randomly selected half of the people in the NHIS who were aged 55 or older. The LSOA was a longitudinal resurvey of the members of the SOA who were aged 70 or over. There were 7,541 age-eligible persons in the 1984 SOA who were reinterviewed in three follow-up surveys in the LSOA at two year intervals in 1986, 1988, and 1990. Due to budgetary restrictions, only 5,151 members of the sample could be interviewed in the 1986 survey year. Thus, in using this data set, the researcher must decide whether to only use the 5,151 observations available in each of the four interviews or whether to use the entire sample with the obvious sampling complications. This choice is typically driven by the type of estimations to be performed and the data requirements of the relevant procedures.

Two types of estimates are performed in the paper so two data sets were developed. The structure of the data sets is discussed first followed by a discussion of the variables which are included in each of the data sets.

In order to perform estimates of the prospective risk of entering a nursing home, the set of individuals at risk must be determined relative to those who experience the event. A reduction in

sample size, as occurred in 1986 in the LSOA, is not problematic. One simply adjusts the risk set appropriately to exclude those no longer in the sample.

Beginning in 1984, then, all individuals in the LSOA were included in the data set for the hazard estimations. None of them were in a nursing home so all were at risk of entry. However, at the 1986 interview, only a subset were reinterviewed. Those not interviewed in 1986 were removed from the sample because their risk status between 1984 and 1986 could not be determined. At the 1986 interview, the survey asks if the person had ever entered a nursing home since the last survey. If they had, that information is coded as months since the month of interview in 1984.

In 1988, if a person was not reinterviewed, they are dropped from the risk set for all months since their previous interview. The same procedure is followed for the 1990 interview. For both the 1988 and 1990 interviews, the retrospective information regarding date of nursing home admission is collected.

The process described thus far provides the majority of observations for a data set where a group of people and their initial characteristics are observed at a month in 1984. These people are followed over a period of time in the subsequent three interviews covering approximately six years to observe the first time they enter a nursing home.

While this describes the bulk of the data construction for the hazard estimates, death provides an additional complication. Fortunately, date of death information is available in the data set. Where the date of death occurred between interviews, the individual was added to the risk set for the appropriate number of months. For those who died, followback interviews were conducted for over 90 percent. In those interviews, questions were asked regarding whether the deceased ever entered a nursing home along with dating information. Those who entered a nursing home prior to death are appropriately coded.

The hazard data set for the full LSOA includes 4,584 of the possible 5,151 observations. Given this data set it is possible, by taking the subsample of individuals who have difficulty performing at least one ADL, to mimic other data sets which initially screen their samples at the national level based on functional limitations such as the NLTCS. The data set, when subsampled in this manner, contains information on 1,193 persons.

The other estimates presented in the paper use a panel logit to capture the relationship between individual characteristics and residential modes in the LSOA. The estimation procedure used required that information be observed on each person included in the sample at all four survey dates. Given this limitation and the need to have information on a core set of variables, it was only possible to include 2300 observations in the estimations.

Variables and Auxiliary Data

The relevance of the variables used in the estimates has been established in the studies discussed in the literature review so they will not be extensively discussed here other than to note that the set of variables chosen most closely follows those employed in the work of Borsch-Supan et al. (1991). For the hazard estimates, all values are taken from the 1984 survey. For the panel logits, the regressors are measured in the four survey years of the LSOA unless otherwise noted.

Several basic demographic characteristics are included in the estimates; age, gender, years of education, and a dummy for missing education. Availability of potential caregivers is captured through two variables; marital status and the number of living children at the time of the 1984 survey. Health limitations are captured both through a count of the number of ADL performed with difficulty as well as indicators of whether the individual had ever been diagnosed with a stroke, heart problem, or dementia. These health diagnoses were coded from matched medical records to the LSOA containing primary diagnoses from Medicare reimbursed health care expenditures using the

ICD-9 (1995) to make the relevant conversions. Dummy variables were also constructed to indicate if the person qualified for Medicaid or Medicare.

Two variables were included in the hazard estimates which could not in the panel multinomial logits. The first was a dummy variable for the level of income (1 indicates $15,000 or more in income). This information was not collected in each wave of the LSOA so a decision was made not to use this variable in the panel estimates. A dummy for race was also included in the hazard estimates. There were no nonwhites in the LSOA who met the criteria to enter the panel logit estimates so the variable is not included.

The dependent variable for the hazard estimates is the number of months in which a person resided in the community after their month of initial interview along with an indicator of when they leave the risk set whether the exit is due to death, noninterview, or nursing home entry. The construction of that information has already been described.

The dependent variable for the panel multinomial logits is a categorical indicator of three modes of residential location; residing in one's own home with or without a spouse; residing with others; or living in a nursing home. This information is collected in each of the four surveys and was treated for the purposes of the estimations as point in time information. The coding of these outcomes is identical to that found in Borsch-Supan et al. (1991).

A final comment regarding the data underlying the estimates is that in order to estimate the multinomial logits, at least one variable was required which varied across the residential alternatives. For this purpose, components of the consumer price index were used which were associated with the choices available in the logit.[1]

4. Methods

Hazard Estimations

The proportional hazard method of Cox (1972) is used to estimate the risk of entering a nursing home. The hazard is written as

$$h(t,x) = h(t,0)e^{\beta' x} .$$

$h(t,x)$ is the risk at time t given the covariate vector x. $H(t,0)$ is called the baseline hazard and refers to the risk at time t given the covariate vector 0. The probability that a person exits the risk set (enters a nursing home) is

$$\frac{e^{h'x}}{\sum_{j \in R_j} e^{h'x}}$$

Where R is the set of individuals at risk of exiting.

Panel Multinomial Logits

The panel multinomial logit estimations consider an elderly individual making a choice from three mutually exclusive alternatives: (1.) independent living arrangements, (2.) shared living arrangements, and (3.) institutional living arrangements. Assume that the utility of alternative j for an individual i in period t, U_{ijt}, is given by the following equation:

$$U_{ijt} = X_{ijt} b + e_{ijt}$$

X represents the relevant regressors and epsilon is a random error from the extreme value distribution. In our estimations, j has a value of three, t has a value of 4, and i indexes the sample.

The parameters are assumed to be constant across time periods, so that choice j is made at time t if $U_{ijt} > U_{ikt}$ where k and j are different residential modes. Because the error terms are not correlated across choice or time period, the model can be estimated as a multinomial logit following Borsch-Supan et al (1991).[2]

5. Results

Appendix Table 1 contains means and standard deviations for the variables from the LSOA used in the hazard estimates. The table also contains a set of descriptive statistics for those individuals who have at least one ADL they perform with difficulty. Comparing the two samples, as one would expect, the average number of functional difficulties is larger in the conditioned sample. Similarly, more individuals have suffered stroke, heart problems, or from dementia in the conditioned sample. More individuals are also currently qualified for Medicaid receipt in the conditioned sample, and the average age of those with functional limitations is higher.

Table 1 contains the estimates of four hazard functions for the full sample. A base specification is estimated, then various additional regressors are added in the three other models. The columns contain parameter estimates and p-values. Throughout this discussion, statistical significance will refer to a .10 level unless otherwise noted.

The base specification controls for a set of demographic and kin availability characteristics as well as the number of ADL performed with difficulty. Greater age is associated with an increased risk of entry into a nursing home as is higher education and the number of ADL performed with difficulty. Somewhat surprisingly, being married as well as the number of living children were not significantly related to the risk of entering a nursing home.

In the second specification (column 2), the ADL variable was dropped to explore the role of specific diagnoses (stroke, heart problems, and dementia). Of the three, dementia (p=0.12) appears most strongly related to the risk of entering a nursing home.

In the third column, both the ADL and specific diagnosis variables are included as regressors. The ADL variable (p=0.096) is significantly related to entry into a nursing home, but dementia is no longer as significant once functional status is controlled.

In the final specification, variables for Medicare and Medicaid eligibility are added to the specification. Of the two, weak evidence is found that Medicare eligibility is associated with a reduced risk of entry (p=0.13).

While there was some variation in the results depending on which regressors were included, advancing age and education were both significantly associated with a greater risk of nursing home entry. The result for age is consistent with the broader literature; however, it is unclear why those with higher levels of education would be at greater risk. Somewhat weaker evidence is found that larger numbers of functional limitations are predictive of nursing home entry. There is also some evidence that those with dementia are at an increased risk of entering a nursing home while those currently qualified for Medicare are at a reduced risk. Being married and having greater numbers of children were not associated with the risk of entry in any of the four models estimated.

Table 2 contains a comparable set of estimates to those found in Table 1 except the estimates were performed using only the observations on individuals who had difficulty performing at least one ADL. Similar to the estimates using the full sample, advanced age is significantly related to the risk of entering a nursing home in each model estimated.

In the base model, education and the number of ADL performed with difficulty are no longer significantly different than zero but the marital status parameter is. Perhaps this points to the greater importance of potential caregivers in preventing nursing home entry among those with functional limitations.

Although the number of ADL performed with difficulty was not significant in the base specification, a specific diagnosis of dementia does appear to be associated with an increased risk of nursing home entry. This can be seen in column 2. Dementia also remains significant in column 3 with the addition of the ADL variable to the model. Medicaid or Medicare qualification does not appear to be significantly related to nursing home entry in this sample.

Panel Logits

Appendix Table 2 contains means and standard deviations for the variables used in the panel multinomial logit estimations. Table 3 contains three sets of estimated parameters and their standard errors. There are two parameters for each variable indicating the effect of the variable on the probability of residing in mode 1 (independent) or mode 2 (with others) relative to living in a nursing home. Where significant, the parameter estimates are consistent with those found in prior studies. Because some of the variables might reasonably be thought to proxy for each other, as in the case of the ADL and medical diagnosis variables, the estimates contained in columns two and three drop alternative regressors as a check on patterns of significance.

Across each of the sets of estimates presented, the parameters associated with the basic demographic characteristics of the sample members take the expected sign. Higher age individuals have a reduced likelihood of residing either with others or in their own residence. The parameter capturing the effect of age is significantly different than zero in each of the three specifications for living with others relative to residing in a nursing home.

Another demographic characteristic, gender, also appears to be related to the mode of residence. Across all three sets of estimates, women have a greater chance of living alone or with others relative to being in a nursing home. The variables capturing the effect of gender on these two options is significantly different than zero in each set of estimates presented.

Because information is unavailable on income levels, the education level will act, in part, as a proxy. Living in a nursing home is generally thought of as an inferior arrangement relative to living in a private residence. As expected, higher educational levels are found to be associated with an increased probability of living either alone or with others relative to residing in a nursing home.

To the extent that comparable estimates are available, the estimated parameters which capture available kin for caregiving also take expected signs. Being married increases the likelihood of residing in one's own home or with others relative to being in a nursing home. The availability of a spouse appears related to whether a person can successfully maintain residence outside of a nursing home.

Children form another potential source of care that may enable aging individuals to continue residence outside of a nursing home. Here, the parameter estimates indicate that having a greater number of living children increases the chance of residing with others relative to living in a nursing home. The parameter is statistically significant in each of the three specifications. More children also reduces the chances of living alone relative to residing in a nursing home. The magnitudes of these two parameters are almost identical in the three models, suggesting that having a child may induce a substitution across residential modes for the elderly out of independent living arrangements into the households of others.

Among the measures of health and functional ability, some appear to be related to nursing home residence. Across all three specifications, individuals who need assistance performing ADLs are more likely to live with others than in a nursing home. While this parameter is significant at the .05 level in each specification, the parameter relating ADLs to the choice between living alone or in a nursing home is uniformly insignificant.

Among the specific diagnoses, dementia appears most strongly related to residential choice. Individuals with dementia appear to be more likely to live in their own residence than in a nursing home. This parameter is statistically significant in the two specifications considered. In the second specification, when educational levels are not controlled, dementia is found to increase the likelihood of residing with one's children.

With respect to financing, both Medicare and Medicaid are found to reduce rather than increase the likelihood of nursing home entry. The parameter estimate of each variable is statistically significant at the 0.05 level.

6. Conclusion

The estimates provided from the LSOA largely confirm those found in other studies based on national data. They also clarify some interpretive issues which arise in using data that are screened to contain only functionally limited elders.

For example, in unscreened data, the number of functional limitations appears important in predicting future nursing home entry although having a spouse or children available as a caregiver does not. In short, the number of caregivers available is probably not that important unless one is considering a population that is characterized by caregiving need.

Once the data are screened to only include those who are functionally limited, the number of limitations does not appear to be important. The availability of a spouse, however, does appear to be important in avoiding nursing home entry when has functional limitations. Thus, the combination of ADL difficulties and no spouse is indicative of greater risk of nursing home entry. Similarly, the combination of ADL limitations and a diagnosis of dementia appears to be associated with a higher risk of nursing home entry.

To say that a group faces a higher risk of entry, however, does not mean that a majority of individuals with a particular risk characteristic make a transition into a nursing home. For example, in the unscreened population, the probability of surviving in the community through the end of the LSOA, controlling for the risk of death, is 0.95. This 5 percent risk of institutionalization corresponds well with the risk estimate of Cohen et al. In the screened sample, the probability of survival is lower, at 0.935. The overwhelming majority of those with trouble performing at least one ADL survive to the end of the sample period in the community.

The estimates confirm a number of impressions which can be drawn from the prior literature. Therapies through medication or assistive devices which reduce morbidity are likely to reduce rates of institutionalization. The results also highlight the importance of family members and particularly spouses as caregivers.

In interpreting the panel logit estimates, it is important to bear in mind that they are descriptive estimates of the factors associated with the probability of observing individuals in a particular residential mode. Prior evidence from Doty (1986) and Weissert (1985) established that the majority of the aged population who are functionally limited reside in the community. Thus, it would be expected, on average, that ADL difficulties would be more closely associated with residing in the community. In the estimates presented here, those with difficulties performing ADL appear to remain in the community by residing with children.

Similarly, those with dementia are most likely to be found in the community because the condition requires large amounts of unskilled care which is often provided by family members for extended periods of time (Stommel, Collins, and Given 1994). The estimates presented here show that dementia is most commonly associated with residence either at home or with others.

Much like the hazard estimates, the logits also highlight the importance of kin caregivers in facilitating community residence. While many speculate whether future availability of caregivers will lead to increased or decreased rates of institutionalization, this literature now seems developed enough to warrant greater efforts in simulations of nursing home entry and patterns of residence among the aged which incorporate projected decreases in morbidity and mortality as well as anticipated demographic trends.

Appendix Table 1. Descriptive Statistics for Hazard Estimation Data

	Full Data Set (N=4584)		ADL Screened Data (N=1193)	
Variable	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Ethnicity (White=1)	0.88	0.33	0.85	0.35
Gender (Female=1)	77.9	5.90	80.1	6.30
Living children in 1984	0.65	0.48	0.75	0.43
Age in 1984	2.50	2.30	2.60	2.40
ADL with difficulty	0.67	1.40	2.60	1.70
Marital status (Married=1)	0.45	0.50	0.35	0.48
Income > $15,000 (=1)	0.55	0.50	0.59	0.49
Years of education	9.60	3.90	8.96	4.10
Education missing(=1)	0.02	0.13	0.02	0.15
Ever had stroke (=1)	0.07	0.25	0.15	0.35
Ever had heart problem (=1)	0.10	0.31	0.15	0.36
Ever had dementia (=1)	0.01	0.07	0.01	0.10
Qualify Medicaid (=1)	0.04	0.21	0.08	0.27
Qualify Medicare (=1)	0.97	0.18	0.97	0.18

Source: Authors' calculations from the LSOA.

Appendix Table 2. Means and Standard Deviations of Variables Used in Panel Multinomial Logit Estimations

	1984		1986		1988		1990	
Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Age	76.6	5.30	78.6	5.30	80.6	5.30	82.6	5.30
Gender	0.67	0.47	---	---	---	---	---	---
Children	2.50	2.30	---	---	---	---	---	---
ADL	0.44	1.10	0.76	1.50	1.00	1.80	1.40	2.10
Marital Status	0.51	0.50	0.46	0.50	0.42	0.49	0.38	0.49
Education	10.1	3.80	---	---	---	---	---	---
Missing Ed.	0.01	0.11	---	---	---	---	---	---
Stroke	0.04	0.20	0.05	0.21	0.05	0.22	0.05	0.23
Heart Problem	0.10	0.30	0.11	0.31	0.11	0.32	0.12	0.33
Dementia	0.002	0.05	0.01	0.10	0.03	0.16	0.04	0.19
Medicare	0.98	0.16	0.96	0.19	0.99	0.12	0.99	0.10
Medicaid	0.04	0.18	0.10	0.30	0.19	0.39	0.24	0.43
Price Choice 1	105	0.77	119	3.40	131	6.00	142	8.40
Price Choice 2	120	2.60	109	1.30	114	1.10	126	1.50
Price Choice 3	119	3.40	134	2.60	136	2.80	158	4.70

Source: All variable except for the prices of the alternatives are based on the authors' calculations from the LSOA. See footnote 1 for that source. Also, the variables are defined as in appendix Table 1.

Endnotes

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1. The choices are residing alone or with a spouse, residing with relatives, and residing in a nursing home. For these choices respectively we used the Consumer Price Index for Renters Cost of Shelter, All Items Less Shelter, and Medical Care Services. Regional indexes were used and matched to the reported region of residence of the individual in the LSOA

2. In other estimations not shown here, we assumed the error terms were correlated both across choices and time and estimated the model with a panel multivariate probit model using a simulated maximum likelihood procedure. The estimates appeared unstable and unbelievable. Thus, those estimates are not presented here.

Table 1. Hazard Estimates of Risk of Nursing Home Entry from the LSOA[a]

	Model (1)		Model (2)		Model (3)		Model (4)	
Parameter	**Parameter**	**P-Value**	**Parameter**	**P-Value**	**Parameter**	**P-Value**	**Parameter**	**P-Value**
Ethnicity	0.11	0.69	0.10	0.70	0.12	0.66	0.16	0.56
Age	0.10	0.01	0.10	0.01	0.10	0.01	0.10	0.01
Gender	0.16	0.41	0.19	0.32	0.15	0.42	0.16	0.41
Living Children	0.001	0.30	0.001	0.77	0.001	0.76	0.001	0.75
Marital Status	-0.19	0.31	-0.19	0.31	-0.19	0.30	-0.18	0.34
Income	0.08	0.53	0.08	0.63	0.08	0.59	0.08	0.61
Education	0.04	0.04	0.04	0.05	0.04	0.04	0.05	0.03
Missing Education	-0.99	0.33	-0.99	0.33	-0.99	0.34	-0.96	0.35
ADL Difficulty	0.08	0.07	---	---	0.08	0.10	0.07	0.12
Stroke	---	---	0.04	0.88	-0.05	0.87	-0.05	0.86
Heart Trouble	---	---	-0.05	0.83	-0.08	-0.32	-0.08	0.73
Dementia	---	---	1.09	0.12	0.91	0.21	0.94	0.19
Medicaid	---	---	---	---	---	---	0.19	0.58
Medicare	---	---	---	---	---	---	-0.56	0.13

[a]Survival Probability = 0.949.

Source: Computed by authors.

Table 2. Hazard Estimates of Risk of Nursing Home Entry from the LSOA[a]

Parameter	Model (1)		Model (2)		Model (3)		Model (4)	
	Parameter	P-Value	Parameter	P-Value	Parameter	P-Value	Parameter	P-Value
Ethnicity	0.55	0.25	0.53	0.28	0.54	0.27	0.59	0.23
Age	0.04	0.05	0.04	0.03	0.04	0.04	0.04	0.04
Gender	-0.17	0.62	-0.14	0.68	-0.17	0.62	-0.17	0.61
Living Children	0.002	0.72	0.002	0.78	0.002	0.78	0.001	0.76
Marital Status	-0.64	0.06	-0.63	0.06	-0.64	0.06	-0.62	0.07
Income	-0.002	0.99	-0.01	0.97	0.01	0.97	0.001	0.98
Education	0.01	0.69	0.01	0.83	0.01	0.80	0.01	0.75
Missing Education	-11.20	0.96	-10.30	0.94	-10.30	0.94	-10.30	0.94
ADL Difficulty	0.08	0.29	---	---	0.06	0.45	0.05	0.50
Stroke	---	---	0.08	0.85	0.03	0.94	0.02	0.95
Heart Trouble	---	---	0.31	0.33	0.30	0.34	0.29	0.37
Dementia	---	---	1.40	0.05	1.30	0.08	1.30	0.08
Medicaid	---	---	---	---	---	---	0.14	0.76
Medicare	---	---	---	---	---	---	-0.50	0.40

[a]Survival probability = 0.935.

Source: Computed by authors.

Table 3. Parameter Estimates from Panel Multinomial Logit

	Model 1		Model 2		Model 3	
Parameter	Parameter	Standard Error	Parameter	Standard Error	Parameter	Standard Error
Age1	-0.23	0.23	-0.19	0.24	-0.49	0.26
Age2	-0.86	0.23	-0.82	0.24	-1.00	0.26
Gender1	0.09	0.01	0.09	0.01	0.09	0.01
Gender2	0.01	0.03	0.01	0.03	0.04	0.01
Children1	-0.32	0.15	-0.36	0.16	-0.26	0.17
Children2	0.32	0.15	0.32	0.16	0.46	0.17
ADL1	-0.02	0.03	-0.02	0.03	0.02	0.03
ADL2	0.04	0.03	0.05	0.03	0.07	0.03
Marital Status1	0.50	0.03	0.53	0.03	0.54	0.03
Marital Status 2	0.37	0.03	0.39	0.03	0.40	0.03
Education 1	0.18	0.18	---	---	---	---
Education 2	0.69	0.18	---	---	---	---
Missing Ed. 1	-0.001	0.02	---	---	---	---
Missing Ed. 2	0.06	0.02	---	---	---	---
Stroke1	-0.28	0.97	-0.28	0.90	---	---
Stroke2	-0.624	0.942	-1.20	0.87	---	---
Heart1	0.35	0.22	0.40	0.20	---	---
Heart2	0.08	0.21	-0.01	0.19	---	---
Dementia1	0.41	0.18	0.45	0.17	---	---
Dementia2	0.27	0.18	0.35	0.17	---	---
Medicare1	0.74	0.26	---	---	---	---
Medicare2	0.44	0.25	---	---	---	---
Medicaid1	1.10	0.16	---	---	---	---
Medicaid2	0.85	0.16	---	---	---	---
Constant1	15.70	1.50	16.00	1.50	15.50	1.50
Constant2	10.90	1.60	10.60	1.60	10.20	1.50
Price Choice 1	-0.03	0.003	-0.03	0.003	-0.02	0.003
Price Choice 2	-0.04	0.01	-0.03	0.01	-0.04	0.01
Price Choice 3	-0.01	0.01	0.04	0.01	0.004	0.01

Source: Computed by authors.

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