The Gerontologist
Vol. 46, No. 3, 334–343

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Creating Needs-Based Tiered Models for Assisted Living Reimbursement

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Purpose: This research provides state policy makers and others interested in developing needs-based reimbursement models for Medicaid-funded assisted living with an evaluation of different methodologies that affect the structure and outcomes of these models. ***Design and Methods:*** We used assessment data from Medicaid-enrolled assisted living residents and waiver-eligible community-dwelling individuals ($N = 726$) in order to evaluate five methodologies in the design of these tiered needs-based models. We used ordinary least squares regression analyses in order to evaluate each model's ability to predict the time needed to care for individuals with varying needs (e.g., activities of daily living limitations, dementia, special services.) ***Results:*** These models varied in fit from .127 to a high of .357 using the adjusted R^2 statistic. Both count and weighted models adequately predicted service needs and discriminated individuals into their appropriate tiers well. Weighted models with the largest score range worked best and provided more flexibility. ***Implications:*** Policy makers can tailor the generic tiered models developed with these methods to a state's population. Any state considering adoption of a needs-based tiered model will need to refine its model based on its assisted living population characteristics, its resources, and how the model fits its long-term care system. For the industry, these models can serve to identify levels of care needed in planning for staff time and skill mix required for assisted living as well as other long-term care populations.

Key Words: Assisted living, Long-term care, Medicaid waiver, Reimbursement models

Assisted living provides older adults with a mixture of housing, personalized support services, and health services in a noninstitutional setting (National Center for Assisted Living [NCAL], 2001). Many states employ home- and community-based Medicaid waivers (1915c) in order to offer the option of lower cost assisted living to Medicaid-enrolled seniors and to counter reliance on more expensive institutional long-term care. Presumably, Medicaid-funded residents will live more independently and states will benefit by paying less per person for assisted living services than for traditional nursing home care (Miller, Ramsland, & Harrington, 1999; Wiener & Stevenson, 1998). It is unclear, however, whether a state would experience lower Medicaid program costs, as more people might be interested in using the assisted living option than in entering a nursing home. Because the Medicaid waiver requires clients to meet each state's nursing home eligibility standards, assisted living facilities often regard these potential residents as frailer and, thus, more costly than privately paying clients (Wilson, 2000). In order to encourage facilities to accept Medicaid-funded residents, some states have created needs-based reimbursement models that scale payments to the amount of care each individual needs (Mollica, 2000). However, there is little evidence that existing state models accurately group residents according to their service needs. This study has two purposes: (a) To provide state policy makers and others interested in developing needs-based models with a review of the various methodologies and issues that should be

This research was funded by the Robert Wood Johnson Foundation and produced in collaboration with the New Jersey Department of Health and Senior Services. We wish to thank Rebecca McMillan, Rosemary Kidder, and Jean Cetrulo of the New Jersey Department of Health and Senior Services for assistance with data collection. We also wish to acknowledge the contributions of the staff of the Rutgers Center for State Health Policy; Donald Hoover and Stephen Crystal from the Institute for Health, Health Care Policy, and Aging Research at Rutgers University; and Paul Hamburg at Human Capital Research Association for their statistical advice. Finally, we thank Nicholas Castle, formerly with the Institute for Health, Health Care Policy, and Aging Research at Rutgers University and now at the University of Pittsburgh, for his consultation at the early stages of this project and his assistance with state assisted living policies.

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considered, and (b) to illustrate how different methodologies can affect a model's structure and outcome.

Although assisted living facilities frequently use needs-based systems in order to determine fees for privately paying clients, most of the literature regarding needs-based fee structures is based on case-mix reimbursement strategies developed for nursing homes (Fries, 1990; Sulvetta & Holahan, 1986). However, this literature does identify commonly assessed factors that researchers could consider in a needs-based model for geriatric assisted living populations. Mollica's (2000) review of states' assisted living policies found that among states that had tiered reimbursement systems, the type, number, and severity of activities of daily living (ADLs) limitations, cognitive or behavioral problems, incontinence, medication administration, and special services were common factors in determining level of need. Assessing health, sensory and motor skills, and cognitive function in order to provide individuals with appropriate support is consistent with the goal of maximizing person–environment fit (Lawton, 1986).

One key factor that is often used to set reimbursement and staffing levels is the resident's physical health. Medical conditions and diagnoses provide insight into the knowledge and skills staff will need in order to provide effective care. Functional dependency (i.e., the inability to perform critical daily activities) is also commonly used to determine eligibility for long-term care and to determine acuity (case-mix), reimbursement, and staffing levels (Finch, Kane, & Philip, 1995; Lazaridis, Rudberg, Furner, & Cassel, 1994). There are several ways to create overall functional dependency scores that can be used in needs-based models. By counting the number of dependencies, or by weighting certain ADLs so that they contribute more to an individual's cumulative score, researchers create a score that is intended to reflect an individual's overall functional ability and, thus, the person's care needs (Jette, 1994; Travis & McAuley, 1990). The use of ADLs as a proxy for functional health status or need for care has raised concerns about comparability, reliability, and validity testing. Still, researchers frequently use ADLs in practice in order to determine an individual's care needs, and recent legislative proposals and programs use ADLs as a basis for long-term care eligibility (Bennett, 1999; Fried et al., 1996; Kane, Saslow, & Brundage, 1991; Pepper Commission, 1990).

Mental functioning and behavioral problems are also often considered in needs-based models (Fries, 1990). Mental health and behavioral issues frequently require skilled staff for assessment, close supervision, and individualized intervention plans. Although Kane and colleagues (1991) found that the care needs for 81%–88% of individuals with dementia would be correctly identified using just ADLs, there has been some concern that ADLs may not provide an appropriate measure of the care needs of the cognitively impaired. As Kane and associates stated, "Ironically, supervision requires more time, not less. Standing by, encouraging, and reminding patients is more time consuming than doing the task for them. But it is precisely those functions that constitute the ongoing care needed for dementia" (p. 65). Clearly, some residents with dementia do not need nursing home care, but most do require a safe environment with specially skilled staff (Pieffer, 1997). Because provision of specialized dementia care is a major goal of both policy makers and the assisted living industry, any needs-based tiered system should take into account the residents' mental and cognitive abilities.

Needs-based models often consider special services such as complex nursing care and treatments, as they can be costly, serious, or invasive. The receipt of special services or treatments may reflect unmeasured frailty associated with a recent acute condition and the progression or instability of chronic conditions. Special services (including chemotherapy, dialysis, intravenous therapy, monitoring of medical conditions, oxygen therapy, radiation, suctioning, pain management, and medication by injection) have been associated with higher levels of caregiver time (Hawes, Phillips, & Rose, 1999; Phillips et al., 2003).

Once indicators and measurement methods are chosen, a model is then created to predict the level of care needed. There are three general types of models: rules, count, and weighted. Rules models use guidelines that define each tier and the requirements for inclusion. Individuals are assigned to the category that best describes their condition, limitations, or care needs. Count models typically assign a score (e.g., 1 = presence, 0 = absence) to the need for assistance across the various indicators (such as ADLs, instrumental ADLs [IADLs], and cognitive ability); the scores are then summed and used to tier individuals.

Weighted models, like count models, compute total scores across a set of indicators, but each factor is adjusted or weighted by relative importance. Weighting expands the potential range of scores, thereby creating more flexibility within the tiers. Weights can be derived empirically or by expert assessment (Finch et al., 1995; Spector, Katz, Murphy, & Fulton, 1987). Assigned weights take into consideration both the nature and extent of the functional loss (for instance, assistance with eating is done often, whereas bathing is done less often but may require more time and be more unpleasant for the caregiver). There is, however, always potential for disagreement regarding the magnitude of assigned weights (Babbie, 2004). Researchers calculate empirically defined weights from a regression analysis that compares the influence of factors such as labor intensity and frequency of assistance. Lazaridis and colleagues (1994) have argued that this methodology may not appropriately describe each individual's care needs, but they suggest it may appropriately rank groups of people into categories of need.

Although some states (e.g., Oregon and Arkansas) have developed their own needs-based models, there

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is little data about the actual performance of these models. The nursing home literature can inform the selection of common factors that influence service needs, but policy makers need a better understanding of how the design of models affects the models' ability to appropriately predict assisted living service needs. If policy makers want to expand assisted living opportunities for Medicaid-funded residents by linking reimbursement rates to clients' needs, they must identify factors that are important to creating needs-based systems. In addition, they must determine the manner by which these factors can best be incorporated into a model that uses functional health to predict individual care needs. This article presents comparisons of several needs-based methodologies (count, rules, and weighted) by using data collected from individuals enrolled in, or assessed as eligible for, the New Jersey Assisted Living Waiver. Specifically, we present several models that were developed with commonly accepted measures in order to show how various scoring methods can be used to better discriminate cases into the appropriate tiers. We evaluate the usefulness of these models based on their ability to predict the number of care hours needed.

Methods

Sample

We did sampling in two stages. First, we selected every other client from a New Jersey Department of Health and Senior Services list of Medicaid-enrolled clients in each assisted living facility in the state. This yielded a 50% sample of the total Medicaid-funded assisted living resident population (n = 307). Although waiver funds were available for 1,500 eligible assisted living clients in New Jersey during 2000, only 600 clients were funded. This underutilization raised concerns that the Medicaid-funded sample might be systematically biased or not representative of all potential Medicaid-funded residents. Needs-based models should fit both community-dwelling individuals who meet the Medicaid-waiver criteria as well as existing assisted living residents already funded by the waiver program. Thus, we expanded the sample to include individuals assessed by New Jersey Department of Health and Senior Services as eligible for the assisted living home- and community-based service waiver during July 2000 (n = 419). This yielded an analytic sample of 726 persons.

Data Source

Staff of the New Jersey Department of Health and Senior Services collected the data in August 2000, using the New Jersey Easy Access Single Entry Comprehensive Assessment Tool. New Jersey case managers use this standardized assessment tool in order to assess the medical and social needs of Medicaid-eligible and -enrolled individuals during in-person interviews. It includes information about the individual's functional health (i.e., ADLs), medical condition (i.e., diagnoses), and social situation (i.e., family support).

Measures

As needs-based models are intended to discriminate groups of individuals by their level of need, we chose the total hours of care needed daily (the outcome variable) as a proxy for assisted living costs because it closely reflected the degree of resources needed to provide basic assisted living services. Medicaid pays for medical services obtained and not for other service costs (such as room and board; Mollica, 2001), but most of the cost for basic assisted living services is for personal care services—hands-on care almost exclusively provided by nonprofessionals. Other health-resource requirements are minimal: Only 12% of facilities in the United States offer skilled nursing on premises (NCAL, 1998). Thus, hours of care needed provided a good estimate of the cost of basic assisted living services that states could use to formulate their reimbursement rates.

For this study, we measured the hours-of-care-needed variable by using a question from the New Jersey Comprehensive Assessment Tool: "On the average, how many hours per day of hands-on care does the client need?" The person most knowledgeable about the individual's current care (such as a registered nurse) supplied this information. The Comprehensive Assessment Tool offers a 4-point scale (0 hours, 1–4 hours, 5–8 hours, and more than 8 hours) that we recoded to approximate a continuous variable (0, 2.5, 6.5, and 12 hours per day) for ordinary least squares (OLS) regression analysis. Independent variables included ADLs, IADLs, special services, and cognitive/behavioral issues. For three existing models, we retained the original independent variables. For the two new models, we selected variables with a significant bivariate relationship to hours of care: bathing, transferring, eating, toileting, nighttime care, medication management, and dementia (Alzheimer's type or all others).

In order to evaluate the impact of scoring methods used by various states, we used all three types of models (rules, count, and weighted) to predict hours of care needed. Because rules models are theoretically designed, we used Oregon's reimbursement system as an example. At the time of the study (2002), Oregon's reimbursement model included the following levels: (a) Level 1—needing assistance in two critical ADLs (toileting, eating, or behavior) or assistance in any 3 critical or other ADLs or assistance in 1 critical ADL and 1 other ADL; (b) Level 2—needing assistance in behavior and eating or toileting; (c) Level 3—needing assistance in 4–6 ADLs or assistance in toileting, eating, and behavior; (d) Level 4—being dependent in 1–2 ADLs or needing assistance in 4–6 ADLs plus assistance in behavior; (e) Level 5—being dependent

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in 3–6 ADLs or dependent in behavior and 1–2 ADLs (Castle, Howell-White, Eder, & Crystal, 2001). After consulting with Oregon's Division of Senior and Disabled Services, we created an approximation model in order to correct a specification problem that had allowed individuals with eating or toileting needs combined with behavior problems to fit into more than one care level.

For the count model, we began with the scoring system from the Katz Index of Independence in ADLs model (Katz Index; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963). This model includes 6 measures believed to be lost in older adults in the reverse order from which they are acquired as children (see Table 1). Although this model can be scored hierarchically, the Katz Index is primarily used as a simple count model by computing a 6-point scale. The New Jersey assessment included measures consistent with the Katz Index. The data were coded so that three levels of assistance (supervision, direction, and personal assistance or dependence) equaled one, whereas independence equaled zero. Additionally, an expanded count model (i.e., the New Jersey Count Model) was then created with an extended range of scores that assigned more points for greater levels of need (see Table 1), ranging from 0 (independent) to 4 (total dependence).

We also evaluated two weighted models: one that used the methodology of Finch and colleagues (1995) and another developed by us. The weighted model of Finch and associates used empirically derived scores to represent the degree of functional impairment associated with ADLs and IADLs. The system for weights was derived by consensus of an expert panel. The model appeared to be a flexible way of incorporating ADLs and IADLs, yet these weighted scores were untested in needs-based reimbursement models. The New Jersey model included the same items used in the count model, with each item weighted by assigning more points for greater levels of need (see Table 1). For instance, scores for bathing ranged from 0 (independent) to 7 (total dependence); scores for medication management ranged from 0 (independent) to 10 (medication by injection).

Analyses

Univariate analyses provide descriptive information about the sample's characteristics and the variables to be used in the models. Bivariate analyses and OLS regression analyses are used to test for collinearity among the independent variables. OLS regression analysis regressed hours of care on the independent measures in order to determine which measures should be used in the model. We used the adjusted coefficient of multiple determination (adjusted R^2) in order to compare the fit of alternative models. We set the cut-off for an acceptable model at 0.20 or higher. This is consistent with Fries's (1990) work comparing case-mix systems for nursing home reimbursement (i.e., Resource Utilization Group–I [RUG–I], RUG–II; the Minnesota model, and the Maryland model, from which he inferred that an R^2 statistic of 0.2 indicates that a model adequately explains nursing time and cost).

In order to develop the tiered models, we used OLS regression analyses to predict the amount of care required for individuals with varying needs (using the total count or weighted scores). It is more meaningful to interpret OLS regression results than odds ratios when results are being used to assign individuals to categories of increasing need for care. We then conducted discriminant analysis and constructed a classification table in order to determine which set of predictor variables most clearly separated the tiers and how accurately cases were tiered (results not shown).

Results

Sample Characteristics

New Jersey's Medicaid-enrolled assisted living residents were generally similar, demographically and functionally, to a national assisted living resident profile. The 2000 survey of assisted living residents (NCAL, 2001) reported that about 19.0% of residents were independent in all ADLs, compared with 20.2% in the New Jersey sample (see Table 2). On average, the national group needed assistance with 2.3 ADLs, whereas the New Jersey assisted living residents required slightly less assistance (with an average of 2.2 ADLs). New Jersey assisted living residents were predominately female (72.3%) and widowed (55.6%). Approximately one third was aged 76–85 years, and another one third was 85 years old or older. Most clients were White, with the largest minority group comprising African Americans. Although one third had completed high school, only 1 in 10 had any post-high school education.

Approximately half of the sample was independent in the following ADLs: mobility in bed, transferring, locomotion in room, and eating. Thirty-seven point eight percent was independent in toilet use, whereas 27.4% was independent in dressing and personal hygiene. Only 10.6% was able to bathe independently. As was expected, more individuals needed assistance with IADLs than with ADLs. For example, less than 5% of the sample was independent in meal preparation, housework, shopping, and transportation. Less than 10% was independent in managing finances or medications. Only 24.7% had no nighttime care needs. Most (66.7%) were bladder and bowel continent. The most prevalent health conditions in this sample were Parkinson's disease (38.1%), depression (21.1%), and non-Alzheimer's dementia (14.0%). Although it is not shown in Table 2, the most common special care services reported were lab-test monitoring (71.8%), glucose monitoring (21.1%), bowel/bladder training (13.7%), and medication injections (13.9%). More than half of the

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Table 1. Scoring Systems for the Count and Weighted Models

Items from New Jersey EASE Comprehensive Assessment Tool Used in Models	Katz Model	Count Model	Finch Model	Weighted Model
Bathing				
Total dependence	1	4	500	7
Extensive assistance	0	3	408	6
Limited assistance	0	2	202	3
Supervision	0	1	202	2
Independent	0	0	0	0
Dressing				
Total dependence	1	—	500	—
Extensive assistance	0	—	408	—
Limited assistance	0	—	202	—
Supervision	0	—	202	—
Independent	0	—	0	—
Eating				
Total dependence	1	4	971	12
Extensive assistance	0	3	871	9
Limited assistance	0	2	424	7
Supervision	0	1	424	5
Independent	0	0	0	0
Locomotion in the room				
Total dependence			758	
Extensive assistance			672	
Limited assistance			363	
Supervision			341	
Independent			0	
Mobility				
Total dependence			301	
Extensive assistance			301	
Limited assistance			91	
Supervision			91	
Independent			0	
Toilet use				
Total dependence	1	4	848	12
Extensive assistance	0	3	792	9
Limited assistance	0	2	465	7
Supervision	0	1	465	5
Independent	0	0	0	0
Transferring				
Total dependence	1	4	792	12
Extensive assistance	0	3	674	9
Limited assistance	0	2	401	7
Supervision	0	1	401	5
Independent	0	0	0	0
Housework				
Performed by others			187	
Performed with help all of the time			187	
Performed with help some of the time			71	
Did on own			0	
Meal preparation				
Performed by others			430	
Performed with help all of the time			430	
Performed with help some of the time			230	
Did on own			0	
Phone use				
Performed by others			295	
Performed with help all of the time			219	
Performed with help some of the time			117	
Did on own			0	
Shopping				
Performed by others			202	
Performed with help all of the time			202	
Performed with help some of the time			89	
Did on own			0	
Night care				
Total dependence	—	4	—	7
Extensive assistance required	—	3	—	6
Limited assistance	—	2	—	3
Oversight required	—	1	—	2
No assistance	—	0	—	0
Medication management				
Needs medication by injection	—	4	—	10
Performed by others	—	3	—	7
Performed with help all of the time	—	2	—	5
Performed with help some of the time	—	1	—	2
Did on own	—	0	—	0
Continence				
Incontinent: Inadequate control, multiple daily episodes	1	4	1,060	10
Frequent incontinence: 2–3 times per week	0	3	629	7
Occasional incontinence: Once a week	0	2	629	5
Usually continent: Episodes once a week or less	0	1	629	2
Continent: Complete control	0	0	0	0
Dementia				
Alzheimer's or non-Alzheimer's-related dementia	—	1	—	5
No Alzheimer's or non-Alzheimer's-related dementia	—	0	—	0
Possible score range	0–6	0–29	0–4,671	0–75
Total no. of items	6	8	6	8

Notes: EASE = Easy Access Single Entry. Total dependence refers to full performance by another person; extensive assistance denotes partial performance by individual, but needs help bearing support; limited assistance refers to individual highly involved in the activity, but received help in guiding limbs; supervision refers to oversight by another individual who also provides encouragement or cueing; independent refers to no help or oversight needed.

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Table 2. Sample Characteristics

Characteristics	Percent (*n*)
Female	72.3 (516)
Age, in years	
< 65	16.3 (111)
65–75	17.8 (121)
76–85	33.0 (225)
> 85	32.9 (224)
Marital status	
Married	15.8 (111)
Widowed	55.6 (390)
Separated or divorced	13.3 (93)
Single	15.1 (106)
Race	
White	79.0 (527)
African American	15.7 (105)
Hispanic, other	5.2 (37)
Hours of Hands on Care Needed	
None	5.6 (38)
1–4	59.1 (405)
5–8	23.6 (162)
> 8	11.7 (80)
ADLs rated as independent	
Bathing	10.6 (77)
Bed mobility	61.7 (447)
Dressing	27.4 (197)
Eating	55.0 (390)
Locomotion in the room	43.6 (313)
Personal hygiene	25.4 (184)
Toilet use	37.8 (273)
Transferring	43.4 (315)
IADLs rated as independent	
Finances	7.4 (53)
Housework	2.2 (16)
Meal preparation	4.0 (29)
Medication management	8.7 (63)
Phone use	45.9 (331)
Shopping	1.8 (13)
Transportation	1.4 (10)
Continent	
Bladder	66.7 (53)
Bowel	64.9 (16)
Mental health conditions	
Alzheimer's disease	8.7 (63)
Non-Alzheimer's-related dementia	14.0 (101)
Depression	21.1 (153)
Parkinson's disease	38.1 (227)

Note: ADLs = activities of daily living; IADLs = instrumental ADLs.

sample (59.1%) needed between 1 and 4 hours per day of hands-on care. One quarter (23.6%) needed between 5 and 8 hours per day, about 1 in 10 (11.7%) needed more than 8 hours per day of care, whereas only 5.8% had no need for hands-on care.

Means and Variances of Models

In order to show the impact of the various scoring methods, Table 3 presents the means and total scores for the individual variables within each model. As was expected, we saw larger means and standard deviations for those models, such as the Finch Model and the weighted model, with expanded scoring ranges.

Predicting Hours of Care

Rules Model.—In order to test the rules model, we constructed an approximation of the Oregon model, which distinguished between mild and serious behavior problems in order to resolve internal inconsistencies in that model. The new version classified only one person in the New Jersey sample into Level 2. Accounting for less than 20% of the variance, this model demonstrated poor fit (R^2 = .127) and was unable to classify 200 of the 726 older adults who did not need assistance in any of the areas specified by the rules. The individuals classified into the top level often used very few hours of care, reflecting the model's poor predictive power. Due to these issues, we have dropped this model from further consideration.

Count Model.—When we tested the Katz Index (Katz et al., 1963) with the New Jersey data, it had an overall adjusted R^2 of .249, with all characteristics significantly predicting care need. Continence, transferring, and toileting created the highest predicted change in hours of care needed. Even though the average number of care hours increased with each additional need, there was a great deal of variation in service hours within the same tier. Essentially, the Katz Index did not distinguish well between different levels of need for assistance, and the range of 0–6 made it difficult to separate this model into tiers.

The New Jersey count model had an adjusted R^2 of .357, with bathing, eating, and medication management significantly predicting care time needed (see Table 4). Because this model performed well with respect to fit, we examined the distribution of clients' cumulative scores (see Figure 1). The lowest total score in this model was 0 (the least impairment), whereas the highest possible score was 28 (the greatest impairment). The distribution of all expanded version scores indicated that most people had low cumulative ADL scores.

Weighted Models.—In order to demonstrate a weighted model, we examined the model of Finch and colleagues (1995) to see how well it predicted the amount of time needed to care for individuals. This model yielded an adjusted R^2 of .330 and demonstrated good predictive power for hours of service for people in the middle tier but performed poorly at the top and bottom tiers. The model predicted a very low number of actual hours of service for a large proportion of the individuals with the 50 highest scores.

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Table 3. Mean Scores for ADLs, IADLs, and Continence Within Each Model

Items Used in Models	Katz Model ($N = 685$)	Count Model ($N = 641$)	Finch Model ($N = 685$)	Weighted Model ($N = 641$)
Bathing	0.89 (0.31)	2.52 (1.27)	325.40 (160.87)	4.60 (2.37)
Bed mobility			58.47 (202.38)	
Dressing	0.72 (0.45)		232.38 (183.68)	
Eating	0.44 (0.50)	1.02 (1.39)	270.19 (348.23)	3.52 (4.32)
Locomotion in the room			144.28 (150.48)	
Transferring	0.56 (0.50)	1.51 (1.51)	326.94 (313.73)	4.85 (4.59)
Toilet use	0.62 (0.49)	1.73 (1.57)	416.09 (355.67)	5.52 (4.72)
Nighttime care		1.76 (1.39)		3.15 (2.52)
Housework			174.50 (40.77)	
Meal preparation			398.18 (129.13)	
Medication management		2.71 (1.06)	357.71 (166.39)	6.41 (2.62)
Phone use			128.54 (131.97)	
Shopping			192.76 (37.17)	
Transportation				
Continence (bowel and bladder)	0.47 (0.50)	1.32 (1.62)	420.93 (467.06)	3.21 (4.02)
Dementia		0.22 (0.41)		1.08 (2.06)
Total score	3.71 (2.10)	12.75 (7.92)	3,446.37 (1,914.90)	32.24 (20.40)

Notes: ADLs = activities of daily living; IADLs = instrumental ADLs. Standard deviations are presented parenthetically.

In view of the challenges of the Finch model, we created the New Jersey weighted model. This model derived an overall adjusted R^2 of .349, with bathing, eating, and nighttime care being significant predictors. The lowest possible score with this model was 0 (no impairment) and the highest was 71 (significant impairment; see Figure 1). As was expected, most scores fell into the lower levels of need (range = 0–18) and tailed off in the higher-need range (greater than 58).

In order to demonstrate how this range of cumulative scores could be incorporated into a needs-based tiered model, we constructed four tiers using the New Jersey weighted model. We constructed these tiers so

Table 4. Results of Multiple Regression Showing the Relationship of Need for Assistance With Hours of Care

	Katz Model ($N = 685$)		Count Model ($N = 641$)		Finch Model ($N = 685$)		Weighted Model ($N = 641$)	
Area of assistance	β	SE β	β	SE β	β	SE β	β	SE β
Constant	1.58**	0.37	1.36**	0.35	0.62	0.60	1.35**	0.33
Bathing			0.34*	0.13	0.01**	0.00	0.19*	0.07
Transferring			0.28	0.16	0.00	0.00	0.07	0.05
Eating			0.52**	0.12	0.00**	0.00	0.17**	0.04
Toilet use			0.07	0.17	0.00	0.00	0.01	0.06
Nighttime care			0.27	0.14			0.17*	0.08
Medication management			0.22*	0.11	0.00*	0.00	0.09	0.04
Continence			0.07	0.09	−0.00	0.00	0.05	0.04
Dementia			−0.18	0.26			−0.04	0.05
Mobility					0.00**	0.00		
Dressing					−0.00	0.00		
Meal preparation					0.00	0.00		
Locomotion in the room					−0.00	0.00		
Phone use					−0.00	0.00		
Shopping					0.00	0.00		
Housework					0.00	0.00		
Need assistance with 1 ADL	1.26**	0.47						
Need assistance with 2 ADLs	1.46**	0.51						
Need assistance with 3 ADLs	1.71**	0.55						
Need assistance with 4 ADLs	2.73**	0.47						
Need assistance with 5 ADLs	3.27**	0.46						
Need assistance with 6 ADLs	5.05**	0.42						
Adjusted R^2	0.249		0.357		0.330		0.349	

Notes: ADL = activity of daily living. For the table, $N = 630$.
*$p \leq .05$; **$p \leq .001$.

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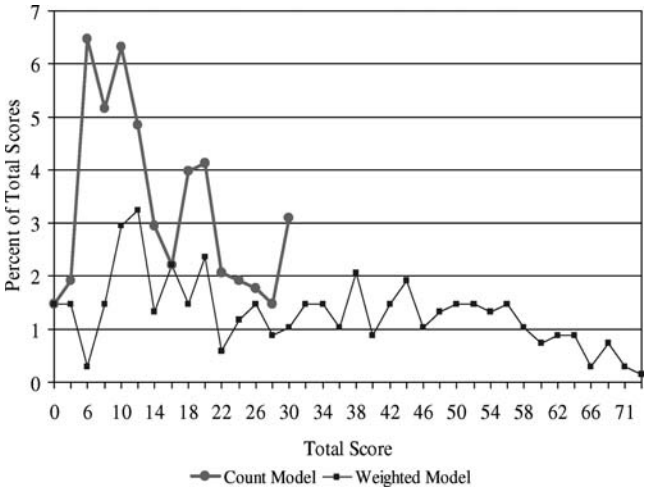

Figure 1. New Jersey count and weighted models representing percent score distribution of Medicaid assisted living residents (n = 680).

that approximately 40% of the population fell into Tier 1, 25% into Tier 2, 20% into Tier 3, and 15% into Tier 4 (see Table 5). Although there was variation in need within tiers, 42% of individuals needed extensive assistance with one or fewer areas of care, and more than 90% of individuals in Tier 1 needed fewer than 4 hours per day of hands-on care. That is, there was homogeneity within tiers as to the need for assistance and hours of care. Moreover, the progression of the maximum scores showed that those in the higher tiers (appropriately) needed the most hours of care. The functions with which people in each tier needed the most assistance were as follows. In Tier 1, the most frequent assistance needed was with medication management, whereas in Tier 2, assistance was most frequently needed with both medication management and bathing. In Tier 3, toileting, transferring, and nighttime care were needed in addition to assistance with bathing and medication management, and in Tier 4, extensive assistance was needed in all areas.

The mean level of assistance needed for each predictor variable (except dementia) had a positive linear direction from low to high tiers: Individuals with few limitations fell into the lower tiers, and those with the most limitations fell into the highest tier. Interestingly, the percentage of individuals with dementia decreased from Tier 1 to Tier 4 when we used the dichotomous measure (1 = dementia, 0 = none) available in the New Jersey data. For instance, the percentage of individuals with dementia in Tier 1 was 40%, in Tier 2 was 30%, in Tier 3 was 20%, and in Tier 4 was 20%. We investigated this counterintuitive pattern further. When we compared the levels of assistance required by individuals with dementia to those required by people without dementia, the proportion of people needing low, moderate, or high levels of assistance was very similar. Individuals with dementia were more likely to have problem behaviors,

Table 5. Potential Tiering of the New Jersey Model: Percent of Cases Classified Within Tiers by Hours of Care Needed for Limited and Extensive Assistance in Performing ADLs

	Weighted Model							
	Tier 1		Tier 2		Tier 3		Tier 4	
Hours of Care Needed	%	*N*	%	*N*	%	*N*	%	*N*
None	11.8	31	2.5	4	1.6	2	1	1
1–4	79.9	210	67.1	106	37.7	46	17.4	17
5–8	7.2	19	24.1	38	39.3	48	44.9	44
>8	1.1	3	6.3	10	21.3	26	36.7	36
No. of areas in which extensive assistance needed or totally dependent	0.9 (0.6)		2.1 (1.1)		4.7 (1.0)		6.5 (0.64)	

such as wandering or aggressiveness, but the number of people with problem behaviors in our sample was too small to produce a statistically significant result. This could reflect the inability of a dichotomous measure of dementia to adequately show increasing needs for assistance or supervision. A measure capturing the stage of dementia or frequency of problem behaviors might produce a result more consistent with the need for assistance in other functional areas.

We also performed discriminant analysis for the weighted model in order to determine whether these predictor variables produced linear discriminant functions that clearly separated the tiers (analysis not shown). The analysis yielded two statistically significant functions that explained 99% of the variance. Pooled within-group correlations between predictor variables and standardized canonical discriminant functions indicated that toilet use, transferring, and nighttime-care needs were most highly correlated with the first discriminant function (R_c = .97, df = 24, p = <.001). Eating and continence were most highly correlated with the second discriminant function (R_c = .56, df = 14, p = <.001). Comparison of group centroids indicated that individuals in Tiers 1 and 2 had a much lower need for assistance with transferring, toilet use, and nighttime care, whereas individuals in Tiers 3 and 4 had a much higher need for assistance in these areas. Individuals in Tier 4 also had a higher need for assistance with eating and had more problems with incontinence. The classification table showed that of the 680 cases with complete data, 93% were correctly classified.

Because we had converted the dependent variable from a categorical variable to a continuous one, we checked the sensitivity of these results by analyzing the count and weighted models with two sets of alternative values (0, 1, 5, and 9; and 0, 4, 8, and 16) representing high and low values within each category. The intercepts and parameter estimates increased or decreased when we used the larger or smaller scale; however, the direction and relative magnitude of the parameter estimates did not change—with the exception of eating, which had

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slightly more influence in the weighted model when we used the lower range of values.

In sum, the New Jersey weighted model provided an expanded scale and the assigned weights were easy to use. By including the key ADLs, continence, and dementia, the New Jersey model discriminated well between individuals with low, moderate, and high care needs.

Discussion

Although states and assisted living facilities do not use a standard methodology in order to determine resident charges, many use a needs-based tiered system (Mollica, 2000). Thus, it is important to understand the impact of methodology on the effectiveness of such models. The present analysis examined how well rules, count, and weighted models predicted the amount of hands-on care needed. Overall, both count models and weighted models adequately predicted hours of care needed, and both assigned individuals into the appropriate tiers. However, the models with larger possible score ranges worked best because they provided more flexibility.

Although assisted living facilities commonly use rules models in order to set costs, these models are inherently highly complex in design because they must account for all possible need combinations. The analysis of Oregon's rules model indicated that this model failed to classify many individuals, provided inconsistent classification for others, and did not discriminate well between tiers. Although rules models allow for discussion and consensus building during model development, they are difficult to adjust as the population's needs change. These models are based on clinical and practical knowledge of resident characteristics that require more care time, rather than being based on population data and being tested to ensure the model correctly predicts needs and classifies residents into appropriate needs-based tiers. If, over time, a rules model inaccurately places too many or too few individuals in a particular tier, facilities and state programs should adjust the tier parameters. This may be difficult because rules models tend to build on lower tiers and, as a result of the changes, there may be problems of logic by which individuals might be assigned into more than one tier. For these reasons, rules-based models should be used with caution, and it is important that detailed and thorough testing of any rules model be conducted throughout its use.

Although simple count models are easiest to use and interpret, they neither take into account severity of need nor provide a very broad range of scores. Response options for ADL and IADL scales play a major role in determining whether functional need is captured. Kempen, Myers, and Powell (1995) reported that multiple-choice–response options are more reliable than dichotomous-response categories, in part because of the greater variability. Moreover, Lazaridis and colleagues (1994) concluded that no one measure (i.e., ADLs only) can assess functional impairment. For these reasons, states should use caution in adopting tiered reimbursement strategies founded on a simple count of physical limitations or dependencies. Scoring factors with a broader scale similar to the New Jersey count model provide a wider range of cumulative scores, recognize differences in level of need for each area of care, and can more accurately predict the amount of care required. Count models that provide for degrees of impairment or performance provide the same ease of use but improve the model's ability to account for variation in impairment or performance.

Because weighted models have greater score ranges than do count models, they provide for more flexibility in defining tiers and accounting for severity. The New Jersey weighted model demonstrated good fit with significant predictor variables. Additionally, the wide distribution of scores offers an adequate range within each tier.

One concern is that, although some models (such as the Finch model [Finch et al., 1995]) use empirically derived weights, the New Jersey weighted model used weights based on clinical assessments with scales of ADL and IADL assistance needed (limited assistance, extensive assistance, or total dependence) that could be subjective and could vary greatly. Although not statistically derived, these weights are common in clinical practice, adding to their relative ease of use and face validity. Subjectivity can be reduced if examples are given to anchor the ratings and if ratings are based on observations rather than self-report. Additionally, ratings can be computed to different metrics (e.g., rescaling the range of scores from 1 to 100).

Because all models rely on the ability of clinical assessment to collect accurate data, altering the assessment instrument by changing the variables or the measurement of need for assistance entails altering the model's tiering in order to reflect those changes. For example, dementia could be included whether the person is in the beginning phase and only needs prompting or in more advanced stages and needs much more supervision and assistance. If a researcher changes the assessment instrument so that it will only measure advanced stages of dementia, this will also affect the model's tiering.

The present study's sample included only Medicaid-enrolled assisted living residents in New Jersey, which limits its generalizability. However, one objective of this research was to demonstrate both the influence of these model designs and their utility for states interested in developing their own needs-based tiered systems. In spite of their lack of non-Medicaid residents, our results do demonstrate the complex issues involved in designing or adopting models using ADLs, IADLs, and special services, and implementing these models for the broader assisted living population.

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Another possible limitation is that hours of care needed is not an exact proxy for assisted living cost of care; this variable therefore needs to be further refined before being used by the industry or facilities for planning. Additionally, this measure does not specify the type of staff needed and is less reliable than using observed hours of care needed. However, for setting reimbursement-rate structure, Medicaid is concerned with eligible costs and would limit reimbursement to health services. Therefore, this measure does provide a good basis for assisted living reimbursement structures as most care would be non-professional personal care services.

Although the New Jersey assisted living Medicaid waiver requires at least one ADL dependency, approximately 20% of the resident sample had no ADL dependencies. Several explanations could account for this. First, some residents could have improved since entering the facility. Second, IADLs are not considered for eligibility, but they may influence ADL limitations. For example, a person who is not eating because he or she cannot prepare food will decline functionally. Once in a facility, this person may be able to eat without assistance, but still will be unable to prepare the food. In addition, some cognitively impaired residents may be able to perform an ADL, but only with prompting or cueing. Once a person meets eligibility requirements for the waiver and enters assisted living, it is difficult to reassess them and determine continued eligibility for the waiver program. This finding echoes large-sample assisted living studies (NCAL, 2001) and again points to the importance of including multiple areas of function and condition for the model—as well as multiple scale categories—in order to more precisely describe the level of performance.

Current directions in state policy and within the assisted living industry suggest that payment and reimbursement structures increasingly use needs-based tiering systems. Consistent with many state reimbursement strategies, tiered models that incorporate ADLs, IADLs, and special services (e.g., medication management and cognitive status/problem behaviors) predicted levels of care within needs-based tiered systems. More complex count models that encompass the degree of limitation and weighted models offer the best practice examples for needs-based tiered models. States considering a needs-based tiered model should refine generic models based on their own assisted living population and resources and to ensure a fit with their long-term care system. In order to ensure that a model continues to accurately classify assisted living residents, states should monitor the changing needs of residents, identify factors that increase care time needed, and repeatedly test the continued accuracy of the reimbursement models. The assisted living industry might utilize these methods in order to develop models using ADLs, IADLs, and special services for planning and evaluation of assisted living services.

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Received July 26, 2005
Accepted February 28, 2006
Decision Editor: Linda S. Noelker, PhD

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