Prior Living Arrangements and Nursing Home Resident Admission ADL Characteristics: A Study of Two States

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Objective. This study examines the relationship between prior living arrangements and average activities of daily living (ADL) function upon nursing home admission across two states.

Methods. Minimum Data Set Plus records from 1993 and 1994 on 4,837 Medicaid reimbursed nursing home residents aged 65 years and older from two states were used. Medicaid reimbursed residents were chosen because Medicaid reimbursement policies differ at the state level, and such differences might affect admission characteristics across states. Ordinary least square models were used to examine the correlates of the number of ADL limitations (range 0–7) upon nursing home admission.

Results. Residents in state A had a mean of 5.36 ADL limitations, whereas residents in state B had a mean of 4.83 limitations. Those who lived alone entered the nursing home with 0.61 fewer ADL limitations (p < .001) than those who lived with others. Living alone in state A reduced this association through an increase of 0.31 ADL limitations (p = .012).

Discussion. Older Medicaid recipients who live alone enter the nursing home with better physical function than those who live with others. The difference in function between those who live alone and those who live with others varies across the two states.

Although there has been much research indicating that living arrangements and formal services can affect the likelihood that someone enters a nursing home, little research has been conducted on how living arrangements and state-level effects interact to affect the average functional characteristics of older persons upon nursing home admission. This present ecological study provides a preliminary examination of how living arrangements and state of residence interact to affect the level of disability with which an individual enters the nursing home. We compared the nursing home admission characteristics of those who received Medicaid in two states with disparate public spending on long-term and home health care services. Given the findings in the literature, this article examines two hypotheses:

Hypothesis 1: Older persons who live alone enter a nursing home with better activities of daily living (ADL) function than those who live with others. Hypothesis 2: The magnitude of the difference in function between Medicaid recipients who live alone and Medicaid recipients who live with others varies across states.

Methods

In order to test the hypotheses, we used the 1993–1994 Minimum Data Set Plus (MDS+) from two U.S. states, labeled State A and State B. The MDS+ is an expanded version of the Minimum Data Set (MDS), created through a Health Care Financing Administration (HCFA) demonstration project in five states. Although the MDS+ is a clinical assessment instrument, it has also been validated for research and contains much unique and clinically important information that deals with function and quality of life (Blaum, O’Neill, Clements, Fries, & Piattarone, 1997; Casten, Lawton, Parmalee, & Kleban, 1998; Frederiksen, Tariot, & De Jonghe, 1996; Hawes et al., 1995; Lawton et al., 1998; Phillips, Chu, Morris, & Hawes, 1993). Because Medicare or Medicaid certified nursing homes are re-
required to complete assessments for every patient under their care, data from the assessments practically represents the universe of nursing home residents in a given state.

We chose to study only residents with Medicaid reimbursed nursing home stays, as Medicaid programs vary by state. In this way, we avoid confounding the ramifications that private and federal nursing home spending can have on state-level effects. State-level effects may not be as profound on those who are not at risk of using state-varying services.

The two states were chosen due to their disparate spending on Medicaid programs and similar urban and rural geographical mixture. On average, state A spends twice as much per Medicaid recipient. Further, state A spends more than 10 times the amount of state B on Medicaid-financed home care programs per Medicaid recipient. Such differences in home care spending reflect the fact that state A has more proactive policies on reducing nursing home use through the provision of community services (Hardwick, Pack, Donohoe, & Aleksa, 1994).

We conducted all analyses with SAS. We used t-tests and chi-square tests to determine whether the two samples had significantly different unadjusted characteristics upon admission. We used multivariate, ordinary, least squares regressions to test hypotheses and to control for confounders. Because the racial composition of the states differed so much (there were just seven Blacks in State A), we compared our results with a similar ordinary least squares analysis that included only white residents to control for any unobserved racial confounding.

We included all of those in the sample who were over 65 years old, had an initial assessment in our 1993-1994 data sample, were admitted from home or a hospital, and were not comatose. This allowed us to examine institutionalization among older persons likely to have lived in the community shortly before admission to the nursing home and those likely to be able to live at home with in-home support.

Our data set consisted of 20,587 individuals over the age of 65 in the two states. Of these, 13,827 were excluded because they did not enter the nursing home with Medicaid reimbursement. Of the remaining 6,760, 1,556 were excluded because they did not enter the nursing home from home or a hospital, and 24 were excluded because they were comatose. This left us with a potential sample of 5,180. The sample shrank to 4,837 (93% of total) when excluding persons who had missing or inconsistent information in the response, predictor, or assessment variables. The majority of those exclusions (210 out of 343) were due to missing insurance status information. It is likely that many of these would be excluded from the study anyway, had their insurance status been known.

**Dependent Variable**

The response variable of interest was an individual's physical function. To measure this, we created a variable summing the number of ADL limitations an individual had. Information on seven ADL categories are elicited in the MDS+, including a resident's bed mobility, transfers, locomotion, dressing, eating, toilet use, and personal hygiene. Response categories fall into five levels with a score of zero signifying that the resident is completely independent, and a score of four indicating that a resident needs "full staff performance of activity during entire seven days." A sixth level was added to some versions of the MDS+ assessment, indicating that the individual did not perform the activity at all in the past seven days. We considered someone as having a limitation if they were not fully independent (did not have a score of zero) in an ADL. The MDS+ from the years included in this study only elicited one response for each ADL. Subsequent MDS instruments elicited multiple responses for some ADLs, such as locomotion ability on and off the nursing home unit.

In order to ensure that our results were not dependent on the choice of ADL limitations used, we repeated the analyses with each of the 127 possible combinations of the seven ADL limitations that use between one and seven ADLs in the definition. In these sensitivity analyses, we used ordinal logistic regressions, instead of OLS regressions, to account for the reduction in the span of our discrete response variable.

**Independent Variables**

The predictor variables of study interest included a dummy variable for living alone prior to being institutionalized and a dummy variable for state of residence. Given our hypotheses, we expected that the living alone variable would show a negative relationship such that those who live alone enter the nursing home with fewer ADL limitations than those who live with others. We expected that residing in state A would be associated with having more ADL limitations because community and home care programs in state A that may delay institutionalization may also increase the average level of disability upon nursing home entry.

We also included an interaction term for living alone and residing in state A. The interaction variable is the product of the dummy variable for living alone and the dummy variable for state of residence and can measure whether state-level associations with resident functional characteristics affect differentially those who live alone. As discussed in our hypotheses, we believed that the extra Medicaid community programs available in state A would have a greater marginal effect on those who live alone. The differential association of living alone and being a resident in state A can be measured directly from the parameter estimate for the interaction variable. Hence, we expected that the interaction variable would show that living alone in state A is associated with entering the nursing home with more ADL limitations.

We also included independent variables that might be correlated with the variables of interest and the dependent variables: age, sex, partial Medicare reimbursement for the nursing home stay, race, admission from a hospital, and cognitive function. All variables were coded as dummy variables to ease the interpretability of the results and acknowledge that the incremental steps in the ordinal and continuous variables might not be proportional. Age, in particular, was split into three levels (65-74, 75-84, and 85+) using 65 to 74 as the reference variable in the model. Control variables for cognitive function, based on the previously validated MDS Cognitive Performance Scale (Morris et al., 1994), were included to make sure that our results measured the association of the independent variables on ADL limitations, not cognitive status. In order to make the MDS Cognitive Performance Scale scores more clinically interpretable, we collapsed the variable into three levels with: a 0 relating to intact or borderline intact mental function (scores of 0 or 1 on the MDS Cognitive Performance Scale), a 1 relating to mild to moderately severe cognitive impairment (scores of 2
RESULTS
As shown in Table 1, nursing home residents differed between the two states in several ways. More older persons in state A lived alone before initial nursing home admission than in state B. Those in state A entered the nursing home with a greater number of ADL limitations and poorer cognitive function than those in state B. Although the age and sex distributions were significantly different, the actual differences were small. The majority of the sample was White, with one fifth of the state B sample being Black. Finally, more persons in state B were likely to have their nursing home costs reimbursed by Medicare.

As shown in the regression results in Table 2, the oldest-old (85+) had 0.26 more ADL limitations than those 65 to 75 years old (p < .001). There was not a significant difference in the number of ADL limitations between those 75 to 84 years old and the 65 to 74 year age group. Men did not have a significantly different number of ADL limitations than women. Being Black was associated with having 0.44 more ADL limitations (p < .001), and being admitted from a hospital was associated with entering with 1.11 more ADL limitations (p < .001). Cognitive impairment was associated with having more ADL limitations than those without cognitive impairment. Our model indicates that those with moderate cognitive impairment had 0.75 more ADL limitations than those with no cognitive impairment (p < .001); those with severe cognitive impairment had 1.60 more ADL limitations than those with no cognitive impairment (p < .001). Having Medicare reimbursement for the nursing home stay was associated with having 0.32 more ADL limitations (p < .001). Living alone was related to having 0.61 fewer ADL limitations (p < .001), whereas living in state A was associated with having 0.41 more ADL limitations (p < .001). Finally, the interaction variable indicated that those who lived alone in state A entered the nursing home with 0.31 more ADL limitations (p = .012).

A comparison of our results with an analysis that included only White residents (results not shown) found that the direction and significance of our results did not change when examining only White residents. In sensitivity analyses with the 127 possible combinations of the seven ADL variables, the direction of the three outcome variables of interest—living arrangements, state of residence, and their interaction—were the same in all ordinal logistic results. The three variables were significant (p < .05) when the response variable included all seven ADLs. The likelihood that at least one of the three variables of interest was not significant at the p = .10 level increased progressively, with 14% of the analyses that used six of the seven ADL functions in the definition of the response variable having at least one that was not significant, 24% of the analyses that used five, and 40% of the analyses that used four. Of the three variables, the interaction term was the most likely not to be significant in the sensitivity analyses.

DISCUSSION
The main variables of interest—living alone, state of residence, and their interaction term—are in the expected directions. In particular, those who lived alone entered the nursing home with an average of 0.61 fewer ADL limitations than those who live with others. This suggests, as hypothesized, that those who live alone enter the nursing home with better function than those who live with others, perhaps due to the lack of a cohab-

Table 1. Characteristics of Study Population
Upon Nursing Home Admission

<table>
<thead>
<tr>
<th>Cognitive score (M, SD)***</th>
<th>5.36 (1.74)</th>
<th>4.83 (2.31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.41***</td>
<td>0.10</td>
</tr>
<tr>
<td>65–74 years old (reference)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>75–84</td>
<td>—</td>
<td>0.08</td>
</tr>
<tr>
<td>85+</td>
<td>0.26***</td>
<td>0.08</td>
</tr>
<tr>
<td>Male</td>
<td>—</td>
<td>0.06</td>
</tr>
<tr>
<td>Black</td>
<td>0.44***</td>
<td>0.07</td>
</tr>
<tr>
<td>Admitted from home (reference)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Admitted from hospital</td>
<td>1.11***</td>
<td>0.06</td>
</tr>
<tr>
<td>Medicare enrollee</td>
<td>0.32***</td>
<td>0.06</td>
</tr>
<tr>
<td>Cognitive score 0 (reference)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cognitive score 1</td>
<td>0.75***</td>
<td>0.06</td>
</tr>
<tr>
<td>Cognitive score 2</td>
<td>1.60***</td>
<td>0.08</td>
</tr>
<tr>
<td>Lived alone</td>
<td>—</td>
<td>0.08</td>
</tr>
<tr>
<td>State A</td>
<td>—</td>
<td>0.08</td>
</tr>
<tr>
<td>(State A) × (Lived alone)</td>
<td>0.31*</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Notes: R² = 0.20; Adj R² = 0.20  
*p ≤ .05, **p ≤ .01, ***p ≤ .001
FUNCTION IN NURSING HOME RESIDENTS

ITER who can provide in-home support. In addition, the dummy variable for state A, the state with higher per capita Medicaid expenditures, suggests that those who live in state A enter the nursing home with 0.41 more ADL limitations than those who live in state B. Finally, the interaction term indicates that those who live alone in state A enter the nursing home with 0.31 more ADL limitations than others. These findings lend evidence to our hypothesis that the magnitude of the difference in function upon nursing home entry between those who live alone and those who live with others varies across states. While the main effect of living in state A could be influenced by a number of state factors besides public programs that affect function both inside and outside the nursing home, we suspect that some of the significance of the interaction variable is related to state-level effects that assist individuals who live alone in remaining at home. Such effects likely include home and community care programs, as evidenced by the disparate amount that each state spends on these programs.

The parameter estimates of the other significant variables also meet theoretical and clinical expectations. Those who are aged 85 years or older have worse function, consistent with previous studies that find that age is a risk factor for ADL limitations (Guralnik et al., 1993). In addition, being Black is associated with having more ADL limitations upon admission. This is consistent with previous findings that Blacks often have worse health and functional status than Whites (Flack et al., 1995; Jamerson, 1993; Kington & Smith, 1997). Being admitted from a hospital is associated with entering the nursing home with more ADL limitations, suggesting that those who require hospitalization prior to nursing home admission may have more severe acute care needs than those who enter the nursing home from home. Having partial Medicare reimbursement for the nursing home is significantly related to entering the nursing home with more ADL limitations. This may be due to the fact that Medicare generally restricts nursing home reimbursement to those with skilled needs. Those with chronic conditions, such as progressive, yet less severe, ADL functional limitations may not be able to receive Medicare reimbursement for nursing home costs. Finally, the positive correlation between cognitive impairment and functional impairment is consistent with previous studies that have found an association between cognitive and ADL functional decline (Cohen-Mansfield, Werner, & Reisberg, 1995).

The above findings suggest that those who live alone enter the nursing home with better function than those who live with others, but that state characteristics may be able to reduce this difference. The findings suggest that states may be able to narrow the gap in ADL function upon admission between those who live alone and those who live with others, perhaps through Medicaid home and community care services.

Our findings concerning the state level differences in admission characteristics are all the more remarkable given that a greater proportion of older persons in state B have disabilities (Hardwick et al., 1994). It is possible that nursing homes in state B are selectively admitting healthier patients because they are more profitable (Nyman, 1989). However, this is unlikely as occupancy rates in both states were similarly high during the study period, suggesting that supply is sufficiently restricted in both states for nursing homes to be able to selectively admit patients. Further, it is not as clear how Medicaid reimbursed individuals who live alone would be differentially affected by such nursing home cream skimming. Instead it seems more likely that factors that allow older Medicaid recipients to remain in the community with greater levels of disability, such as home care services, cause the state differential in nursing home characteristics, particularly with respect to those who live alone.

There are limitations to our study. This was an ecological study in which we chose the states because of their disparate Medicaid spending on home and community care services. However, we can not definitively isolate home and community care services as being primarily responsible for affecting nursing home admission characteristics across the states. Other possible effects, such as cultural characteristics or person-level effects, might account for some of these differences. Still, the comprehensiveness of our data and uniqueness of our cross-state comparison strengthen the validity and importance of our findings.

Another limitation to our study was that not all definitions of ADL limitations in our sensitivity analyses produced statistically significant results among the three independent variables of interest. However, the likelihood of finding nonsignificant results decreased as the number of different ADL limitations summed in the response variable increased. This suggests that analyses that use a greater number of ADLs might be more sensitive at discerning differences in functional ability.

The findings in this study highlight the need for more research into identifying state-level effects that can affect resident characteristics upon admission to the nursing home. Such findings can better help researchers and policymakers calculate the true costs and benefits of state-provided services. For example, since caring for individuals with greater levels of disability may be more expensive for nursing homes, any state-funded programs that increase average disability levels of nursing home residents may also raise average costs of state-reimbursed nursing home stays. This may be a heretofore unexpected cost of public home and community care programs. Future research can help us better understand such causes and effects.

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