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Access of Medicare Patients to
Post-Hospital SNF Care

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SUMMARY

The access of Medicare SNF patients to a particular nursing home is determined by the willingness of that facility to accept any Medicare admissions at all (participation), and the number of patients the nursing home is willing to serve (utilization). Characteristics of facilities, their market areas, and state Medicaid reimbursement were found to affect both participation and utilization. SNFs in states which require Medicare certification were more likely to participate, suggesting that the cost and effort of achieving certification are a barrier to service to Medicare SNF patients. For-profit facilities, hospital-based SNFs, and larger nursing homes have higher rates of participation and serve more Medicare patients when they participate. Of most interest, conditions in the Medicaid and private nursing home markets that support high-intensity care encourage facilities to serve Medicare patients, and to admit more of them.

TABLE OF CONTENTS

LIST OF TABLES

I.   INTRODUCTION

Inadequate access of hospitalized Medicare patients to post- hospital care can increase their hospital stays, causing problems for hospitals, as well as for patients and eventually for Medicare. Under Medicare's Prospective Payment System (PPS), a hospital is paid the same amount for a case of a given type whether or not there are delays in discharging such patients because of low availability of post-hospital care.   Hospitals that experience difficulty in placing Medicare patients in post- acute care thus experience higher costs without any increase in reimbursement, unless patients exceed the outlier threshold for patient days (see Kenney and Holahan).[1]

The access of Medicare patients to post-hospital care depends on the supply of all types of post-hospital care in an area, including skilled and intermediate care nursing home beds open to private pay patients, Medicaid covered nursing home care, Medicare home health care, home-delivered nursing and personal care, as well as the Medicare-covered skilled nursing facility (SNF) care that is the focus of this analysis. This study examines a part of the picture: the access of Medicare patients to Medicare-covered skilled nursing care, as reflected by the willingness of skilled nursing facilities to provide Medicare's SNF benefit to eligible beneficiaries.

Medicare-covered SNF care is not always easily available to Medicare patients discharged from hospitals. Due to the limitations on the types of patients covered and on the facilities that can provide covered care, the Medicare SNF benefit funds less that 2% of nursing home expenditures in the

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1. Discharge delays increase the costs of the hospital which experience them, but do not directly increase Medicare hospital expenditures under PPS. Eventually, however, excess lengths of stay result in larger average payment per case, as costs of discharge delays in some areas are spread across all hospitals by rebasing.

United States (Waldo, Levit, and Lazenby). The Medicare SNF benefit is limited
to beneficiaries discharged from hospital stays of at least three days and in
need of daily skilled nursing or skilled rehabilitation services related to the
condition for which they were hospitalized. The benefit covers 100 days of
skilled nursing care, but the average covered stay was only 29.6 days in 1983
(Report to Congress).

Furthermore, some hospitalized patients who are be eligible for Medicare-
covered SNF care may not receive it, or may experience placement delays, either
because of a lack of available Medicare-certified skilled nursing home beds,
or because of the unwillingness of nursing homes to provide care to Medicare
covered patients. Some Medicare-certified nursing homes are reluctant to admit
Medicare SNF patients because of Medicare's reimbursement methods: although
Medicare patients have been shown to have greater than average care needs and
higher marginal and average costs (Shaugnessy, Dor), Medicare rates do not
cover these costs. Instead, Medicare pays nursing homes their average cost up
to a ceiling, producing a disincentive to admit SNF patients, whose costs are
likely to be higher than reimbursement.

The wide variation in the use of Medicare-covered SNF care across states
is consistent with the existence of excess demand for Medicare SNF care in the
low-utilization states. Medicare SNF admissions per thousand elderly varies
from .31 in Mississippi to 26.36 in California (Table 1, Column 1). The supply
of Medicare-certified SNF beds also varies greatly across the country, from .51
per thousand elderly in Oklahoma to 47.23 per thousand in North Dakota (Table
1, Column 5). The supply of beds available to serve Medicare SNF patients is
the product of a number of factors. These include the general availability of
nursing home beds in the state (Table 1, Column 2), and the proportion of beds
certified for SNF care (Table 1, Column 3), both due in large part to state

Table 1

Availability and Use of Medicare SNF Care

	Medicare SNF Admissions per 1000 Elderly 65+	Total Certified Beds per 1000 Elderly 65+	% Beds Certified SNF	% of SNF Beds Certified by Medicare	Medicare Beds per 1000 Elderly 65+
Alabama	22.99	44.10	71.65	82.88	25.87
Alaska	7.64	32.71	95.14	27.78	8.71
Arizona	9.46	3.58	100.00	100.00	3.58
Arkansas	3.13	62.64	65.53	6.27	2.56
California	26.36	38.94	96.92	82.81	31.29
Colorado	15.25	60.41	79.97	30.28	14.63
Connecticut	16.73	62.73	79.98	93.30	46.81
Delaware	17.86	50.29	45.08	88.53	20.07
District of Columbia	3.76	35.70	27.76	100.00	9.91
Florida	13.87	22.51	97.52	51.50	11.31
Georgia	7.98	54.93	89.26	31.16	18.28
Hawaii	13.01	26.61	69.32	99.56	18.36
Idaho	33.38	37.98	97.13	76.65	27.91
Illinois	14.45	59.08	57.69	25.71	8.76
Indiana	20.00	69.29	23.59	89.29	14.59
Iowa	13.58	76.54	3.07	88.97	2.09
Kansas	8.35	78.51	11.35	47.62	4.24
Kentucky	15.75	41.62	20.75	100.00	24.64
Louisiana	8.65	67.10	8.3	97.64	5.44
Maine	4.99	60.83	4.60	86.92	2.43
Maryland	11.00	48.71	50.58	100.00	24.64
Massachusetts	5.69	57.31	44.52	32.93	8.40
Michigan	19.86	45.03	76.48	78.34	26.98
Minnesota	12.51	90.94	65.67	32.27	19.27
Mississippi	0.31	44.87	86.59	2.69	1.04
Missouri	15.73	44.83	64.89	39.34	11.44
Montana	19.49	65.28	59.93	55.92	21.88
Nebraska	14.30	78.72	18.24	39.28	5.64
Nevada	12.37	26.99	92.67	95.10	23.78
New Hampshire	7.65	58.38	9.85	77.21	4.44
New Jersey	10.28	36.35	91.06	45.52	15.06
New Mexico	5.19	38.25	7.82	95.17	2.85
New York	17.39	44.18	75.32	100.00	33.21
North Carolina	12.38	31.07	47.36	92.02	13.54
North Dakota	20.37	78.13	73.47	82.28	47.23
Ohio	18.96	60.38	52.92	99.12	31.68
Oklahoma	4.97	70.47	1.10	66.29	0.51
Oregon	11.95	36.17	14.56	79.02	4.16
Pennsylvania	20.79	47.69	51.17	80.00	19.52
Rhode Island	13.04	67.96	22.97	89.31	13.94
South Carolina	10.30	35.64	66.47	99.36	23.53
South Dakota	3.66	81.35	60.80	10.67	5.28
Tennessee	13.57	47.01	15.41	100.00	7.25
Texas	4.30	61.36	13.75	26.43	2.23
Utah	23.92	42.38	54.70	61.15	14.18
Vermont	6.51	48.94	21.44	88.96	9.33
Virginia	7.45	38.06	10.28	100.00	3.91
Washington	12.67	51.01	92.25	13.72	6.45
West Virginia	13.06	30.59	47.27	94.94	13.73
Wisconsin	11.26	85.26	94.04	17.53	14.05
Wyoming	3.14	51.17	85.48	22.81	9.98

regulation and Medicaid reimbursement practices as well as to private demand factors. In addition, the proportion of SNF beds certified for Medicare in each state varies widely (Table 1, column 4). However, the availability of certified beds does not insure access for Medicare patients.[2] Even those facilities that have achieved certification to serve Medicare beneficiaries may not find it worthwhile to admit them when they seek care. Because Medicare payments are often low relative to the costs of caring for Medicare patients, nursing homes may instead use their certified beds to serve Medicaid or private-pay patients. This is especially likely where all types of nursing home beds are in short supply and potential private and/or Medicaid revenues are high. The current analysis is directed to examining whether Skilled Nursing Facilities choose to serve any Medicare patients, and, if so, how many they admit.

II. MEDICARE PARTICIPATION AND UTILIZATION FOR SNFS

A Skilled Nursing Facility will seek to serve Medicare patients to the extent it is worthwhile to do so, holding constant the characteristics of the facility and its market. Decisions about service to Medicare patients are considered here in two parts: the decision of a particular SNF to serve any Medicare patients (participation), and, for those facilities that do admit Medicare patients, decisions about the number of Medicare admissions per bed (utilization). A model of the nursing home as a net revenue-maximizing enterprise can identify facility characteristics that vary with the probability that serving any Medicare patients will be worthwhile, and with the desired

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2. A number of states require that facilities certified for Medicaid SNF care also be certified for Medicare. These SNFs may seek certification with no intention of providing Medicare-covered SNF care.

number of Medicare patients. Other facility characteristics not directly connected with costs and revenues are hypothesized to affect the probability of Medicare participation and the number of Medicare patients. Under certain circumstances, the model predicts that facilities will wish to serve more Medicare patients than are available. For this reason, market area characteristics indicating the availability of Medicare patients and SNF beds are included in the statistical analysis for the number of Medicare patients. The model of nursing home choice about Medicare patients is outlined below, with its implications for the variables in the statistical analysis. Then the probable impact of other facility and market characteristics on the choice to serve Medicare patients and the number of patients served is discussed.

Incremental Cost, Opportunity Cost, and Revenue

A stylized model of nursing home decision making highlights the net revenue effects of service to Medicare patients (see Appendix). In brief, the probability of a positive net return from service to Medicare patients, and the number of Medicare patients served, vary with the basic average cost of the care provided to other patients in the facility, with the number of Medicaid patients it serves, and with the degree to which the state Medicaid program ties a facility's Medicaid rate to its own average cost. These factors affect the incremental cost of serving a Medicare patient, the opportunity cost (revenue lost) of serving a Medicare patient rather than a Medicaid or private patient, and the revenue gained directly from the Medicare rate and indirectly if the Medicaid rate increases with average cost.

Consider first the basic cost of care in the facility. It is assumed that individual facilities choose to supply a particular level of nursing care to patients, and to target their services to certain types of patients, depending on local and area conditions in the private market, state payment

generosity for Medicaid patients, and its own particular characteristics. Some facilities develop their services for high-need, high-cost patients, or provide more amenities than others. Other facilities serve mostly Medicaid patients, and provide a level of service that is constrained by the state's Medicaid rates. Thus there is variation within and across market areas in facilities' basic cost of care. For convenience, we assume that, because Medicare is a national program providing post-acute care, Medicare patients on average cost more than other patients, and that the cost of serving a Medicare patient is essentially the same across facilities and areas. What differs across facilities and areas is the <u>incremental</u> cost of serving a Medicare patient: that is, the difference between the facility's basic cost per patient, determined by its target casemix, care intensity, quality, and amenity levels, and the cost of serving a Medicare patient. High-cost facilities can serve a Medicare patient without much additional cost, while lower-cost facilities must add significantly to resources to serve a Medicare patient appropriately.

The cost to a SNF of serving a Medicare patient instead of its typical patient includes not only this difference between the Medicare cost and the facility's own basic cost, but also opportunity cost, the revenue lost because the Medicare patient has replaced the typical patient. Because nursing homes are assumed to choose their mix of private and Medicaid patients so that the marginal revenue from private pay patients is equal to the marginal revenue from public patients, the revenue lost may be represented by the facility's Medicaid rate (Scanlon 1980).

Turning to revenue, there are two components of the increment to revenue that results from serving a Medicare patient. First, the facility receives a direct payment, the Medicare rate, equal to its average cost subject to a ceiling. Second is an increase in payment from Medicaid, insofar as the

Medicaid rate is responsive to average cost: the feedback from Medicare to Medicaid occurs because the Medicare patient increases average cost and thus the Medicaid rate wherever the rate is cost-related. As shown in the Appendix, this increment is greater the more Medicaid patients are being served, and the closer the connection of the facility's Medicaid rate to its own average cost. The participation decision is hypothesized to be affected by both the degree of responsiveness of the Medicaid rate setting system to average cost and also to the number of Medicaid patients served by the facility, which forms the base number to which any Medicaid rate increase applies. Utilization, the number of Medicare patients served by facilities that choose to serve any, is also affected by rate system responsiveness, but the effect of the commitment to Medicaid cannot be modelled directly.[3]

Specifically, the reimbursement method used by the state Medicaid program, interacting with the number of Medicaid patients in the facility, determines the feedback from the increase in cost induced by a Medicare patient to the total revenue to be gained from Medicaid patients. It is hypothesized that facilities in areas with flat reimbursement and strong prospective reimbursement are less likely to serve Medicare patients, other things constant, because they cannot reap this feedback from Medicare service to Medicaid revenues, and that these effects are more pronounced in high-Medicaid nursing homes.

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3. The incremental revenue for an additional Medicare patient indeed depends on both the number of Medicaid patients and on the responsiveness of the rate system. However, at the optimum number of Medicare patients, incremental revenue is driven to zero, with Medicare patients replacing Medicaid patients. Therefore, we do not expect the observed number of Medicare patients served to be affected by the interaction between rate responsiveness and the commitment of the facility to Medicaid in equilibrium for facilities that participate in Medicare.

Considering revenue and cost together, a SNF is more likely to gain positive net revenue from service to Medicare patients when its own basic costs, chosen in light of the facility's overall market situation, are high. For such a facility, the cost of serving a Medicare patient is not much greater than its basic cost, so that the incremental cost of a Medicare patient is relatively small. Facilities with the highest cost relative to the Medicaid rate should seek to admit Medicare patients, and more of them, so that Medicare average cost payment can assist them in covering both fixed and variable costs.

SNFs target their services to higher levels of nursing intensity where private demand is strong. But they also spend more on care where Medicaid rates are high enough to support high intensity care. Thus SNFs in states with high Medicaid SNF rates should be more likely to serve Medicare patients. However, because the Medicaid rate is also the opportunity cost of serving a Medicare patient instead of a Medicaid patient, nursing homes in states with high SNF rates are also expected to serve fewer Medicare patients. Thus high SNF rates both encourage high- intensity care that fosters Medicare service, and discourage facilities from serving many Medicare patients.

Medicare Certification

Nursing homes that serve any Medicare patients also face the cost of Medicare certification, a loss deducted from the total net revenue of serving the optimal number of Medicare patients. If this cost is too high, no Medicare patients will be served. Medicare certification may have a value beyond its direct impact on Medicare revenue, however, especially for facilities with certain characteristics: for example, Medicare certification may have special value in marketing the services of a nursing home. In addition, some states require that SNFs be certified for Medicare as well as Medicaid. When the value of certification is high, and where it is required, Medicare patients may

be served even though the total direct return is less than the total cost of certification and care, as long as the incremental return exceeds the incremental cost. This implies that state mandated certification should be included in the participation analysis; it presumably does not affect the number of Medicare patients served for facilities that decide to participate.

Other Facility Characteristics

A hospital-based SNF presumably has a close relationship with its parent hospital, and steady access to Medicare SNF referrals. The value to the hospital of discharging a Medicare patient to the nursing home can be added to any increment of nursing home revenues over costs for that patient. Hospital based SNFs tend to target their services to high-cost patients, so that the incremental cost of serving a high-cost Medicare patient will be relatively low. It is hypothesized that hospital-based SNFs will thus be more likely to serve Medicare patients, and will serve more of them.

Larger facilities may be more likely to serve Medicare patients, other things equal, because they can spread the fixed costs of certification over more patient days. They also may admit more Medicare patients per bed because a bed is more likely to be available when a patient seeks admission. Ownership type may affect the probability or intensity of Medicare involvement through differing management objectives and styles of care. These characteristics will be included in the statistical analysis without a priori hypotheses. Facilities with several levels of care might have more Medicare patients seeking admission, or might find Medicare patients more worthwhile because of the probability of conversion from Medicare SNF to private-pay ICF.

Market Characteristics

The demand for Medicare SNF admissions, indicated by the Medicare hospital discharges per SNF bed, are expected to affect the number of Medicare patients available to a facility. Where there are more Medicare hospital discharges per SNF bed, facilities should be able to admit more Medicare patients. The supply of competing beds, represented by the SNF beds per capita, is expected to affect the number of admissions that any facility serving Medicare patients can hope to capture. Where there are more SNF beds per capita elderly, any particular SNF will find fewer Medicare patients to admit, other things constant, and will be less likely to serve any Medicare patients at all.

III. DATA SOURCES

A data base was created for this project using the Medicare/Medicaid Automated Certification System (MMACS), and Medicare Provider Analysis and Review files for 1985 (MEDPAR). The MMACS facility file contains data on the number and certification of beds, ownership and other general information for all nursing homes certified by either Medicare or Medicaid. Patient characteristics are available on the MMACS patient characteristics file for a subset of multi-level and skilled nursing homes, and include the number of patients with various disabilities, as well as the distribution of patients in the facility by payer source. MEDPAR files contain patient specific data on Medicare covered admissions to and discharges from nursing homes and hospitals. MEDPAR data on SNF benefit use were aggregated to the nursing home level to produce facility specific data on Medicare SNF benefit admissions for the purposes of this analysis. Hospital discharge data from MEDPAR were aggregated to the market area level.

Because the percentage of patients by payer source was necessary for the analysis, the sample was limited to facilities on the MMACS patient characteristics file. The original file contained 6,555 observations; 1513 of these observations were deleted due to missing data. Another 500 were deleted due to inconsistent data, resulting in a sample size of 4,542. Twenty eight percent of these observations produced occupancy rates below 80 percent. Given that the average occupancy rate in 1985 was 91.5, (Strahan, 1987) it is unlikely that 28 percent of the observations in this sample actually had occupancy rates below 80 percent. Therefore, observations with occupancy rates below 80 percent were deleted. This was done for two reasons: 1) low occupancy rates are potentially indicative of serious data errors which would have resulted in inaccurate reporting of the distribution of patients by payer, and 2) the analysis attempts to model the behavior of average facilities; if these facilities in fact had occupancy rates below 80 percent, they are, in a sense, unusual or outliers and should be deleted. The deletion of these facilities resulted in a final analysis file containing 3,249 observations.

MEDPAR data on Medicare SNF benefit admissions were then merged to this file by provider. Market level data on median income, SNF beds per elderly, and hospital discharges were constructed and merged onto the file. Median income was developed using 1980 census data, trended forward, and SNF beds per thousand elderly was constructed with the MMACS facility file and census population data. As mentioned earlier, hospital discharges were derived from MEDPAR data files. Market areas were constructed at the three digit zip code level for rural areas and at an approximation of Metropolitan Statistical Areas (MSAs), based on three digit zip codes, for urban regions. Although not a perfect definition of nursing home market areas, this approach simulates market areas because three digit zipcodes and the approximations of MSAs are based on

existing transportation hubs and natural lines of transportation. Consequently, they reflect the local economic pattern (Rand McNally, p. 5) Although a more appropriate measure of nursing home markets may have been Health Services Areas (HSAs), because they are designed to represent health care delivery markets, it is difficult to obtain HSA level nursing home bed supply and population data. Finally, state Medicaid reimbursement characteristics were merged onto the file.

Variable definitions and statistics are presented in Table 2. Table 3 compares the means for SNFs that do and do not admit Medicare patients.

IV. ESTIMATION

The model is operationalized using a two-step procedure. The first stage estimates the probability that a SNF will serve any Medicare patients. As discussed, an important variable is the facility's basic cost of care, which ideally should be computed without the cost of Medicare patients. Unfortunately, the data set cannot provide this level of detail. The equation for the probability of any Medicare admissions uses instead market variables that indicate the likely basic cost of nursing home care, most importantly the average SNF rate for the state, and also income of the elderly, which presumably varies with private demand. Certain facility characteristics are included to represent the cost and benefit of achieving certification and other factors (state mandate; size; ownership; hospital based status). The number of SNF beds per capita elderly is expected to account for the scale of the market open to any particular facility: the proportion of facilities that find it worthwhile to serve any Medicare patients must be lower in areas with more beds per capita than in areas with few beds per capita, other things constant. Interaction terms showing Medicaid patients served times rate setting method

Table 2

The Variables

Variable Name	Definition	Full Sample		Medicare Participants	
		Mean	S.D.	Mean	S.D.
DEPENDENT VARIABLES					
ADMTCARE (MEDPAR)	Binary variable indicating nursing home admitted 1 or more Medicare SNF benefit patients.	.6605	.4736	——	——
ADMPSNF (MEDPAR)	Medicare SNF benefit patients admitted per facility's certified SNF beds.	——	——	.9602	1.6413
INDEPENDENT VARIABLES					
NONPROF (MMACS)	Binary variable indicating nursing home is a non-profit facility.	.2206	.4206	.2167	.4121
GOVT (MMACS)	Binary variable indicating nursing home is a government facility.	.0917	.2887	.0792	.2701
HBNUM (MMACS)	Binary variable indicating nursing home is hospital based.	.0785	.2687	.0848	.2787
TOTBEDS (MMACS)	Total number of beds in the nursing home.	112.31	67.56	117.29	68.06
WMINC75 (Census)	Weighted median income for those 75 and older in the nursing home market area.	$11,315	$2,205	$11,576	$2,220
TSNF65Z (MMACS & Census)	Certified SNF beds per 1000 elderly in the nursing home market area.	39.77	20.487	35.22	18.02

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Table 2 (continued)
Page 2

Variable Name	Definition	Full Sample		Medicare Participants	
		Mean	S.D.	Mean	S.D.
SNFRATE	The average medicaid SNF rate in the state in which the nursing home is located.	45.39	8.03	45.64	6.98
MCAREMAX	Binary variable indicating whether the nursing home is located in a state that mandates Medicare certification of all SNF beds.	.1748	.3800	——	——
MULTI (MMACS)	Binary variable indicating whether the nursing home is a multilevel facility with only SNF & ICF beds.	——	——	.1645	.3708
ESICF (MMACS)	Binary variable indicating whether the nursing home is a multilevel facility with dual certified SNF/ICF beds.	——	——	.1645	.3708
PMCAID (MMACS)	The percentage of Medicaid & private patients in the nursing home which are Medicaid.	——	——	.5987	.2665
FLATREV (LAUDICINA)	A binary variable indicating the nursing home is located in a state with a flat rate Medicaid nursing home reimbursement system.	——	——	.1855	.3888
PROSTRONG (LAUDICINA)	Binary variable indicating the nursing home is located in a state with a strong prospective Medicaid reimbursement system.	——	——	.2908	.4542

Table 2 (continued)
Page 3

Variable Name	Definition	Full Sample		Medicare Participants	
		Mean	S.D.	Mean	S.D.
PROSWEAK (LAUDICINA)	Binary variable indicating nursing home is located in a state with a Medicaid reimbursement system which makes casemix adjustments.	———	———	.3350	.4721
IMCAIDFR	Interaction between PMCAID and FLATREV.	.1307	.2864	———	———
IMCAIDPS	Interaction between PMCAID and PROSTRONG.	.1918	.3317	———	———
IMCAIDPW	Interaction between PMCAID and PROSWEAK.	.2319	.3354	———	———
IMCAIDCM	Interaction between PMCAID and CASEMIX.	.1377	.2793	———	———
NURSTBED	Nurses per total beds in the facility	———	———	.1336	.0766
RNTNURS	Proportion of total nurses that are RNs	———	———	.4496	.1966

Table 3

Means for Participating and Nonparticipating
Skilled Nursing Facilities

	No Medicare Admissions	Admits Medicare	t-statistic
Nonprofit	0.255	0.217	2.445*
Government	0.116	0.079	3.449**
Hospital-based	0.066	0.085	-1.808
Multilevel	0.077	0.164	-6.729**
Dual-certified Beds	0.827	0.728	7.902**
Licensed Nurses per Bed	0.128	0.134	-1.110
Proportion RNs	0.410	0.450	-1.094
Proportion Medicaid	0.706	0.599	12.328**
Total Beds	102.615	117.288	-5.964**
Elderly Income	10.807	11.576	-0.973
SNF Beds per 1000	48.607	35.223	17.405**
Required Medicare Cert	0.070	0.229	-13.389**
State SNF Rate	42.964	46.635	-11.556**
Medicare Discharges SNF Bed	3.237	4.490	-6.440**
Flat Rate	0.243	0.185	3.993**
Strong Prospective	0.267	0.291	-1.452
Weak Prospective	0.461	0.335	7.090**
Casemix Adjusted	0.195	0.245	-3.224**

  * < .10 level.
 ** < .05 level.
*** < .01 level.

represent the size of the potential feedback to revenues from increases in the Medicaid rate when costs go up due to Medicare service.

The second stage estimates Medicare admissions per SNF bed given that at least one Medicare patient was served during the year. The opportunity cost of serving an additional Medicare patient is represented by the average Medicaid SNF rate for the state, by variables indicating the strength of the nursing home's private demand (elderly income, proportion non-Medicaid patients in the facility), and by an indicator for dual certification of beds to serve both SNF and ICF patients. The preferred version of the second stage includes two variables related to facility- specific costs, the full time equivalent licensed nurses per bed (registered nurses plus licensed practical nurses), and the ratio of registered nurses to total licensed nurses. Area market characteristics that may limit the number of Medicare patients available to any particular facility include measures of the number of SNF beds per capita elderly and the Medicare hospital discharges per SNF bed. Also included are facility characteristics (ownership type, multilevel, hospital based, size). The role of reimbursement systems in increasing or reducing the number of Medicare admissions, other things constant, is considered by including dummy variables representing reimbursement types; as noted above, it is not appropriate to include the interaction with Medicaid when considering the number of Medicare admissions.

V. FINDINGS

Probability of Medicare Participation

The probability that a skilled nursing facility would admit any Medicare patients was estimated using probit analysis. Results are presented in Table 4. The chi-squared statistic is highly significant, and rho (change in

Table 4

Probability of Medicare Participation

	Coefficient	t
Constant	-0.764	-3.15***
SNFRATE	0.042	10.91***
WMINC75	3.177	2.28**
IMCAIDFR	-1.234	-9.32***
IMCAIDPS	-0.544	-4.16***
IMCAIDPW	-1.594	-12.41***
IMCAIDCM	-0.712	-6.27***
IMCAIDR	0.068	0.35
MCAREMAX	0.042	10.91***
HBNUM	0.641	5.87***
TOTBEDS	0.00298	8.35***
NONPROF	-0.397	-6.14***
GOVT	-0.463	-4.76***
TSNF65Z	-0.014	-10.83***
N		3249
Log Likelihood		-1652.30
Restricted Logliklihood		-2081.8
RHO		0.206235
Percent Predicted Correctly		76.6%

*** > 99%
** > 95%

likelihood function over initial likelihood with no explanatory variables) is
.206. The equation correctly predicts 76.6% of the actual outcomes.

Nursing homes are able to maintain higher basic costs in states with
generous SNF rates and/or strong private demand. Nursing homes located in
states with high Medicaid SNF rates were thus able to provide higher intensity
care. The probit equation shows that these facilities were more likely to
admit Medicare patients, indicated by the positive relationship between the
probability of Medicare admissions and both the state's average SNF Medicaid
rate; (SNFRATE) and elderly income (WMINC75, indicating stronger private
demand). The SNF rate has a large impact: computing the effect of a change in
the SNF rate around the sample probability of serving Medicare patients (.66)
shows the probability rising to .77 for a facility in a state with a SNF rate
one standard deviation above the sample mean, and falling to .53 for a SNF in a
state one standard deviation below the mean...

The interactions between Medicaid and the rate setting systems showed an
interesting pattern. For a given Medicaid involvement, SNFs in flat-rate
states (least feedback from Medicare to Medicaid, shown by IMCAIDFR) were less
likely to serve Medicare patients than those with retrospective reimbursement
(most feedback from Medicare to Medicaid, shown by IMCAIDR; the latter
coefficient is not significantly different from zero). (The difference at the
mean probability for SNFs whose non-Medicare patients were all Medicaid for
these two reimbursement types would be a drop of approximately 42 percentage
points in probability). However, weak prospective systems, which presumably
should provide a reimbursement environment more like full cost reimbursement
than like flat rate systems, apparently had a more chilling effect on Medicare
use (as shown by the coefficient for IMCAIDPW of -1.59) than did flat rate

systems (coefficient of IMCAIDFR only -1.23); and the variable representing strong prospective systems, IMCAIDPS, had a coefficient of -.543.[4]

States with case-mix-adjusted Medicaid reimbursement systems are able to pay higher rates for more difficult Medicaid patients. The coefficient for the variable representing the interaction of Medicaid use with the presence of a casemix- adjusted system (IMCAIDCM) is significant and negative, indicating that SNFs are less likely to serve Medicare patients when they are paid more appropriately for Medicaid patients.

A variable representing the state requirement that all Medicaid SNFs be certified for Medicare (MCAREMAX) had a coefficient of .042, adding approximately four percentage points to the probability of serving Medicare patients at the mean. This implies that, other things equal, SNFs in states requiring certification are more likely to serve some Medicare patients; presumably some of these facilities would not undertake certification if it were not required, but once they have spent certification costs, Medicare admissions are worthwhile considering only Medicare revenues and variable costs.

Hospital-based SNFs, as expected, are much more likely to serve Medicare patients, as shown by the coefficient of HBNUM. At the sample mean probability, the shift from free-standing to hospital-based results in an increase of approximately 22 percentage point increase in the probability of serving Medicare patients, other things constant.

Larger SNFs are slightly more likely to serve Medicare patients, as shown by the very small but statistically significant coefficient for TOTBEDS, the

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4. For weak prospective versus flat rate, the predicted decrease in probability at the sample mean was .14; and facilities in strong prospective states had 16 percentage points lower probability of serving Medicare patients than did facilities in cost reimbursement states.

total size of the facility. Increasing bed size by ten percent at the mean for the sample, from 112 to 123, increases the predicted probability of serving any Medicare patients by approximately one percentage point.

Government and nonprofit facilities are significantly less likely to serve Medicare patients. The coefficient for NONPROF indicates that the probability that a nonprofit facility will serve Medicare patients is fifteen percentage points smaller than that for a for-profit SNF, and government facilities have a probability of serving Medicare patients approximately 17 percentage points smaller than proprietaries, other things equal (GOVT).

Finally, SNFs located in areas with more beds per capita are significantly less likely to serve Medicare patients, as shown by the coefficient for bed supply variable, TSNF65Z. At the means for all variables, a ten percent increase in SNF beds per capita would result in a decrease in the probability of serving Medicare patients of approximately two percentage points for any SNF in the area, other things equal.

Admissions per Bed for SNFs Serving Medicare Patients

The second stage of the model (Table 5) estimates the number of Medicare patients admitted per bed, given that the SNF serves any Medicare patients. The preferred version of the second stage (model 1) includes two variables associated with facility specific cost, the number of licensed nurses (registered nurses and licensed practical nurses) per bed and ratio of registered nurses to licensed nurses. Both versions of the second stage include as a variable the inverse of Mill's ratio (Heckman 1979):

$$= \frac{\phi(Z)}{1 - \Phi(Z)}$$

Table 5

Medicare Admissions per SNF Bed

	Model 1		Model 2	
	Coefficient	T-Statistic	Coefficient	t-Statistic
Constant	2.756	6.82***	3.181	7.91***
SNFRATE	−0.014	−2.01***	−0.010	−1.49****
WMINC75	−139.863	−0.78***	−0.006	−0.33
PMCAID	−2.058	−10.78***	−2.117	−11.38***
ESICF	−0.715	−8.38***	−0.707	−8.24***
NURSTBED	3.043	6.90***		
RNTNURS	0.442	2.58***		
TSNF65Z	−0.010	−3.23***	−0.009	−3.04***
DISH2	0.062	10.14***	0.060	9.90***
HBNUM	1.216	8.02***	1.350	8.92***
TOTBEDS	0.002	4.05***	0.002	2.91***
NONPROF	−0.535	−5.72***	−0.414	−4.44***
GOVT	−0.714	−4.89***	−0.550	−3.76***
MULTI	0.246	2.66***	0.194	2.08**
FLATREV	−0.523	−3.34***	−0.510	−3.25***
PROSTRNG	−0.437	−3.92***	−0.381	−3.40***
CASEMIX	−0.186	−1.82*	−0.172	−1.67*
LAMDA	0.895	3.11***	0.741	'2.57***
R-squared	0.28348		0.26526	
Adj. R-square	0.27742		0.25974	
N	2146		2146	
F(18,2127)	46.75	F(16,2129)	48.04	

* < .10
** < .05
*** < .01
**** .13

where Z is the score computed by the probit equation, ϕ is the standard normal density, and Φ is the normal cumulative distribution. LAMDA is the hazard function for the inclusion of the observation in the sample with non-zero admissions; it is an increasing function for each observation of the probability that the particular SNF participates in Medicare. Inclusion of LAMDA as an independent variable in the equation is necessary to avoid biased estimates. It is expected that the stronger the impetus to participate, the more patients will be admitted.

The variables representing the opportunity cost of serving Medicare patients (instead of Medicaid or private-pay) have the expected signs in both equations: the higher is the state average Medicaid SNF rate and the higher is income of the elderly, the fewer will be admissions per bed. (The former variable, SNFRATE, is highly significant only when facility-specific costs are included, and the latter variable, WMINC75, is not significant in either version). SNFs with beds dually certified as SNF and ICF, indicated by ESICF, admit fewer Medicare patients per bed, possibly because of more flexible opportunities to use available beds.

The individual SNF's involvement in the Medicaid market (PMCAID, the proportion of non-Medicare patients that are Medicaid) was included as an opportunity cost indicator, but behaved as a facility cost indicator. It had a negative impact on admissions per bed, possibly showing that lower cost facilities, reliant on Medicaid, are unable to serve many Medicare patients profitably.

Ideally, the model should include the cost of care in the specific facility for all non-Medicare patients, to include implicitly the incremental cost of Medicare patients. The nursing resources per bed, approximated by two available variables showing the number and mix of licensed nurses only, must

vary with basic cost of care, but also must be affected by the number of Medicare patients served, because these patients are more expensive to care for. The coefficients of the two facility-specific cost variables, NURSTBED and RNTNURS, were positive and significant, showing that high-cost facilities serve more Medicare patients. Because the direction of causality is especially unclear for these variables, a second version of the equation is displayed which does not include them.

The market variables also had expected signs. The rate of admissions per bed was significantly lower for SNFs located in areas with many SNF beds per population (shown by TSNF65Z), because in such areas, available admissions must be shared among many beds. Admissions per bed are higher for SNFs in areas where Medicare hospital discharges per SNF bed were high (shown by DISH2), because availability of admissions per SNF bed is greater.

Hospital-based facilities had significantly more admissions per bed than did free standing facilities, as shown by the large and significant coefficient for HBNUM. SNFs with more beds were able to achieve higher admission rates (TOTBEDS), but the effect was small, with an increase of only .02 for a 10% increase in bed size at the mean.

Nonprofit and government SNFs that serve Medicare patients serve fewer of them, as shown by the significant negative coefficients for NONPROF and GOVT. Multilevel facilities, all else constant, serve significantly more Medicare patients, with a coefficient for MULTI of .246.

The coefficients for the reimbursement system types show that fewer Medicare patients are served where there is less feedback from Medicare costs to the Medicaid rate. The reimbursement system variables showed a monotonic progression from flat systems (decreasing the admission rate by .501 in comparison with the omitted case, retrospective reimbursement) through strong

prospective (decrease admission rate by .381) and weak prospective (decrease
admission rate by .354). These coefficients are consistent with the expected
pattern of feedback to the Medicaid rate from Medicare utilization: feedback is
greatest, making Medicare patients most attractive, under full cost and weak
prospective systems, and there is no feedback under flat rate systems, making
Medicare patients less attractive. The negative effect of casemix
reimbursement in conjunction with strong or weak prospective reimbursement is
shown by the coefficient of CASEMIX and may indicate, as in the first-stage
equation, that Medicaid patients are more attractive in casemix states than
elsewhere, other things equal.

VI. SUMMARY AND CONCLUSIONS

The statistical analysis shows that certain types of Skilled Nursing
Facilities in areas with certain market characteristics are more likely to
participate in the Medicare program, and will admit more Medicare patients if
they do participate. More skilled nursing facilities will actively participate
in Medicare where the Medicaid reimbursement system supports high-intensity
care through a generous SNF rate, and through cost-related reimbursement
systems. SNFs in states which require Medicare certification were more likely
to participate, suggesting that the cost and effort of achieving certification
are a barrier to service to Medicare SNF patients. Possibly because they can
spread costs of certification over more beds, larger facilities also were more
likely to find participation worthwhile; they also had a higher flow of
Medicare admissions per bed when they did participate. Hospital-based SNFs had
higher rates of participation and served more Medicare patients when they
participate, presumably because of the value to the hospital of smooth
discharge of Medicare patients to SNF care.

Facilities that participate in Medicare but face a higher opportunity cost of serving Medicare patients because of a high average Medicaid SNF rate will admit fewer patients; and facilities that are staffed to provide higher intensity nursing will admit more Medicare patients.

In general, conditions in the Medicaid and private nursing home markets that support high-intensity care encourage facilities to serve Medicare patients, and to admit more of them. Under Medicaid cost reimbursement, certain SNFs are able to staff for and serve high-need patients, and can add Medicare patients to this mix with relative ease. The same should be true under reimbursement systems with SNF rate levels that permit nursing intensity sufficient for high-need patients, and under case-mix adjusted systems that recognize the costs of facilities serving high-need Medicaid patients.

In some areas at least, the availability of Medicare hospital discharges affects the admission rate for participating SNFs (shown by the positive, significant coefficient of DISH2, discharges per SNF bed). This implies that in some markets, demand may be the limiting factor, with more SNFs willing to supply care than there are Medicare patients who need it.

The degree to which SNFs in various states specialize in caring for high-need patients, including those eligible for Medicare, would be useful to pursue. The current analysis indicates that any specific SNF is less likely to participate in Medicare where the SNF beds per thousand elderly is high, showing specialization. Different approaches to Medicaid reimbursement may support different degrees of specialization, and may indirectly affect the availability of care for Medicare patients as a particular segment of those with high need.

APPENDIX

It will be worthwhile for a Skilled Nursing Facility to participate in Medicare by seeking certification as a Medicare SNF and to serving Medicare patients whenever the increment to revenue due to serving these patients is greater than the cost of certification and the incremental direct and opportunity costs of patient care. This stylized model considers these components of incremental costs and revenues to identify the factors that affect Medicare participation (the decision to serve any Medicare patients) and utilization (the number served) for inclusion in the statistical analysis.

The model assumes that the facility staffs a target number of beds, B, which are filled. (Table A-1 defines symbols.) Because Medicare is a marginal source of patients and revenue for most SNFs, the model treats as fixed certain of the SNF's decision variables, including size and basic average cost, which are chosen in light of public and private market characteristics. For simplicity, the model takes beds devoted to private pay patients as fixed in advance, with the beds for non-private (Medicare and Medicaid) patients represented by B_p. Thus Medicare patients are always seen as displacing Medicaid patients. The model is presented in terms of patient use of beds and cost on a daily basis; multiplying by 365 would yield annual costs and patient days.

Average Cost per Patient Day. Each facility has a particular average cost, defined as fixed cost per bed (F/B) plus a constant cost per patient (c); costs vary across facilities depending on private and public market factors. If Medicare patients are served, average cost rises. As noted in the text, the model assumes a constant per patient cost (C) for Medicare patients across facilities, plus a scale factor b that indicates that cost per Medicare patient

Table A-1

Symbols for Model of Nursing Home

B	=	beds
B_p	=	public beds, Medicaid plus Medicare
F	=	total fixed cost per day
c	=	per diem basic cost
$C+bM$	=	per diem Medicare cost
M	=	Medicare patients
R_F	=	fixed per diem portion of Medicaid rate
a	=	responsiveness of Medicaid rate to cost; $0 < a < 1$
C_c	=	Certification cost

increases as more Medicare patients are served.[5]   Nursing homes vary in their
incremental cost of serving a Medicare patient: $(C - c)$ is larger for
facilities with low basic costs (low values for c) and smaller for facilities
that are targeting a high-intensity market (high values for c). When Medicare
patients are served, average cost increases by $(C-c + bM)$ times the proportion
of Medicare patients being served, M/B.

   Medicaid Rate. The Medicaid rate is represented by a fixed portion, R_F,
and a portion that is related to actual average cost according to the ratio a,
as follows:

$$\text{Medicaid rate} = R_F + a \left[F/B + c + \frac{M (C + bM - c)}{B} \right]$$

The value of a, showing the relationship of the rate to cost, is 0 in states
where the Medicaid program sets flat rates, and 1 in states where Medicaid pays
full average costs retrospectively. More common than either flat rate or full
cost retrospective reimbursement systems today are systems where some portion
of average cost is reimbursed, either retrospectively or through the rebasing
of prospective rates; these are shown in the model by a value for a between 0
and 1. Reimbursement systems that respond to case mix have a non-zero value
for a, because costs of caring for a more difficult casemix are recognized.
Strongly prospective systems are presumed to have a lower value for a than
weakly prospective systems, which are frequently rebased.

   The model emphasizes the feedback from Medicare patient costs to the
Medicaid rate: average cost increases when Medicare patients are served, and

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5. Without this factor indicating diseconomies of serving Medicare patients, a
    nursing home would seek to fill all beds with Medicare patients whenever it
    was worthwhile for it to serve one patient.

this increases the Medicaid rate to the extent that the Medicaid rate is responsive to average cost.

Medicare Rate. The Medicare rate is treated here as if it were equal to average cost. For facilities with cost exceeding the Medicare ceiling, the Medicare rate is less than average cost.

Net Revenue. Each nursing home manager is assumed to decide whether to serve Medicare patients by comparing net revenue at the optimum Medicaid, private, and Medicare utilization with and without Medicare patients. Net revenue per day for a nursing home serving Medicare patients is shown in line 1 of Table A-2, and that for the same nursing home serving no Medicare patients in line 2. It is assumed that the number of beds allocated to private patients is determined on the basis of private demand factors, in conjunction with resource input decisions (c) and so on; and that Medicare patients displace Medicaid patients. Although this is not strictly true, as noted in the text we can assume that the number of private patients served is chosen so that marginal revenue equals the Medicaid rate, so that this assumption does not affect the analysis of the incremental profitability of Medicare patients. In the model, the number of beds allocated to public (both Medicaid and Medicare) patients is represented by the symbol B_p, set for each facility. The components of net revenue in equation 1 are private revenue, Medicaid revenue, Medicare revenue, total cost, and Medicare certification cost; in equation 2 only private revenue, Medicaid revenue and total cost are present, and there is no feedback from Medicare patient costs to the Medicaid rate, because no Medicare patients are served. Equation 3 shows the difference, or incremental net revenue. This has five components:

o   the increase in Medicaid rate due to the increased cost of Medicare patients,

$$a \ (M/B) \ (C + bM - c)$$

$$(1) \quad \pi_M = (B - B_p) P + (B_p - M) \left[R_F + a \left(\frac{F}{B} + c + \frac{M}{B} (c + bM - c) \right) \right] +$$
$$M \left[\frac{F}{B} + c + \frac{M}{B} (c + bM - c) \right] - \left[F + cB + M (c + bM - c) \right] - C_c$$

$$(2) \quad \pi_{NOM} = (B - B_p) P + B_p \left[R_F + a \left(\frac{F}{B} + c \right) \right] - \left[F + cB \right]$$

$$(3) \quad \Delta \pi = B_p \left[a \frac{M}{B} (c + bM - c) \right] - M \left[R_F + a \left(\frac{F}{B} + c + \frac{M}{B} (c + bM - c) \right) \right]$$
$$M \left[\frac{F}{B} + c + \frac{M}{B} (c + bM - c) \right] - M (c + bM - c) - C_c \overset{?}{>} 0$$

$$(4) \quad \frac{d \Delta \pi}{dc} = M \left[- \frac{B_p}{B} a + (1 - a)(1 - \frac{M}{B}) + 1 \right] > 0$$

$$(5) \quad \frac{d \Delta \pi}{da} = - M \left[\frac{F}{B} + c - \left(\frac{B_p - M}{B} \right) (c + bM - c) \right] \overset{?}{\lessgtr} 0$$

$$(6) \quad \frac{d \Delta \pi}{dB_p} = a \frac{M}{B} (c + bM - c) > 0$$

is multiplied by the number of beds allocated to non-private patients.

o the opportunity cost of serving a Medicare patient is the Medicaid rate, and this is multiplied by the number of Medicare patients served.

o direct Medicare revenue is equal to the number of Medicare patients served times the Medicare rate.

o the incremental cost of Medicare patients is their per diem cost (C-c) times the number of Medicare patients served.

o certification cost, Cc, is paid only if the facility serves some Medicare patients.

The question then becomes whether incremental net revenue is greater than zero. We can consider whether this is more likely for different types of facilities or in different markets by considering the derivative of incremental net revenue with respect to various variables of interest. First, the derivative of incremental net revenue with respect to the facility's basic cost (equation 4) is always positive, meaning that incremental net revenue is more likely to be greater than zero the higher is basic cost. As discussed in the text, this means that facilities that are staffed to serve high need patients are more likely to find Medicare patients profitable.

The derivative of incremental net revenue with respect to a, the responsiveness of the Medicaid rate, is less than zero when costs are high and Medicaid utilization is low, but is greater than zero for facilities serving many Medicaid patients with relatively low basic costs (equation 5).[6] The direction of the effect of the responsiveness of a state's Medicaid rate system

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6. The second term of the derivative compares basic cost (F/B + c) to the incremental cost of Medicare patients (C-c) times the proportion of beds allocated to Medicaid patients ($(B_p - M)/B$). If the basic cost of the facility (c, F/B) is very low or the proportion of beds allocated to Medicaid patients is very large, the second term of the derivative could be negative, making the derivative of incremental profit with respect to a positive.

to average cost on the probability of Medicare participation could be positive or negative, depending on the facility's commitment to Medicaid patients. The empirical analysis will test the effect of responsiveness in combination with Medicaid utilization.

Finally we consider the derivative of incremental net revenue with respect to the number of beds allocated to public (Medicaid and Medicare) patients. This is always positive because of the feedback from the Medicare utilization to the Medicaid rate. Thus facilities whose optimal number of Medicaid patients is high in the absence of Medicare patients are more likely to find Medicare patients profitable, other things equal.[7]

The higher is certification cost, the less likely are facilities to serve any Medicare patients.

Number of Medicare Patients. Table A-3 shows the conditions for maximizing net revenue when Medicare patients are served. Corner solutions are possible under a number of conditions: serving any Medicare patients is not worthwhile when equation (1) does not represent a maximum, i.e. when the second derivative (equation 2) is positive; and the optimum number of Medicare patients may not yield a positive net revenue (equation (3), Table A-2). Assuming that the number of Medicare patients that satisfies (1) does represent a maximum, totally differentiating (1) with respect to M, c, a, and B_p can indicate the expected direction of change in the number of Medicare patients served (M) for an increase in basic cost (c), responsiveness of the Medicaid rate system (a), and beds allocated to non-private patients (B_p).

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7. "Other things" include the basic cost of care and other factors; in the empirical work, a higher proportion of patients who are Medicaid patients is associated with lower basic costs for the facility.

$$(1) \quad \frac{d\pi}{dM} = -R_F + (1-a)\left[\frac{F}{B} + c + \frac{M}{B}(c+bM-c) - \left(1+\frac{M}{B} - a\,\frac{B_p-M}{B}\right)\right] *$$
$$(c+2bM-c) = 0$$

$$(2) \quad \frac{d^2\pi}{dM^2} = \underbrace{\frac{2(1-a)}{B}(c+2bM-c) - 2b\left(1 - \frac{M}{B} - a\,\frac{B_p-M}{B}\right)}_{**} < 0 \quad \begin{array}{l}\text{for a}\\\text{maximum}\end{array}$$

$$(3) \quad \frac{dM}{dC} = \frac{(1-a)\left(1-\frac{M}{B}\right) + \left(1 - \frac{M}{B} - a\left(\frac{B_p-M}{B}\right)\right)}{-**} > 0$$

$$(4) \quad \frac{dM}{da} = \frac{-\left[\frac{F}{B} + c + \frac{M}{B}(c+bM-c)\right] + \frac{B_p-M}{B}(c+2bM-c)}{-**} \gtrless 0$$

$$(5) \quad \frac{dM}{dB_p} = \frac{\frac{a}{B}(c+2bM-c)}{-**} > 0$$

Table A-3

Consider first the derivative of the optimal number of Medicare patients (M) with respect to basic cost (c) (equation 3). The numerator is always positive and the denominator is minus 1 times the second derivative of the net revenue function with respect to M, negative for a maximum. This means that dM/dc is positive: the higher is basic cost, the greater will be the optimal number of Medicare patients.

Equation (4) shows the derivative of the optimal number of Medicare patients with respect to a, the responsiveness of the rate system. The denominator is again positive, but the numerator may be positive or negative depending on the relationship of average cost (the first term in the numerator) to the proportion Medicaid times the marginal cost of a Medicare patient (the second term of the numerator). As with the participation decision, the effect of the responsiveness factor on Medicare utilization will be estimated empirically.

The derivative of the optimum number of Medicare patients with respect to B_p, the number of beds devoted to nonprivate patients, is greater than zero (equation 5). Intuitively, additional Medicare patients are more profitable where there are more Medicaid patients to capture the Medicaid rate increases due to increased cost, other things constant.

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