Residential Care Supply, Nursing Home Licensing, and Case Mix in Four States

James Swan, Ph.D., and Robert Newcomer, Ph.D.

Simulation analyses quantify admission and continuing physical and cognitive impair ment patient case-mix changes under two scenarios: with increases in residential care supply and with all nursing homes licensed only as skilled care facilities. Findings raise caution about the assumed interplay between residential care supply and nursing home use. The propor tion of nursing home patients with only physical and cognitive impairment likely to be affected by current and emerging long-term care (LTC) policy was well under 25 percent of the nursing home population in each of the four study States. States varied in LTC supply and utilization controls.

INTRODUCTION

Consumers, private investment, and many State governments view the residential care industry, particularly that sector known as assisted living, as a viable alternative for nursing homes for many persons. Residents in this housing have access to meal and maid services and assistance with such tasks as using medications, dressing, grooming, eating, bathing, and transferring. Increasingly too, States have begun to permit those living in residential care facilities (RCFs) to receive extended periods of skilled nursing care and to remain in these facilities even if they become non-ambulatory or if they are receiving hospice care (Mollica, 1998).

Arguments favoring the growth and expanded role of assisted living or other forms of RCFs in serving the needs of the frail elderly population include consumer preference, affordability relative to nursing homes, and potential reductions in State Medicaid expenditures (Wilson, 1993). Even when accepting these arguments on face value, there is little empirical basis to guide State governments in how to achieve the substitution of supportive housing for nursing home care. Should States further constrain the growth of nursing homes, stimulate the growth of residential care beds, extend access to assisted living by reshaping the eligibility criteria about those who can remain in supportive housing, or provide financial reimbursement for the home and community-based care (HCBC) (e.g., homemakers, personal care aides) that may be needed in such housing? In the absence of their own experience, States look to other States to resolve such questions. Such mimicking may focus on specific policies (e.g., eligibility criteria), while ignoring essential contextual influences (the prevailing ratio of nursing home beds to population), or multiple interactive policies (e.g., reimbursement for RCF care, licensing standards for nursing homes) that are essential to the success of the adopted new policy.

Investigators (Spector, Reschovsky, and Cohen, 1996) at the Agency for Healthcare Research and Quality (AHRQ) estimate

that between 25 and 35 percent of the 1-million-plus nursing home residents are there mainly because of limitations in ability to perform personal care tasks such as bathing, dressing, and ambulation. They suggest that a subgroup of these individuals can be potentially served with home care services or by residence in supportive housing.

The AHRQ estimate of the potentially "relocatable" nursing home population has some important limitations. One of these is that it is based on a national sample of nursing home residents, but with too few cases to adjust for local or community-level conditions—such as the availability of alternative services or State policies affecting allowable levels of care. In this article, with nursing home resident characteristics from the nursing home minimum data, we use simulations to test the sensitivity of the AHRQ estimate to community-level contextual factors in four States. These models evaluate how the introduction of two exemplar policies affect case mix, holding constant various facility, State policy, and community characteristics.

One policy is the requirement that all nursing facilities in a State meet the standards appropriate for skilled nursing facility (SNF) licensing. Imposition of this standard implies that facilities will be staffed appropriately to the skilled levels of care and that the facility will have fewer incentives to serve a population with care needs less than those required and reimbursed in skilled care. The second simulated policy is one where the State achieves substantial growth in the number of residential care beds per 1,000 population. A growth in such supply is assumed to be a necessary condition if RCF care is to substitute for nursing home care.

METHODS

The principle data sources used in this analysis are those of the On-Line Survey, Certification, and Reporting System (OSCAR) and the Minimum Data Set (MDS), both maintained by HCFA. With these data, it is possible to calculate case-mix classifications of the residents of each nursing home and to compare the relationship between case mix and various other facility attributes. These data are supplemented to include community characteristics using the Area Resource File (ARF).

OSCAR data are available for certified nursing homes in the United States. These data include facility characteristics and staffing, which are used here. OSCAR data are collected during annual certification surveys by the State or their contracted agencies. The MDS is specific to each resident, measuring functional abilities, medical problems, and emotional states (such as depression and behavior problems). MDS data are pooled in this analysis to classify a facility's case mix. The MDS is collected on all nursing facility residents at or near the time of admission, upon readmission from a hospital, if there is a significant change in status, and quarterly.

Community characteristics were obtained from the 1998 ARF, which is a compilation of census and other county-level data assembled by the Bureau of Health Professions, U.S. Department of Health and Human Services. The data elements, whether from OSCAR, MDS, or the ARF, pertain to 1995 or reflect governmental estimates for 1995. Exceptions are that hospital discharges are from 1993, and the percent of females in the labor force is from 1990.[1] Residential care beds (defined

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[1] The percent of females in the labor force seems to be relatively stable, approximately 50 percent among the sample States. The hospital discharge rate is much more variable, both among States and over time. The actual amount of change was generally similar in three States. For example, between 1993 and 1996, the number of hospital admissions per 1,000 population declined in Kansas by 8.9. Comparable numbers were 7.5 for Maine and 10.2 for Ohio. In Mississippi (1.4 per 1,000) there was no substantive change, whereas in South Dakota (34.5 per 1,000), the change was much more dramatic. All of this points to the likely improvement in the model if trend data can be used instead of point-in-time estimates (American Hospital Association, 1994, 1997).

to include all licensed housing by the State, regardless of the term used by each particular State to describe its supportive housing) data were obtained directly from State licensing and regulatory agencies in each State. Unlicensed RCFs were not counted.

Study States

Analyses are limited to States for which appropriate MDS data were available. As of 1995, 11 States were compiling MDS data into statewide data systems as part of case-mix reimbursement demonstrations. Five States (Kansas, Maine, Mississippi, Ohio, and South Dakota) having complete MDS records for most nursing homes were used in these analyses. In these States, freestanding nursing homes were required to submit MDS assessment forms. An extensive number of missing MDS or facility-identification problems precluded using the other States. A total of 1,555 freestanding nursing homes (the unit of analysis) were licensed in the five study States in 1995. OSCAR and MDS records were matched for 95.4 percent of these facilities.

Hospital-based facilities were excluded from the analysis because of a high rate of missing MDS records for such facilities (e.g., 15 of 17 facilities missing MDS records were hospital based in Mississippi, as were 64 of 106 facilities in Ohio). MDS records are needed to calculate case mix.[2] OSCAR records were not available in 1995 (including a 6-month window on either side of the calendar year) for a total of 26 facilities in these five States. OSCAR data are needed to connect facility and community characteristics to the case-mix information.

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[2] Although some of the hospital-based facilities may be functioning as de facto nursing homes in smaller communities, our analysis comparing freestanding with hospital-based facilities in our five-State data base generally shows that hospital-based facilities have a case mix that is significantly different from that of freestanding nursing facilities. Facilities serving only the mentally ill were also excluded as being out of scope.

Although the States used in this analysis were chosen because of the pragmatic consideration that they provided appropriate data, they also reflect a spectrum of State policies relative to nursing homes and residential care, and varying market conditions. Table 1 summarizes selected State LTC policies in effect in 1995. These policies exemplify approaches that can be used singularly or in combination to affect access into the alternative levels of care. The prevalence of these policies is changing rapidly. For example, by 1998, 28 States provided some form of Medicaid-reimbursed assistance for persons in supportive housing, 24 permitted at least part-time or intermittent nursing to be provided, and 34 permitted residents to be non-ambulatory (Mollica, 1998). Replications of the current analyses among more States or within States over time could further delineate these policy options, such as by considering conversions or closures of nursing home beds, the extent of HCBC available within a community, and the financial standards for Medicaid eligibility.

Even though the sample States are representative of approaches used by other States, the findings should not be interpreted as representing national outcomes. Analyses are specific to each of the sample States.

Kansas and South Dakota had mandatory all-payer pre-admission screening processes that preceded and encompassed the study period. All States had been requiring such screening for Medicaid-eligible applicants. There was variation in the specific minimum criteria for nursing home eligibility, but the basic attributes were common—a need for skilled nursing or other skilled care. Reimbursement for publicly subsidized RCF residence was not high in any State, but three States did offer some such assistance using Medicaid HCBC waivers and/or State supplemental

Table 1

Summary of State Policies Affecting Nursing Home and Residential Care Eligibility and Financing: Selected States, 1995

Policy	Kansas	Maine	Mississippi	Ohio	South Dakota
Pre-admission screening	Required of all nursing facility admissions prior to and including 1995	Required of all nursing facility admissions only after 10/1/1995	Minimal screening of nursing facility admissions prior to and during 1995	Required of all nursing facility admissions only after 1/1995	Required of all nursing facility admissions since 1988
Nursing facility eligibility criteria	3 or more ADLs plus 2 or more IADLs and other skilled care needs	3 or more ADLs plus daily skilled nursing or therapy 5 times per week	3 or more ADLs or other skilled nursing or therapy needs	3 or more ADLs or other skilled care needs	24-hour supervision or skilled nursing needs
Medicaid funds for residential care	HCBC, 1995	None, 1995	None, 1995	None, 1995	Up to $150 per month available in some RCFs
State supplemental payments or other State funds for residential care	Up to $155 monthly	$49-$219, 1995	None, 1995	None, 1995	Up to $250 per month available in some RCFs
Residential care eligibility	Screening only if HCBC	No exclusions, home health care required for those needing skilled nursing	Ambulatory, continent, non-violent	Few exclusions; up to 100 days or more of intermittent nursing permitted	Excludes residents who need more than limited hands-on physical assistance or who require ongoing nursing

NOTES: ADL is activities of daily living. IADL is instrumental activities of daily living. HCBC is home and community-based care. RCF is residential care facility.

SOURCE: Telephone interviews with respective State officials, 1997.

Figure 1

RUG-III Case-Mix Definitions

Rehabilitation (Special): Residents receiving physical, occupational, or speech therapy with the treatment goal of restoring function.

Extensive Care: Residents with a RUG-III ADL Index score of at least 7 (on a scale that ranges from 4 to 18 points) and requiring one or more of the following: parenteral feeding, suctioning, tracheostomy, or respirator/ventilator care.

Special Care: Residents with a RUG-III ADL Index score of at least 7 and one or more of the following serious conditions: burns, coma, fever (with vomiting, weight loss, pneumonia, or dehydration), multiple sclerosis, stage 3 or 4 pressure ulcers, quadriplegia, septicemia, intravenous medications, radiation treatment, tube feeding.

Clinically Complex: Residents with at least one of the following: aphasia, aspirations, cerebral palsy, dehydration, internal bleeding, hemiplegia, pneumonia, stasis ulcer, terminal illness, urinary tract infection, chemotherapy, dialysis, 4 or more physician visits per month, respiratory or oxygen therapy, transfusions, wound care other than pressure ulcer care, including active foot dressings. Patients meeting Extensive or Special Care criteria, but with RUG-III ADL Index scores of 4-6 are also classified as Clinically Complex.

Cognitively Impaired: Residents with a RUG-III ADL Index score of 4-10 and with cognitive deficits in all three of the following: short-term memory, orientation, and decisionmaking. Cognitive impairment is used to classify only those with these problems who do not qualify for one of the first four RUG-III categories.

Behavior Problems: Residents with a RUG-III ADL Index score of 4-10 and displaying daily problems with inappropriate behavior, physical abuse, verbal abuse, wandering, or hallucinations. Persons with a combination of both cognitive impairment and behavior problems are classified as cognitively impaired.

Physical Functions (Reduced): Residents not meeting the conditions for any of the previous categories but having a RUG-III ADL Index score of 11 or more.

NOTES: RUG-III is Resource Utilization Group, Version III. ADL is activity of daily living.

SOURCE: (Fries et al., 1994.)

payments to Supplemental Security Income. Access to residential care, as reflected in functional and other levels of care excluding placement, was the least restrictive in Maine and Ohio and most restrictive in Mississippi and South Dakota. Based on the combination of restrictions and facilitative features of these various policies, Maine and Kansas appear to be the most facilitative of the substitution of residential care for nursing facility placement across all levels of care. South Dakota is also facilitative but more bounded in the physical and cognitive areas of disability. Ohio's limited RCF exclusions may encourage substitution across a variety of levels of care, but the absence of reimbursement suggests that this effect will not be reflected in the lower income population. Mississippi's policies reflect a traditional nursing facility and RCF boundary.

Case-Mix Classification

Resource Utilization Groups, Version III (RUG-III) were used to consolidate resident characteristics into a standardized case-mix classification system. These classifications are based on assessment data in the nursing home MDS. These instruments were compiled for calendar year 1995. At that time, 44 RUG-III groups, organized by the 7 major hierarchical categories shown in Figure 1, could be derived from the instruments (Fries et al., 1994). Residents qualifying for more than one of these categories are classified by the most resource-intensive group. Each of the seven major groups can be subdivided into a second- or third-level subclassification based on the specific value of the activities of daily living scale (e.g., toileting, eating, bed and chair transferring), whether they are depressed (Clinically Complex only), and whether they are receiving nursing

rehabilitation (Cognitively Impaired, Behavior Problems, and Physical Function only). Sample sizes precluded using these subdivided classes.

Two sets of case-mix classifications were compiled for each facility. One used only the MDS records of the facility admissions during the 1995 calendar year. The second represents the continuing or average daily case mix in the facility itself. This continuing care case mix was calculated by summing the RUG classifications on each resident from their first MDS assessment in each available quarter in 1995. This process weights each assessment equally in terms of the exposure time within the facility. Table 2 shows the means and standard deviations for seven RUG-III major domains. Admission and continuing care case mix are presented separately.

ANALYTICAL MODEL

Table 3 shows the descriptive statistics for the independent variables used in the analysis. The measures are arranged into three groupings following the economic framework that conceptually guided their selection (Paringer, 1985; Scanlon, 1980a). The first grouping consists of attributes describing the individual facilities. Facility attributes, such as the average age of residents and size of facility, are thought to influence the attractiveness of a facility for prospective clientele and to reflect predisposing attributes (e.g., licensing status) relative to the types of clients being sought. Service demand, the second dimension, reflects county- or market-level attributes. Among these are variables shown in prior work to be associated with nursing home use: population size and age structure (Mendelson and Schwartz, 1993; Scanlon, 1980b; Zedlewski and McBride, 1992), and service demand generating resources (Feldstein, 1988; Grumbach and Lee, 1991). Other circumstances potentially affecting demand, such as the percent of females in the labor force, may both increase household resources needed to finance care for the elderly and make women unavailable to be full-time caregivers (Chiswick, 1976).

A number of other population characteristics (e.g., percent of aged persons living in poverty, percent of persons age 85 and over) were tested in preliminary analyses using step-wise backward deletion regression. Collinear items found during this process were not used in the reduced form models shown. Individual-level measures known to have an influence on nursing home placement, such as living arrangement and the presence of family caregivers (Evashwick et al., 1984; Greene and Ondrich, 1990) were not used at all because this information was not available for the study population in the ARF.

Supply is the third dimension in the model. Competing supply is directly measured for nursing homes and licensed residential care beds. Other community resources, such as home care supply, are indirectly measured using population per square mile. Home care services have been shown to increase in the presence of higher population density, and nursing home use rates have been found to decline as competition or population density increases (Dubay, 1993; Scanlon, 1980a).

The Herfindahl index of competition, in this case the proportion of beds in the subject nursing facility as a percent of total beds in that community, was also tested, but the individual components of competition were more predictive of case mix than was this index. Rural versus urban location is represented in population per square mile. Additional information, such as on the number of persons receiving HCBC covered services or the number of home care visits per 1,000 population could per-

Table 2

Percent of Residents in RUG-III Classifications at Time of Nursing Facility[1] Admission, Averaged over Calendar Year 1995: Selected States

Average Across Facilities

RUG-III Classification	Kansas		Maine		Mississippi		Ohio		South Dakota	
	Percent	Standard Deviation	Percent	Standard Deviation	Percent	Standard Deviation	Percent	Standard Deviation	Percent	Standard Deviation
Admission Case Mix	(n = 366)		(n = 121)		(n = 142)		(n = 754)		(n = 94)	
Rehabilitation	7.19	11.99	9.08	10.65	3.47	7.13	10.73	14.47	2.18	4.78
Extensive	0.76	2.26	1.05	1.96	2.01	3.51	2.29	5.04	1.34	3.07
Special Care	6.04	8.40	7.51	6.43	11.70	7.97	9.40	9.09	12.52	13.36
Clinically Complex Care	33.44	20.19	45.09	17.58	38.09	13.67	48.82	17.79	48.08	20.46
Cognitive Impairment	14.72	14.00	10.22	9.40	13.06	10.06	11.15	11.71	10.18	14.20
Behavior Problems	1.67	6.99	0.45	1.64	0.46	1.37	1.53	5.89	0.51	1.88
Physical Functioning	36.18	23.31	26.60	17.00	31.20	14.58	16.08	14.22	25.18	18.32
Continuing Case Mix	(n = 366)		(n = 122)		(n = 142)		(n = 759)		(n = 94)	
Rehabilitation	2.71	5.79	2.19	7.57	0.85	1.41	1.18	1.94	1.51	2.11
Extensive	0.50	0.78	0.92	2.10	1.45	2.04	1.26	2.22	0.74	0.92
Special Care	4.28	2.96	5.17	3.13	11.11	6.00	9.42	6.46	5.11	2.68
Clinically Complex Care	30.64	12.20	34.11	9.05	32.46	8.21	40.72	10.74	38.03	7.82
Cognitive Impairment	16.52	7.24	13.33	7.22	13.66	5.82	12.67	7.00	11.55	4.86
Behavior Problems	2.35	7.41	1.05	1.44	0.97	1.65	2.32	4.07	1.16	1.51
Physical Functioning	43.00	13.15	43.23	10.63	39.49	8.35	32.44	10.85	41.89	9.08

[1] Freestanding facilities only.

NOTE: RUG-III is Resource Utilization Groups, Version III.

SOURCE: Minimum Data Set, Center for Health Systems Research and Analysis, University of Wisconsin, Madison, 1995.

Table 3

Facility[1] and Market Area Characteristics: Selected States, Calendar Year 1995

Characteristic	Kansas (n = 366)		Maine (n = 122)		Mississippi (n = 142)		Ohio (n = 759)		South Dakota (n = 94)	
	Statistic	Standard Deviation	Statistic	Standard Deviation	Statistic	Standard Deviation	Statistic	Standard Deviation	Statistic	Standard Deviation
Facility Attributes										
Number Beds in Facility	75.51	36.42	73.06	37.81	103.20	50.97	106.80	63.46	72.99	32.56
Percent NFs That Are For-Profit Facilities	48.09	—	82.00	—	89.40	—	79.40	—	41.50	—
Percent NFs That Are in Corporate Chains	55.46	—	48.40	—	62.00	—	50.50	—	60.60	—
Percent SNF Licensed	51.64	—	100.00	—	57.00	—	69.00	—	57.40	—
Average Age of NF Residents	82.25	5.64	81.87	6.46	80.78	4.37	79.59	6.69	83.34	2.56
Percent of Facility Residents										
Under Medicaid	46.12	18.19	69.20	17.20	67.71	18.55	66.58	20.52	50.36	12.92
Facility Occupancy Rate	84.92	16.74	93.06	6.81	95.26	8.78	85.57	17.18	95.54	4.61
Service Demand										
Percent Age 65 or Over in County	16.73	4.64	14.05	1.37	12.98	2.14	13.67	2.16	17.55	4.96
Percent of County Females in Labor Force	52.47	5.85	53.67	4.27	45.81	6.20	50.47	5.46	53.32	7.41
Per Capita Income in Thousands	$19.78	3.92	$19.89	3.19	$16.30	2.65	$21.73	3.77	$18.73	3.32
Hospital Discharges per 1,000 Population	119.49	61.96	127.10	41.99	158.90	101.90	123.70	63.11	116.60	90.62
Population per Square Mile in Thousands	0.15	0.26	0.13	0.107	0.10	0.09	0.87	0.97	0.031	0.049
Percent of County NF Residents with Medicare Payment	14.19	9.42	12.50	2.93	7.83	5.08	16.68	6.83	37.31	7.76
Percent of County NF Residents with Medicaid Payment	45.08	8.05	66.76	6.59	65.70	12.51	65.11	6.83	50.67	8.47
Service Supply										
NF Beds per 1,000 Population	17.73	14.43	8.10	1.76	7.35	2.56	9.85	3.39	17.47	8.95
NF Residents per 1,000 Age 65 or Over	87.61	63.49	62.43	13.70	58.30	17.60	61.47	34.83	108.20	38.51
Number of RCF Beds per 1,000 County Population	1.94	1.84	3.92	1.81	1.11	1.26	1.70	6.00	1.43	1.61

[1] Freestanding facilities only.

NOTES: NF is nursing facility. SNF is skilled nursing facility. RCF is residential care facility.

SOURCE: Area Resource File, Bureau of Health Professions, U.S. Department of Health and Human Services, 1998. On-Line Survey, Certification, and Reporting System, Health Care Financing Administration, 1995.

haps further refine the enumeration of alternative service supply and demand, but these data are not available in the ARF and require either county inventories or access to State administrative records not available to this project. Moreover, the number of recipients for programs such as Medicaid HCBC, except in Ohio, is generally small both in absolute terms and in number of recipients relative to those in nursing homes. Recipient figures for 1995 in the sample States were: Kansas, 6,400; Maine, 911; Mississippi, 1,300; Ohio, 14,963; and South Dakota, 550 (Bectel and Tucker, 1998).

The supply of nursing home beds relative to demand is further controlled for in the analysis using three measures: the percentage of the county's total nursing facility population being paid for by Medicaid, the percentage being paid by Medicare, and each nursing facility's occupancy rate. The first two measures are indicators of prevailing local market conditions and reflect the context for the patient selection decisions of each facility. Occupancy rate is a direct indicator of supply-demand balance as reflected at a facility level.

An ordinary least squares (OLS) regression is used to model the relationship between nursing home case mix and the facility, demand, and supply attributes. The choice of variables in the final model derived first from the theoretical framework and then from the selection of a reduced-form model that used backward step-wise regression to eliminate highly correlated covariates. The simulation models estimated RUG case-mix proportions using these same OLS models, changing two parameters to represent the simulated effects. The simulated parameters are the proportion of nursing homes licensed for skilled nursing care and the proportion of licensed residential care beds per 1,000 population.

The SNF licensing measure was chosen as a simulation effect based on empirical findings (reported later) that show important influences on case mix within the sample States. The RCF supply measure was chosen to test the assumption that expansion of this nursing home alternative would reduce nursing home use among persons with cognitive or physical problems. Analyses and the simulations were conducted separately for each State, thereby holding constant other policies (such as certificate of need, income eligibility, reimbursement levels for LTC services, and expenditures on HCBC) and the regulation-enforcement practices prevailing within each State. Differences in these policy attributes may have affected the number of persons receiving some level of Medicaid-reimbursed HCBC. Comparing the number of HCBC recipients with Medicaid-reimbursed nursing home recipients, the percentages were as follows: Kansas, 48.8 percent; Maine, 14.9 percent; Mississippi, 11.6 percent; Ohio, 27.0 percent; South Dakota, 12.6 percent (Bectel and Tucker, 1998).

FINDINGS

Policy and Contextual Relationships

Tables 4 through 11 show the coefficients for the OLS models using nursing facilities as the unit of analysis. Tables 4-7 estimate case mix among admission patients, and Tables 8-11 show the same for continuing care patients. The results shown are for five case-mix groupings, and separate tables are shown for each State. Persons with cognitive impairment and physical impairment are represented in the case-mix groupings that are thought to be those most likely to be housed in RCF or community care settings as the supply of RCFs grows and as other policies facilitate

Table 4
Analysis of Nursing Facility Admissions Case Mix: Kansas, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	-1.40	—	-24.37	—	-29.19	—	35.49	—	46.07	—
Facility Attributes										
Facility Average Resident Age	0.08	0.72	*0.18	2.05	**0.58	2.78	0.02	0.15	0.24	1.00
Facility Percent Medicaid	0.06	1.71	-0.03	-1.14	-0.03	-0.55	0.02	0.44	0.01	0.19
Facility Occupancy	-0.06	-1.52	0.01	0.45	-0.01	-0.16	*-0.09	-2.08	0.09	1.23
Facility Number of Beds	0.01	0.34	-0.01	-0.65	0.04	1.18	0.18	0.75	-0.06	-1.48
Facility For-Profit	-0.61	-0.44	-1.36	-1.28	0.13	0.05	*3.80	2.19	-3.44	-1.21
Facility Chain	1.46	1.04	1.18	1.10	1.17	0.46	2.38	1.36	-4.07	-1.42
Facility SNF Licensed	**7.17	5.10	0.74	0.68	-0.20	-0.08	**-6.50	-3.71	-0.74	-0.26
Demand Variables										
Percent Age 65 or Over in County	0.24	1.07	0.14	0.82	-0.28	-0.68	-0.43	-1.50	0.47	1.02
County Percent of Females in Labor Force	0.06	0.33	0.21	1.43	-0.07	-0.21	-0.06	-0.24	-0.29	-0.74
Per Capita Income in Thousands	-0.03	-0.13	-0.16	-0.84	0.71	1.54	-0.36	-1.13	-0.02	-0.03
Population per Square Mile in Thousands	5.07	1.45	-1.62	0.61	-3.46	-0.55	2.07	0.48	0.87	0.12
Discharges per Thousand	*-0.02	-2.28	0.00	0.62	0.04	1.81	-0.00	-0.33	-0.01	-0.60
County Medicare Percentage	0.06	0.90	0.08	1.45	0.06	0.48	-0.03	-0.39	-0.27	-1.90
County Medicaid Percentage	0.03	0.32	0.08	1.14	0.13	0.82	-0.00	-0.03	*-0.36	-2.07
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	0.00	0.03	0.01	0.30	0.07	1.46	-0.04	-1.31	-0.05	-0.96
NF Beds per 1,000 Population in County	0.01	0.1	0.01	0.12	-0.40	-1.95	0.24	1.70	0.22	0.94
Number of RCF Beds per 1,000 County Population	-0.00	-0.02	0.02	0.36	-0.04	-0.33	0.06	0.73	0.04	0.33
Mean Case-Mix Percent	7.12	—	5.97	—	33.07	—	14.56	—	35.79	—
Adjusted R^2	**0.187	—	0.036	—	**0.102	—	*0.083	—	**0.129	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 366, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 5

Analysis of Nursing Facility Admissions Case Mix: Mississippi, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	-2.23	—	**59.33	—	45.36	—	-2.28	—	-12.28	—
Facility Attributes										
Facility Average Resident Age	0.19	1.28	**-0.65	-3.46	-0.20	-0.62	0.10	0.40	*0.70	2.20
Facility Percent Medicaid	-0.05	-1.25	0.02	0.46	-0.04	-0.42	-0.04	-0.63	0.12	1.45
Facility Occupancy	**-0.28	-3.53	-0.00	-0.02	0.16	0.90	0.20	1.49	-0.07	-0.40
Facility Number of Beds	0.02	1.50	-0.00	-0.27	0.03	1.20	0.01	0.46	*-0.06	-2.16
Facility For-Profit	*4.88	2.54	1.26	0.50	0.48	0.11	-1.27	-0.39	-7.29	-1.72
Facility Chain	-1.75	-1.39	1.59	0.96	*6.53	2.26	-2.60	-1.21	-2.13	-0.77
Facility SNF Licensed	**4.23	3.54	1.66	1.07	1.70	0.62	*-4.53	-2.23	-4.28	-1.62
Demand Variables										
Percent Age 65 or Over in County	-0.02	-0.03	-0.03	-0.05	-1.47	-1.41	-0.24	-0.31	*2.15	2.14
County Percent of Females in Labor Force	**0.41	2.83	-0.08	-0.45	0.20	0.60	-0.36	-1.48	-0.34	-1.06
Per Capita Income in Thousands	-0.11	-0.28	0.86	1.69	-0.03	-0.03	0.30	0.46	-0.93	-1.08
Population per Square Mile in Thousands	-0.43	-0.03	-22.99	-1.42	-22.63	-0.80	20.71	0.98	35.54	1.30
Discharges per Thousand	-0.00	-0.30	0.00	0.50	0.01	0.43	-0.01	-0.73	-0.00	-0.05
County Medicare Percentage	0.08	0.71	0.03	0.21	0.01	0.04	0.01	0.06	-0.24	-0.91
County Medicaid Percentage	-0.02	-0.39	-0.10	-1.33	0.01	0.07	0.11	1.15	-0.00	-0.01
Supply Variables										
NF Residents per 1,000 Population 65 or Over in County	*-0.19	-2.15	-0.03	-0.29	*-0.46	-2.34	0.02	0.17	**0.72	3.79
NF Beds per 1,000 Population in County	1.06	1.64	0.19	0.22	*3.40	2.29	0.20	0.18	**-5.37	-3.76
Number of RCF Beds per 1,000 County Population	-0.00	-0.07	-0.01	-0.32	0.01	0.25	-0.00	-0.1	0.00	0.02
Mean Case-Mix Percent	3.47	—	11.70	—	38.09	—	13.07	—	31.20	—
Adjusted R²	**0.402	—	*0.190	—	0.148	—	0.135	—	**0.305	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 6
Analysis of Nursing Facility Admissions Case Mix: Ohio, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	2.60	—	7.71	—	-17.25	—	14.99	—	**63.91	—
Facility Attributes										
Facility Average Resident Age	0.04	0.61	-0.01	-0.26	**0.38	3.77	0.02	0.36	*-0.15	-2.01
Facility Percent Medicaid	**-0.10	-3.72	0.02	1.22	**0.12	3.48	0.03	1.36	**-0.08	-2.98
Facility Occupancy	*0.06	2.07	0.01	0.48	0.06	1.43	-0.04	-1.44	*-0.07	-2.53
Facility Number of Beds	**0.04	4.19	0.00	0.5	-0.00	-0.03	*-0.02	-2.48	**-0.02	-2.95
Facility For-Profit	**5.25	4.25	-0.18	-0.21	-1.89	-1.1	0.38	0.35	**-3.91	-3.18
Facility Chain	**2.69	2.77	0.46	0.67	0.26	0.19	-0.84	-0.96	*-2.06	-2.13
Facility SNF Licensed	**7.93	6.65	**4.16	4.92	*3.46	2.21	**5.08	-4.77	**-10.72	-9.02
Demand Variables										
Percent Age 65 or Over in County	0.18	0.44	-0.01	-0.05	0.22	0.40	-0.19	-0.53	-0.17	-0.43
County Percent of Females in Labor Force	0.10	0.44	-0.02	-0.14	0.20	0.64	0.04	0.19	-0.21	-0.92
Per Capita Income in Thousands	-0.06	-0.18	-0.16	-0.64	-0.27	-0.56	-0.02	-0.05	0.40	1.13
Population per Square Mile in Thousands	0.98	0.93	0.01	0.01	-2.73	-1.87	*2.14	2.27	-0.63	-0.6
Discharges per Thousand	0.01	1.24	0.01	1.59	0.02	1.61	-0.01	-0.77	**-0.05	-4.11
County Medicare Percentage	**-0.37	-3.95	-0.01	-0.13	*0.33	2.54	0.05	0.58	0.01	0.12
County Medicaid Percentage	-0.13	-1.30	0.05	0.70	0.10	0.77	-0.02	-0.27	-0.04	-0.42
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	0.01	0.62	0.01	0.68	-0.01	-0.51	0.02	1.08	-0.03	-1.57
NF Beds per 1,000 Population in County	-0.38	-1.80	*-0.33	-2.18	0.21	0.72	*-0.02	-2.48	0.40	1.93
Number of RCF Beds per 1,000 County Population	-0.04	-0.56	0.00	0.05	0.08	0.74	-0.06	-0.87	-0.05	-0.67
Mean Case-Mix Percent	10.73	—	9.40	—	48.82	—	11.15	—	16.08	—
Adjusted R²	**0.264	—	**0.063	—	**0.068	—	*0.104	—	**0.244	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 7

Analysis of Nursing Facility Admissions Case Mix: South Dakota, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	-19.81	—	3.02	—	155.14	—	-59.01	—	-15.75	—
Facility Attributes										
Facility Average Resident Age	0.18	0.64	0.18	0.22	-0.97	-0.74	0.68	0.80	0.66	0.59
Facility Percent Medicaid	-0.02	-0.42	-0.13	-0.77	-0.16	-0.60	0.30	1.75	0.09	0.39
Facility Occupancy	0.13	1.07	0.14	0.39	0.25	0.44	0.10	0.29	-0.76	-1.59
Facility Number of Beds	0.00	0.07	0.07	1.19	0.07	0.76	-0.01	-0.24	-0.13	-1.74
Facility For-Profit	*2.79	2.52	*7.55	2.31	-2.15	-0.42	-1.52	-0.46	-5.89	-1.35
Facility Chain	0.30	0.25	-3.18	-0.91	7.74	1.43	-4.95	-1.42	0.88	0.19
Facility SNF Licensed	2.49	1.78	2.65	0.64	3.53	0.55	-3.02	-0.73	-4.75	-0.86
Demand Variables										
Percent Age 65 or Over in County	0.03	0.08	0.44	0.39	-0.80	-0.46	-1.80	-1.62	2.24	1.51
County Percent of Females in Labor Force	-0.01	-0.07	-0.42	-0.78	-0.01	-0.02	0.17	0.32	0.08	0.12
Per Capita Income in Thousands	0.02	0.06	0.57	0.70	-1.78	-1.41	0.65	0.80	0.42	0.39
Population per Square Mile in Thousands	14.75	0.89	41.30	0.85	26.42	0.35	-43.72	-0.89	-27.24	-0.42
Discharges per Thousand	-0.01	-1.46	-0.03	-1.33	-0.04	-1.20	0.04	1.50	0.05	1.64
County Medicare Percentage	-0.02	-0.33	-0.27	-1.30	0.17	0.52	-0.24	-1.16	0.36	1.29
County Medicaid Percentage	-0.11	-1.23	0.01	0.05	-0.04	-0.08	-0.07	-0.25	0.04	0.10
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	0.02	0.44	0.09	0.55	-0.12	-0.47	-0.16	-0.97	0.26	1.19
NF Beds per 1,000 Population in County	-0.15	-0.46	-0.83	-0.84	0.35	0.23	1.90	1.92	-1.76	-1.34
Number of RCF Beds per 1,000 County Population	0.05	0.14	-0.05	-0.05	1.43	0.76	-1.25	-1.27	-0.17	-0.13
Mean Case-Mix Percent	2.19	—	12.52	—	48.08	—	10.18	—	25.18	—
Adjusted R^2	*0.290	—	0.214	—	0.187	—	*0.298	—	0.252	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 8

Analysis of Nursing Facility Continuing Care Case Mix: Kansas, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	10.09	—	1.76	—	-0.87	—	-17.45	—	8.49	—
Facility Attributes										
Facility Average Resident Age	-0.02	-0.37	*0.07	2.18	** 0.42	3.41	**0.29	3.89	**0.37	2.98
Facility Percent Medicaid	0.01	0.35	-0.02	-1.77	-0.03	-0.95	*0.05	2.45	-0.02	-0.48
Facility Occupancy	**-0.05	-2.98	-0.01	-1.30	0.02	0.47	-0.00	-0.13	0.05	1.29
Facility Number of Beds	**-0.03	-3.30	-0.00	-0.84	0.02	1.22	0.01	1.14	-0.00	-0.21
Facility For-Profit	-0.27	-0.39	0.07	0.20	*3.28	2.19	0.08	0.09	-1.78	-1.17
Facility Chain	-0.45	-0.65	-0.30	-0.81	0.34	0.23	*1.82	2.04	-1.48	-0.97
Facility SNF Licensed	**2.71	3.86	0.48	1.30	-0.74	-0.49	-0.09	-0.10	-2.02	-1.32
Demand Variables										
Percent Age 65 or Over in County	-0.05	-0.43	0.01	0.14	-0.39	-1.61	-0.04	-0.28	0.48	1.91
County Percent of Females in Labor Force	-0.01	-0.12	-0.05	-0.96	-0.19	-0.93	0.19	1.57	0.01	0.04
Per Capita Income in Thousands	0.13	0.99	0.04	0.66	0.37	1.35	*-0.37	-2.25	-0.18	-0.63
Population per Square Mile in Thousands	2.92	1.68	*1.81	1.98	1.03	0.28	2.44	1.09	6.82	1.79
Discharges per Thousand	-0.01	-1.74	0.00	0.91	0.01	0.82	0.00	0.10	-0.01	-0.80
County Medicare Percentage	0.02	0.44	0.02	1.37	0.10	1.28	0.04	0.86	-0.13	-1.66
County Medicaid Percentage	-0.01	-0.20	-0.01	-0.29	0.00	0.00	0.08	1.49	0.04	0.46
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	-0.00	-0.11	0.01	1.02	-0.01	-0.35	-0.02	-1.23	0.02	0.76
NF Beds per 1,000 Population in County	-0.01	-0.18	-0.04	-1.15	0.04	0.32	0.09	1.20	-0.09	-0.69
Number of RCF Beds per 1,000 County Population	-0.04	-0.20	0.00	0.00	0.29	0.78	-0.31	-1.40	0.14	0.36
Mean Case-Mix Percent	2.69	—	4.28	—	30.55	—	16.47	—	43.09	—
Adjusted R²	**0.135	—	**0.094	—	**0.107	—	**0.104	—	**0.207	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 9

Analysis of Nursing Facility Continuing Care Case Mix: Mississippi, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	3.21	—	**83.47	—	8.48	—	0.56	—	-9.10	—
Facility Attributes										
Facility Average Resident Age	-0.06	-1.75	**-0.92	-7.98	*0.46	2.44	0.09	0.66	**0.58	2.97
Facility Percent Medicaid	-0.01	-0.69	-0.03	-0.93	0.04	0.90	0.00	0.06	0.01	0.21
Facility Occupancy	0.00	0.22	-0.02	-0.26	*-0.22	-2.14	0.10	1.33	0.13	1.28
Facility Number of Beds	-0.00	-0.67	**-0.03	-2.91	**0.04	2.65	0.01	1.11	-0.02	-1.46
Facility For-Profit	0.38	0.90	1.54	1.01	-0.39	-0.16	-0.73	-0.39	-1.30	-0.50
Facility Chain	0.16	0.58	*0.84	0.83	*3.69	2.22	-1.84	-1.49	-2.12	-1.24
Facility SNF Licensed	**0.72	2.67	-0.47	-0.49	-1.04	-0.66	0.35	0.30	0.72	0.44
Demand Variables										
Percent Age 65 or Over in County	-0.06	-0.54	0.30	0.83	0.28	0.46	0.28	0.62	-0.78	-1.27
County Percent of Females in Labor Force	**0.09	2.68	-0.02	-0.15	0.22	1.15	-0.182	-1.29	-0.22	-1.14
Per Capita Income in Thousands	-0.10	-1.19	0.32	1.03	-0.76	-1.50	-0.01	-0.02	0.53	1.01
Population per Square Mile in Thousands	-2.91	-1.05	-0.00	-0.54	-8.24	-0.51	14.86	1.23	8.18	0.49
Discharges per Thousand	0.00	1.22	0.01	1.58	-0.00	-0.24	-0.00	-0.40	-0.00	-0.46
County Medicare Percentage	*0.05	2.02	*0.24	2.53	0.21	1.39	-0.02	-0.15	0.04	0.27
County Medicaid Percentage	-0.01	-0.45	0.01	0.23	-0.01	-0.18	-0.00	-0.01	0.01	0.08
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	-0.02	-1.03	0.07	0.96	-0.19	-1.69	0.15	1.77	0.01	0.10
NF Beds per 1,000 Population in County	0.15	1.01	-0.65	-1.26	1.15	1.36	-1.02	-1.82	0.30	0.34
Number of RCF Beds per 1,000 County Population	-0.03	-0.28	*-0.69	-2.03	0.77	1.38	-0.78	-1.90	0.79	1.38
Mean Case-Mix Percent	0.95	—	11.11	—	32.46	—	13.66	—	39.49	—
Adjusted R^2	**0.237	—	**0.468	—	**0.234	—	0.155	—	*0.216	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 10
Analysis of Nursing Facility Continuing Care Case Mix: Ohio, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	1.62	—	9.27	—	**48.24	—	*20.58	—	-7.98	—
Facility Attributes										
Facility Average Resident Age	0.00	0.38	**-0.18	-5.19	-0.11	-1.78	-0.02	-0.55	**0.51	8.94
Facility Percent Medicaid	-0.00	-1.12	0.01	0.72	-0.02	-0.91	0.01	0.93	-0.02	-0.96
Facility Occupancy	**0.01	2.59	0.01	0.53	0.01	0.49	-0.02	-1.20	-0.01	-0.26
Facility Number of Beds	**0.00	3.39	**0.01	3.01	0.01	1.36	-0.01	-1.40	**-0.02	-3.04
Facility For-Profit	0.15	0.82	**-1.86	3.23	-1.00	-0.97	-0.55	-0.82	-1.11	-1.15
Facility Chain	0.18	1.25	*-0.89	-1.98	-0.23	-0.28	0.50	0.94	0.50	0.66
Facility SNF Licensed	*0.35	2.00	**3.11	5.61	**3.83	3.86	**-0.73	-2.66	**-4.26	-4.5
Demand Variables										
Percent Age 65 or Over in County	0.04	0.67	-0.14	-0.80	0.46	1.42	-0.19	-0.88	0.15	0.48
County Percent of Females in Labor Force	-0.04	-1.26	-0.01	-0.11	-0.00	-0.02	0.10	0.77	0.25	1.42
Per Capita Income in Thousands	0.01	0.11	0.13	0.80	0.27	0.93	0.12	0.61	-0.42	-1.54
Population per Square Mile in Thousands	0.17	1.12	0.50	1.03	**-2.51	-2.89	1.04	1.82	0.34	0.41
Discharges per Thousand	0.00	0.87	0.00	0.94	0.01	1.01	0.00	0.14	*-0.02	-2.28
County Medicare Percentage	-0.02	-1.46	-0.04	-0.87	-0.12	-1.55	0.04	0.88	*0.14	1.99
County Medicaid Percentage	-0.01	-0.68	**0.15	3.29	-0.14	-1.70	0.00	0.09	-0.01	-0.12
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	0.00	0.35	0.00	0.10	0.02	1.27	-0.01	-0.55	-0.02	-1.57
NF Beds per 1,000 Population in County	-0.03	-0.86	*-0.19	-2.02	-0.25	-1.46	-0.03	-0.27	*0.34	2.09
Number of RCF Beds per 1,000 County Population	-0.01	-0.84	0.02	0.59	-0.07	-1.04	0.01	0.27	0.06	0.90
Mean Case-Mix Percent	1.18	—	9.42	—	40.72	—	12.67	—	32.44	—
Adjusted R²	**0.094	—	**0.197	—	**0.071	—	**0.055	—	**0.195	—

** Significant at the 0.01 level.

* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 11
Analysis of Nursing Facility Continuing Care Case Mix: South Dakota, 1995

Independent Variable	Rehabilitation		Special Care		Complex Care		Cognitive Impairment		Physical Impairment	
	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score	Statistic	T-score
Intercept	14.49	—	**49.67	—	43.81	—	11.26	—	-15.96	—
Facility Attributes										
Facility Average Resident Age	-0.13	-1.26	**-0.46	-2.93	0.26	0.55	0.17	0.53	0.18	0.39
Facility Percent Medicaid	-0.00	-0.04	-0.04	-1.31	*0.22	2.35	0.02	0.23	*-0.23	-2.50
Facility Occupancy	-0.04	-0.88	-0.07	-0.98	0.11	0.54	0.12	0.84	-0.19	-0.96
Facility Number of Beds	0.00	0.17	0.02	1.44	0.01	0.42	-0.01	-0.38	-0.02	-0.51
Facility For-Profit	*0.89	2.16	-0.88	-1.43	*3.57	1.96	0.08	0.07	*-4.25	-2.40
Facility Chain	0.48	1.09	-0.40	-0.61	2.03	1.04	0.32	0.24	-3.00	-1.59
Facility SNF Licensed	*1.19	2.29	0.09	0.12	1.47	0.64	0.04	0.02	-2.24	-1.00
Demand Variables										
Percent Age 65 or Over in County	0.09	0.68	**0.57	2.76	-0.07	-0.11	-0.28	-0.66	-0.31	-0.51
County Percent of Females in Labor Force	0.05	0.76	0.08	0.82	*-0.60	-1.99	-0.21	-1.02	*0.63	2.16
Per Capita Income in Thousands	0.03	0.25	*-0.32	-2.09	0.16	0.36	-0.13	-0.42	0.32	0.74
Population per Square Mile in Thousands	0.13	0.02	2.15	0.24	6.78	0.25	4.13	0.22	-13.66	-0.52
Discharges per Thousand	0.00	0.25	-0.00	-0.38	-0.01	-0.69	0.01	0.87	0.00	0.29
County Medicare Percentage	-0.03	-1.07	-0.05	-1.34	0.00	-0.28	-0.08	-1.00	0.20	1.76
County Medicaid Percentage	*-0.07	-2.11	-0.07	-1.48	**-0.40	-2.66	-0.03	-0.32	**0.62	4.32
Supply Variables										
NF Residents per 1,000 Population Age 65 or Over in County	0.01	0.46	**0.09	2.96	0.12	1.32	-0.02	-0.30	*-0.18	-2.06
NF Beds per 1,000 Population in County	-0.05	-0.41	**-0.60	-3.20	-0.87	-1.58	-0.04	-0.10	**1.46	2.73
Number of RCF Beds per 1,000 County Population	0.02	0.12	-0.17	-0.92	0.90	1.64	-0.42	-1.13	-0.52	-0.99
Mean Case-Mix Percent	1.51	—	5.11	—	38.03	—	11.56	—	41.89	—
Adjusted R^2	**0.496	—	*0.308	—	*0.287	—	0.138	—	**0.501	—

** Significant at the 0.01 level.
* Significant at the 0.05 level.

NOTES: Number of cases = 142, degrees of freedom = 17. SNF is skilled nursing facility. NF is nursing facility. RCF is residential care facility.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

access to these nursing home alternatives. Rehabilitation, special care, and complex care patients are represented by case-mix groupings associated with skilled care. The prevalence of these patients, measured by the percentage of each specific case mix, holding other things constant, would be expected to change as the proportion of custodial patients declines. A direct effect from RCF policy to skilled care case mix is not expected.

Unadjusted regression coefficients show the relationship between case mix (the outcome of interest) and the facility, demand, and supply attributes included in the rows of the tables. Of particular interest in these tables is whether a facility is licensed as a SNF and the number of RCF beds. The RCF supply coefficient can be interpreted as the unit change in the case-mix percentage that occurs for each unit change in the number of RCF beds per 1,000 population. Negative coefficients for any attribute suggest a reduction of cases in a case-mix group. Coefficients associated with binary variables, such as being licensed as a SNF, can be interpreted as the absolute change in case-mix percentage when a facility is SNF licensed. This attribute has a tendency (statistically significant in some States) to be associated with increases in the skilled care RUG classifications and to have a negative association with the custodial care RUG classifications. RCF supply has similar tendencies, but with no statistically significant coefficients. The absence of a more consistent effect among all States on SNF licensing attribute may be partly the result of the analysis being limited to freestanding nursing homes. The other measures show variation among the States in the strength and pattern of association with case mix. As a group, these measures serve the function in these analyses of adjusting for differences among counties within a State. An interpretation

of their effects or a simulation of changes in these parameters is outside the scope of this article.

Simulation Results

The simulations are estimated in two models. The first sets the county's proportion of nursing homes licensed as SNFs to 100 percent and applies that State's SNF coefficient from Tables 4 through 11 to this simulated unit mix as appropriate for admission or continuing case mix. All other conditions and relationships reflected in Tables 4-11 are held constant. The second set of simulations also uses this model, while additionally setting the number of residential care beds per 1,000 population in the county to be equal to the number in Maine and applying the State's coefficient for RCF beds per 1,000 population. Simulation results shown in Table 12 reflect the case mix among nursing home admissions given these changes. Table 13 shows similar case-mix simulation results among continuing care nursing home residents.

For Tables 12 and 13, the results shown are limited to three case-mix groupings: persons in nursing homes with cognitive or physical problems as their predominant problem and patients receiving rehabilitation care as their primary reason for placement. The first set of columns shows the results when only the SNF measure is changed; the second when both the SNF parameter and RCF supply are changed. The values shown in the first row of each group are the predicted or simulated percentages of patients with the indicated RUG classification. These values represent the case mix as estimated in each facility and then averaged across nursing homes in the State. The next two rows in each group re-estimate the simulation using the upper and lower limits on the

Table 12

Simulation of Admission Case Mix: Selected States

RUG-III Category	Kansas		Mississippi		Ohio		South Dakota	
	Percent SNF = 100	RCF = Maine	Percent SNF = 100	RCF = Maine	Percent SNF = 100	RCF = Maine	Percent SNF = 100	RCF = Maine
Physical Impairment								
Mean SNF Coefficient Value	36.01	36.00	29.39	29.04	12.77	12.66	23.16	22.74
Upper Limit for SNF Coefficient	41.60	41.60	34.62	34.26	15.10	14.98	33.96	33.54
Lower Limit for SNF Coefficient	30.42	30.41	24.17	23.82	10.45	10.33	12.36	11.94
Observed Mean RUG Percentage	36.18	36.18	31.20	31.20	16.08	16.08	25.18	25.18
Cognitive Impairment								
Mean SNF Coefficient Value	11.63	12.67	11.00	12.33	9.59	9.45	8.90	5.79
Upper Limit for SNF Coefficient	15.09	16.13	15.02	16.34	11.68	11.54	17.00	13.90
Lower Limit for SNF Coefficient	8.18	9.22	6.98	8.31	7.50	7.36	0.79	-2.32
Observed Mean RUG Percentage	14.72	14.72	13.06	13.06	11.15	11.15	10.18	10.18
Rehabilitation								
Mean SNF Coefficient Value	10.71	10.61	5.26	5.47	13.18	13.08	3.25	3.36
Upper Limit for SNF Coefficient	13.50	13.40	7.63	7.84	15.52	25.42	5.99	6.10
Lower Limit for SNF Coefficient	8.31	8.22	2.89	3.10	10.84	10.74	0.51	0.62
Observed Mean RUG Percentage	7.20	7.20	3.47	3.47	10.73	10.73	2.19	2.19

NOTES: SNF is skilled nursing facility. RCF is residential care facility. Percent SNF is set to equal 100 percent in each of the two models in all States. RCF = Maine refers to the condition where all States are assumed to have the proportion of residential care facilities per 1,000 population as existed in Maine in 1995. These models also set percent SNF = 100 percent. RUG-III is Resource Utilization Groups, Version III. Upper and lower limits refer to 95-percent confidence interval.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

Table 13

Simulation of Continuing Care Case Mix: Selected States

RUG-III Category	Kansas		Mississippi		Ohio		South Dakota	
	Percent SNF = 100	RCF = Maine	Percent SNF = 100	RCF = Maine	Percent SNF = 100	RCF = Maine	Percent SNF = 100	RCF = Maine
Physical Impairment								
Mean SNF Coefficient Value	42.11	42.37	39.80	42.01	31.13	29.42	40.94	39.64
Upper Limit for SNF Coefficient	45.12	45.39	42.98	45.19	33.00	33.08	45.31	44.01
Lower Limit for SNF Coefficient	39.09	39.36	36.62	38.83	29.30	31.25	36.57	35.27
Observed Mean RUG Percentage	43.09	43.09	39.49	39.49	32.44	32.44	41.89	41.89
Cognitive Impairment								
Mean SNF Coefficient Value	16.44	15.83	13.81	11.61	12.14	12.16	13.58	10.53
Upper Limit for SNF Coefficient	18.21	17.60	16.11	13.91	13.41	13.44	14.65	13.61
Lower Limit for SNF Coefficient	14.66	14.05	11.51	9.31	10.86	10.88	8.50	7.46
Observed Mean RUG Percentage	16.47	16.47	13.66	13.66	12.67	12.67	11.56	11.56
Rehabilitation								
Mean SNF Coefficient Value	4.00	3.93	1.15	1.08	1.29	1.27	2.02	2.06
Upper Limit for SNF Coefficient	5.37	5.30	1.68	1.60	1.64	1.61	3.04	3.07
Lower Limit for SNF Coefficient	2.62	2.55	0.62	0.54	0.94	0.92	1.00	1.04
Observed Mean RUG Percentage	2.69	2.69	0.85	0.85	1.18	1.18	1.51	1.51

NOTES: SNF is skilled nursing facility. RCF is residential care facility. Percent SNF is set to equal 100 percent in each of the two models in all States. RCF = Maine refers to the condition where all States are assumed to have the same proportion of residential care facilities per 1,000 population as existed in Maine in 1995. These models also set percent SNF to 100 percent. RUG-III is Resource Utilization Group, Version III. Upper and lower limits refer to 95-percent confidence interval.

SOURCE: Swan and Newcomer, San Francisco, California, 1999.

point estimate's confidence interval. This is done to show the confidence interval for the simulated case-mix rate. The simulated estimates can be contrasted with the last row of each group, which is the observed case-mix distribution as shown in Table 2. The difference between the observed and the estimated values can be interpreted as the likely change in the proportion of patients in a particular RUG classification when the SNF licensing policy is applied and/or when the SNF policy is applied in the presence of a higher average number of RCF beds per 1,000 population. Upper and lower bound simulation intervals crossing the observed distribution are not statistically significant.

The values adopted for the simulated parameters were those from Maine. This State has LTC policies and an RCF bed supply that are reflective of what appears to be the emerging national direction for these areas of expansion.[3] For example:

- Maine's LTC reimbursement and eligibility policies are consistent with those of States such as Oregon, long considered to be the innovator in ensuring access to community care, including RCF care, (Mollica, 1998). Maine's rank in per capita HCBC spending is 10th nationally, and Oregon is ranked 7th (Bectel and Tucker, 1998).

- The number of RCF beds per 1,000 population is two to three times higher in Maine than in the other sample States. Maine (with 33) is among the top 7 States nationally in the number of

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[3] The selection of policy or market parameters from other States, as had been done in the Spector, Reschovsky, and Cohen (1996) study, was considered during the process of choosing the coefficients to use in the simulation. The choice of parameters was constrained by the desire to use empirically based coefficients in the simulation models. No national studies have compiled market-area inventories of RCF supply or have evaluated the relationship between RCF supply and nursing home case mix. Absent this information, coefficients estimated among the sample States were needed to represent the effects of nursing home licensing status and RCF supply.

licensed residential care beds per 1,000 aged population. Only Oregon (with 42) and California (with 44) have more than 40 licensed beds per 1,000 aged population (Bedney et al., 1996).

Admissions Case Mix

A positive effect of the simulated policies would be to decrease the percentage of nursing home residents with primarily physical and/or cognitive impairments and to increase the proportion who require more skilled or other complex clinical care. Among the four States for which simulations were estimated (a simulation was not conducted in Maine), the addition of SNF licensing for all nursing homes was associated with a marginal reduction in the percentage of persons who, at time of nursing home admission, were there primarily due to physical and/or cognitive impairments. In three of the States, the reduction had an absolute value of about 2 percent (comparing the simulated result with the observed rate) when the SNF coefficient was used. This occurred regardless of the underlying physical-impairment prevalence rate. These estimates were sensitive to the confidence ranges in the coefficient effects estimate. These range up to ± 12 percent relative to the observed prevalence among upper and lower limits of the SNF licensing effect. Kansas, with the highest percentage of observed physical impairment cases and the highest proportion of nursing home beds per 1,000 population, was the State least affected by the simulated SNF policy change. In all States, the addition of the simulated RCF bed supply did not materially change the admission case mix over that achieved with the SNF policy change considered alone.

Similar patterns of absolute change were observed among the cognitive-impairment case mix. The rates of absolute change var-

ied from 1 to 3 percent using the SNF effect, again with an upper and lower bound on the estimate that crosses the observed rate. This magnitude of change had the effect of leaving all States with roughly comparable proportions of patients within this RUG classification. The introduction of changes in RCF supply had an inconsistent effect across the States. In two States, it increased the proportion of nursing home residents with cognitive problems, and in one State, it had no effect over that of the SNF policy. The fourth State suggested a substantial incremental reduction with this change, but the estimate was unstable because the coefficient's confidence interval crossed the value of 0 percent.

Rehabilitation case mix was included in the simulation model primarily as a verification check. Movements toward more skilled care capacity should be expected to increase the attractiveness of nursing homes for this use, under the assumption of adequate demand. Such a growth in this level of care could occur either as custodial beds are made available through the processes modeled previously or through the use of currently vacant nursing home beds. All States reflected an absolute increase in the proportion of nursing home residents who would have a rehabilitation classification. This increase ranged from 1 to 3 percent when SNF policy effect was simulated, but the confidence interval on this estimate suggests the potential for even greater increases. These effects did not change when RCF supply context was added to the estimate.

Continuing Care Case Mix

The typical daily census of nursing resident case mix, as reflected in the classifications shown in Table 13, was less affected by the simulated policies than it was among admissions residents. For both physical and cognitive impairment, there was virtually no difference in the simulated or estimated prevalence rate from the observed rate. This suggests that the simulated SNF licensing policy had no effect on continuing custodial care case mix, holding other State policy attributes constant. The introduction of increased RCF supply, however, did suggest a marginal effect, having an absolute difference ranging from 1 to 3 percent among the States. Relative to rehabilitation case mix, the simulation of the SNF licensing policy showed very little, if any, difference in the estimated prevalence. RCF supply changes did not affect this.

DISCUSSION

Among the assumptions underlying the adoption of less restrictive State RCF policy are that consumers will have more choice in where they live and that the State may experience reduced demand for Medicaid-reimbursed nursing home stays. The States included in this analysis provide a range of environmental and policy variations within which these relationships can be tested. An earlier analysis of the potential number of nursing home residents suggested that as many as 35 percent (i.e., those with predominantly personal care needs) might be appropriately managed in settings other than nursing homes (Spector, Reschovsky, and Cohen, 1996). This estimate was based on analysis of a 1987 national probability sample of nursing home patients.

Patient characteristics based on RUG classifications were used to provide a current (i.e., 1995) estimate of nursing home case mix. Among the more than 1,500 nursing homes used in this analysis, the most common classifications are Clinically Complex, accounting for one-third to one-

half of all residents; Physical Problems, accounting for about 20 to 40 percent of residents; and Cognitive Impairment, about 10 to 15 percent of residents. Persons in these latter two groups reflect those whose needs are predominantly for personal care. Given these prevalence rates, a State would have to relocate about one-half of those in the current nursing homes due solely to physical or cognitive impairments to achieve a 25-percent reduction among nursing home residents.

Maine, with a relatively low rate of nursing home beds per 1,000 population and a relatively high rate of RCF beds per 1,000 population, was used as an exemplar. Simulation analyses were conducted in four States to estimate the change in the nursing home patient population in other States when two of Maine's policies were stipulated as present. The effect was reflected by reductions in the proportion of nursing home patients with either physical or cognitive problem classifications. The magnitude of the effect ranged from 0 to 3 percent among the States for physical impairment and 1 to 4 percent among those with cognitive impairment. Admission case mix was not associated with changes in RCF supply. Continuing care case reductions, ranging between 0 and 3 percent for physical and 0 and 2 percent for cognitive problem case mix, were less consistent among the States. Increases in RCFs were associated with most of the estimated reductions. These effects, even assuming the outer limit of the confidence interval, were too small to be statistically significant given the sample available for this analysis.

Holding other considerations constant, one might expect that the proportions of physically and cognitively frail custodial patients in nursing facilities would be lower in those communities where custodial patients could (both by policy and financing) receive care in RCFs.

Kansas and South Dakota have relatively high and comparable ratios of nursing home beds per population, comparable proportions of residents who are Medicaid recipients, and policies that are relatively facilitative of RCF use (Kansas for reimbursement and eligibility, South Dakota for reimbursement only). In both States, the simulated case mix suggests that expansion of RCF supply was not sufficient to substantially alter nursing home demand under the existing nursing home reimbursement and utilization controls currently used in States with high nursing home bed supply.

Ohio provides another permutation on the policy environment, this time reflecting an environment with RCF eligibility criteria favorable to higher levels of frailty in RCFs but with no reimbursement programs to facilitate access to this care among those with low incomes. This State, in contrast to the preceding two, has a moderate rate of nursing facility beds to the population and residents per population approximating those of Maine. Moreover, of the four States in the simulation, Ohio had the lowest observed RUG proportion for physical impairment at admission and among continuing cases even before the simulation. In this context, the simulation of Maine SNF policy produced a 25-percent reduction in the proportion of physically impaired (4 percent in absolute terms) and a comparable reduction (2 percent in absolute terms) among the cognitively impaired at admission. There were no effects associated with continuing case mix. RCF supply simulation added to these changes among the physically impaired continuing cases, where the absolute change was about 2 percent.

Mississippi is the most traditional of the States in this sample, with no financial assistance for RCF care and restrictive exclusions of the frail from these facilities.

This State has the lowest proportion of nursing home beds per 1,000 population, and the number of residents per population is lower than that of Maine. The observed proportions of physically and cognitively impaired nursing home residents are between those of Kansas and South Dakota, but the simulated SNF policy effect among admissions cases is of a magnitude comparable to most of the other States, being about 2 percent in absolute terms, and no effect among continuing cases. The addition of more RCF supply did not affect admissions cases but was associated with a small decrease in the proportion of those with cognitive impairment.

CONCLUSIONS

A number of States have begun to modify their RCF regulations and other LTC policies to facilitate access to residential alternatives to nursing home care and to possibly reduce State Medicaid expenditures on this care. Such substitutability assumes some comparability in the level of need and the availability of an appropriate service supply. Prior work by others has suggested that perhaps as many as 35 percent of those in nursing homes are there mainly because of personal care needs and that some portion of these residents could perhaps be relocated into other forms of care (Spector, Reschovsky, and Cohen, 1996). We attempted to further quantify the estimate of the potentially "relocatable" nursing home population and to assess how case mix might be expected to change in the presence of two tested policy scenarios. This was done within the context of measured nursing home and residential care service supply, community-level demand, nursing home attributes, and State policies affecting allowable levels of care. RUG-III case classifications were used to differentiate a nursing facility's case mix among both admissions and continuing residents. The analysis was applied to each of four States for whom appropriate case mix and service supply were available.

The effects of State policy scenarios were simulated by the replication of predictive models where the proportion of SNF-licensed nursing homes was set to 100 percent and the supply of RCFs per 1,000 population was set to the levels present in Maine in 1995. State LTC policies (e.g., placement eligibility for RCF care and availability of public funds for RCF care) varied among the four States, as did the relative supply of nursing beds. Facility attributes, service demand, and nursing home supply characteristics were held constant within each State.

The findings suggest that nursing facility case mix, as expressed by the proportion of persons with physical or cognitive impairment, can be affected at time of admission by adoption of policies that restrict nursing home operations to skilled levels of care. The magnitude of this effect, though small (1 to 8 percent, combining both cognitive and physical RUG classified cases) in absolute reductions, is observed in varying State conditions. This reduction is present among the two study States with high nursing home occupancy rates (95 percent), regardless of the underlying prevalence of physical impairment in the patient population, among one of two States with lower occupancy rates, and among one of two States with a high ratio of nursing home beds per population. These effects were generally not enhanced under the assumption of an expanded RCF supply. This was true even for States having somewhat facilitative (although severely constrained) RCF reimbursement or RCF eligibility criteria.

Among the continuing care population, the simulated SNF policy had very little effect on either physical- or cognitive-problem case mix within any of the States. The simulated condition of expanded RCF supply, however, does suggest a minor reduction (about a 1-percent absolute change) in most of the States and for both groups of conditions.

Conclusions drawn from these findings are qualified. The foremost limitation is the cross-sectional nature of the analysis. At a point in time, 1995 in this case, it seems likely that market forces had established a balance between the demand and supply for nursing and residential care beds. This seems to be true regardless of the sources of reimbursement or admission criteria. Recognizing this, it is likely that cross-sectional analyses assess only the very small maladjustment between supply and demand present at any one time, possibly making the policy effects predicted here downwardly biased and limited to near-term effects. For example, the simulated adjustment in market conditions (i.e., setting all nursing homes to SNF status and doubling or tripling the RCF supply) very likely would produce reductions in nursing home beds over time due to the conversion of some facilities to RCFs or rehabilitation centers, or even closure of facilities. Reductions in nursing home supply were not simulated in the analysis. However, reductions in bed supply could substantially alter the demand for beds by each of the RUG classifications. Further work using rates of change over varying periods (instead of point estimates) among the demand and supply attributes as predictors of rates of change in case mix (again instead of point-in-time estimates of case mix) may produce different results.

Important, too, is the existing disparity between the number of nursing home beds per 1,000 population and that of RCF beds in most of the study States. Within Maine, the reference case, the ratio is essentially 2:1 (i.e., 8.1 versus 3.9 per 1,000 population). In the other four States the ratio is much higher: South Dakota, 12:1; Kansas, 9:1; Mississippi, 7:1; and Ohio, 6:1. A substantial growth in RCF supply or nursing home bed supply reductions would have to occur before most States began to approach the supply mix of Maine. This can be achieved, but it will take time.

Another caution is that the attainment of a balanced supply mix by itself is not sufficient. Presently, Maine, Ohio, and Mississippi (each with different distributions of nursing home and RCF supply among their counties) have similar numbers of nursing home residents per 1,000 aged persons and similar proportions of cognitively impaired RUG classified cases in nursing homes. These States vary only in the proportion classified with physical problems. This suggests that the forces operating to affect nursing home use may be more complex than the relatively simple models used here. These models allowed the effect of all pre-existing State utilization controls and other policies affecting nursing home placement and retention to be held constant. Viewed within the context of an individual State, this was a convenient way to assess the effect of the two specific changes introduced. However, as the simulated effects on case mix were more pronounced in some States than others, it seems appropriate that attention be given to further delineation of other LTC policies and their implementation and that the supply of alternative services, such as HCBC and unlicensed housing, be incorporated into the analysis. An empirical starting point for the identification of effective State policy mixes could be those States (such as Ohio) that already have low proportions of nursing home patients classified as physically or cognitively impaired.

Many of the limitations associated with measurement, absence of case-mix or policy variation, or the time effects noted here can be overcome with longitudinal replication and refinement in the supply-and-demand attributes. The advent of the MDS system within all States will soon make such analyses feasible across the country. However, overcoming limitations arising from constrained policy options among the States may require analysis of these hypothetical innovations. A particular example is that of identifying the level of RCF reimbursement needed to facilitate access to (and stimulate supply of) residential care for low-income persons. Medicaid and State supplemental payments for RCF-level care observed among the sample States are well below market rates for such housing. Reimbursement rates more comparable to market rates could likely reduce some proportion of nursing home residents for whom Medicaid is the primary payer by allowing access to supportive housing. On average, the current proportion of Medicaid patients would have to be reduced by 50 percent to effect a 25-percent reduction in the total number of nursing home patients. The price of the daily room rate needed to affect such a change could be determined by examining the income levels of those with physical or cognitive problems entering nursing homes. As currently modeled, this effect seems most likely among ongoing cases with cognitive problems because it is among this population where the RCF supply seems to be most associated with case mix.

Although this study has limitations, the underlying findings should not be ignored. They raise a caution about the optimistic assumptions of the interplay between RCF policy and nursing home use. To the extent that effects exist, changes in nursing home demand resulting from changes in State policy will not be instantaneous.

Moreover, the upper limit of the proportion of nursing home cases with only physical and cognitive impairment likely to be affected by current and emerging LTC policy appears to be well under 25 percent of the current nursing home population. This is known not by the simulation but by the observed RUG rates. Furthermore, the findings suggest that particular attention be given to ongoing nursing home residents and the factors influencing the retention of cases with predominately physical or cognitive impairments. These proportions are more similar among States than case mix at admission, and they do not appear to have much association with RCF supply.

Finally, there is the issue of supply and demand and how they interact. States and counties that have had historically high rates of nursing home beds per 1,000 population may be somehow fundamentally different than those with lower bed supply in their preferences for nursing homes. As State policy and other circumstances begin to alter the presumed balance between the demand for and supply of long-term services, the direction of adjustment in terms of bed supply and case mix may prove to be unpredictable within communities and across the State, as they have shown to be in these simulations.

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