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DISSERTATION

Variation in the Utilization of the Medicare Skilled Nursing Facility Benefit

Scott C. Harrison

August 1989

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Published by The RAND Corporation
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90406-2138

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N-2948-RGSD

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The original version of this study was prepared as a dissertation in January 1989 in partial fulfillment of the requirements of the doctoral degree in public policy analysis at the RAND Graduate School. The faculty committee that supervised and approved the dissertation consisted of C. Richard Neu (Chairman), Joan Buchanan, Daniel Relles.

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PREFACE

This Note is an analysis of variations among metropolitan areas in the utilization of skilled nursing care by Medicare beneficiaries. This analysis was supported in part by Health Care Financing Administration cooperative agreement 99-C-98489/9-04. Additional support was provided by Health Care Financing Administration cooperative agreement 17-C-98891/5-02, which supports a larger study of postacute care for Medicare beneficiaries. This larger study is being carried out jointly by the School of Public Health of the University of Minnesota and The RAND Corporation.

SUMMARY

Previous work for the Health Care Financing Administration (HCFA) has shown that there are large interstate variations in the utilization of Skilled Nursing Facility (SNF) services under the national Medicare program. The primary purpose of this Note is to address the question of whether local market characteristics play a part in explaining this variation in the utilization. Within this broader purpose, this Note pays special attention to local market factors and to state Medicaid policies toward nursing homes that may affect Medicare SNF utilization. In addition, some analyses examine the influence of hospital and patient characteristics on the utilization of Medicare SNF services.

The study is based on data from July 1984 through June 1985. During that time, the Medicare SNF benefit was strictly a short-term, posthospital care benefit. The patient must have spent three days in a hospital no more than 30 days prior to admission to an SNF; and coverage in the SNF averaged only 29 days. The restricted nature of the benefit limited the impact that Medicare has had on the nursing home industry. Only 2 percent of the industry's revenue comes from Medicare, while about 50 percent comes from the state Medicaid programs. Therefore, it is thought that Medicaid policies may affect the Medicare SNF program in many parts of the country.

Medicare and other local market characteristics may also affect SNF utilization. One of the primary local factors examined is the supply of Medicare-certified SNF beds in a market. Other local characteristics explored include the supply of hospital-based SNF beds and physicians, demographics, and practice patterns.

Data on utilization come from a 20 percent random sample of Medicare patients discharged from hospitals during the time period starting July 1, 1984, and ending June 30, 1985. A patient was considered to have used SNF services if he or she had a Medicare-covered stay in an SNF that began no more than 30 days after hospital discharge. In addition, an SNF user could not have received Medicare-covered rehabilitative or home health care between discharge from the hospital and admission to the SNF.

This Note uses two different modeling approaches to analyze the variation in utilization. The first approach is a market-level model that seeks to examine the variation in utilization across metropolitan areas. Utilization in a metropolitan area is defined as the number of SNF users per Medicare hospital discharge in the area. Hypotheses relating market characteristics to the utilization in the metropolitan area market are tested, as are hypotheses relating state Medicaid policies to the supply of Medicare-certified SNF beds in metropolitan areas.

In order to test the hypotheses on a market level, two-stage, least -squares regressions are estimated for a system of two equations. This technique is used to correct for simultaneity problems between the SNF bed supply and SNF utilization. MSAs are used as market areas, and rural areas are excluded from the analyses.

The first equation estimates the supply of Medicare-certified SNF beds in each metropolitan statistical area (MSA). The results from this equation show that Medicaid policies affect the Medicare SNF bed supply. The general finding is that the more demand there is for *Medicaid* SNF beds, the more *Medicare*-certified SNF beds there are in an area.

The second equation estimates a log-odds transformation of the utilization rate in each MSA as a function of the bed supply, demographics, and medical practice pattern variables. SNF utilization is higher in metropolitan areas with more SNF beds, with a higher percentage of SNF beds located in hospitals, where hospital admission rates are higher, in states with high SNF utilization rates, and in states with low Medicaid utilization of SNF services.

The second modeling approach is patient-level analysis. For five selected Diagnostic Related Groups (DRGs)—numbers 14, 88, 127, 209, and 210—patient-level logistic regressions were estimated to predict whether patients would use Medicare SNF services. Independent variables used to predict utilization include patient-level, hospital-level, MSA-level, and state-level variables. Patients discharged from rural hospitals were not included in these regressions.

Findings from the patient-level analyses are generally consistent with the market-level analyses. Patients were more likely to utilize SNF care if they were discharged from hospitals in metropolitan areas that had larger supplies of Medicare-certified SNF beds, had more SNF beds located in hospitals, had higher per capita income, were located in states with high SNF utilization, and were located in states with low Medicaid SNF utilization. Also, care delivered by rehabilitation facilities, home health agencies, and inpatient hospitals was found to be used to substitute for care delivered by SNFs. Medical practice patterns at the state, MSA, and hospital level all were found to have distinguishable effects on the probability that a patient would receive SNF services. Importantly, low-income patients appear to have more trouble than other patients in gaining access to SNF services.

The Note concludes with five recommendations to the HCFA:

- HCFA should be aware that state Medicaid programs have a great deal of influence over the supply of Medicare SNF beds, and thus the utilization of SNF services.
- Medicare patients gain access to SNF care.
- A special study of the poor's access to Medicare SNF care should be undertaken.

- The potential for substitution between SNF services, home health-care services, rehabilitation facility services, and inpatient hospital services should be noted before making any changes in reimbursement systems.
- HCFA should realize that any system bundling the payment for SNF care with the payment for inpatient care, or seeking to create a prospective payment system for SNFs, will set a national payment schedule for a benefit strongly affected by state and local practice patterns.

ACKNOWLEDGMENTS

I am indebted to the members of my dissertation committee: C. R. Neu, Joan Buchanan, and Daniel Relles. I would like to thank them for their guidance, constructive criticism, and support. I would also like to thank RAND colleagues Daniel Byrne, Joanna Heilbrunn, and Michael Kahn for their help in the creation and management of the data used in this study.

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I. VARIATION IN THE USE OF SKILLED NURSING FACILITY CARE

INTRODUCTION

Previous work for the Health Care Financing Administration (HCFA) has shown that there is tremendous interstate variation in the utilization of Skilled Nursing Facility (SNF) services under the national Medicare program. Various health care analysts have suggested different reasons for this variation. State Medicaid nursing home policies could greatly affect Medicare SNF utilization because Medicaid pays for the bulk of SNF services across the country. Variation in utilization could also be evidence of access problems that Medicare patients face in finding available space in SNFs. There has also been speculation that different interpretations of the SNF benefit coverage requirements by the different Medicare fiscal intermediaries around the country have contributed to the variation in utilization. All of these hypotheses fit into the more general hypothesis that local market characteristics are responsible for the variation in the utilization of the Medicare SNF benefit.

PURPOSE

The primary purpose of this Note is to address the question of whether local market characteristics affect the utilization of SNF care in the Medicare program. Within this broader purpose, this Note will pay special attention to local Medicare factors and to state Medicaid nursing home policies that may affect Medicare SNF utilization. In addition, some analyses will examine the influence of hospital and patient characteristics on the utilization of Medicare SNF services.

PREVIOUS FINDINGS OF VARIATION IN UTILIZATION

In work completed in the early 1980s by Feder and Scanlon at the Urban Institute, tremendous variation in the utilization of Medicare-covered SNF care was found across states. Table 1 is taken from some of that work.[1] The table shows the number of Medicare SNF users per 1000 elderly in each state in 1978. Persons aged 65 and older in Nevada were about 12 times more likely to use Medicare SNF services than were elderly persons in Arkansas. A glance at the table shows that the variation is not just due to a few unusual states; even if the ten highest-use states and the ten lowest-use states are eliminated, there is still substantial variation with

[1]Judith Feder and William Scanlon, *Medicare and Medicaid Patients' Access to Skilled Nursing Facilities*, The Urban Institute, Working Paper 1438-02, November 1981.

Table 1

MEDICARE SNF USERS PER 1000 PERSONS AGE 65 AND OVER, 1978

State	Users per 1000
Nevada	21.2
Hawaii	19.3
California	18.7
Montana	18.5
Rhode Island	18.3
Washington	18.0
Oregon	17.0
Utah	17.0
New Hampshire	16.3
Alabama	16.1
Michigan	16.0
Ohio	15.9
Kentucky	13.7
Illinois	13.4
Nebraska	13.0
Pennsylvania	12.9
Connecticut	12.7
Maine	12.4
Colorado	11.8
Idaho	11.6
Florida	11.6
North Carolina	11.3
Arizona	11.3
Indiana	10.9
New Jersey	10.7
Missouri	10.7
North Dakota	10.3
Vermont	10.0
South Carolina	9.3
Minnesota	9.0
New York	8.9
Maryland	8.6
Iowa	8.5
Tennessee	8.4
South Dakota	8.1
Kansas	7.4
Georgia	6.7
Wisconsin	6.6
Massachusetts	6.4
West Virginia	6.1
Delaware	5.9
Virginia	5.2
Oklahoma	4.8
District of Columbia	4.7
Louisiana	3.9
Texas	3.7
Mississippi	1.9
Arkansas	1.8
United States	11.2

SOURCE: Judith Feder and William Scanlon, *Medicare and Medicaid Patients' Access to Skilled Nursing Facilities*, The Urban Institute, Working Paper 1438-02, November 1981, p. 36.

Michigan having 2.4 times the utilization rate of Wisconsin.[2] Feder and Scanlon reported on interviews with hospital discharge planners and concluded that potential Medicare SNF patients had difficulty being placed in SNF beds, and the degree of difficulty depended heavily on "a narrowly defined local market."[3]

Large variation in the utilization of the SNF benefit was also found in work done for HCFA by Neu and Harrison at RAND. In that work, SNF utilization was measured as the percentage of hospital discharges that subsequently use SNF care during the same episode. Table 2 illustrates the great interstate variation in utilization, even for patients who were in the hospital with the same diagnoses, as indicated by the Medicare Diagnostic Related Groups (DRGs).[4] Stroke patients (DRG 14), for instance, were more than 18 times more likely to use SNF care in New Hampshire than they were in Mississippi. The DRGs in this table were the 27 that utilized the most SNF care in 1981.

THE MEDICARE SNF BENEFIT AND PROBLEMS OF ACCESS

The Medicare SNF benefit was designed to shorten Medicare hospital lengths of stay.[5] Medicare patients must spend at least three covered days as a hospital inpatient before they can be eligible for SNF care.[6] In addition, a patient must require:

> on a daily basis skilled nursing care (provided directly by or requiring the supervision of skilled nursing personnel) or other skilled rehabilitation services, which as a practical matter can only be provided in a skilled nursing facility on an inpatient basis, for any of the conditions with respect to which he was receiving inpatient hospital services. . . .[7]

These coverage requirements have sometimes made it difficult for potential Medicare SNF patients to be successfully placed in SNFs. The first problem is that the interpretation of these vague requirements is done by about 80 different fiscal intermediaries (FIs) who often would reach different conclusions on coverage determinations. One study designed nine test cases and asked 18 different FIs for a coverage determination. On none of the cases did all

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[2]Feder and Scanlon, *Medicare*, p. 36.

[3]Feder and Scanlon, *Medicare*, p. 31.

[4]C. R. Neu and Scott Harrison, *Prospective Payment for Medicare Posthospital Services: Some Empirical Considerations*, The RAND Corporation, R-3435-HCFA, December 1986, pp. 30–31.

[5]Feder and Scanlon, *Medicare*, p. 13.

[6]The text of this Note uses the term *currently* to refer to situations that were in effect at the end of 1988. There have been some major changes in the Medicare SNF program that have been enacted in the Medicare Catastrophic Coverage Act which began taking effect in 1989. Any changes in policy that occur through the implementation of the Act will be noted only in footnotes. In this particular case, patients will no longer be required to spend any time as a hospital patient before becoming eligible for SNF care.

[7]United States Code, Title 42, Section 135f (2) (C).

Table 2

STATE-TO-STATE VARIATIONS IN THE USE OF SNF CARE, 1981

DRG Number	Description	Ratio[a]	Highest/ Lowest[b]	Zero Use[c]
14	Specific cerebrovascular disorders except transient ischemic attack	18.8	NH/MS	AK
210	Hip & femur procedures except major joint[d]	32.4	NH/MS	WY
209	Major joint and limb reattachment procedures	13.4	CA/WV	AK AS DE WY
127	Heart failure and shock	54.8	UT/MS	AK VT WY
89	Simple pneumonia and pleurisy[d]	71.2	RI/AS	AK KS MS WY
296	Nutritional and miscellaneous metabolic disorders[d]	34.6	RI/WI	AK KS SD
320	Kidney and urinary tract infections[d]	55.0	ID/MS	AK AS ME NM SD VT WY
468	Unrelated operating room procedures	10.3	NH/AS	AK MS WY
182	Esophagitis, gastroenteritis, and miscellaneous digestive disorders[d]	37.1	RI/KS	AK AZ DE DC ME NE NV NM SD WY
148	Major large and small bowel procedures[d]	32.6	MT/TX	AK ME MS NM UT VT WV WY
88	Chronic obstructive pulmonary disease	42.9	HI/MS	AS DE SD VT WY
294	Diabetes, age ≥36	34.5	HI/TX	AK AS DE KS MS SD WY
243	Medical back problems	25.3	ND/WV	AK AS DE DC MS
140	Angina pectoris	31.3	HI/MA	AK AZ AS CO DE DC GA ID KS LA ME MN MS NE NV NM NC RI SC SD TN VT WV WI WY
15	Transient ischemic attack and precerebral occlusions	35.5	DE/LA	AK AS DC MS NE NM ND WY
236	Fractures of hip and pelvis	43.6	CA/AS	AK NM WY
87	Pulmonary edema and respiratory failure	28.1	HI/MD	AK AS ID LA MS MO MT NE NV NH NM SD UT VT WV WY
263	Skin grafts and/or debrid for skin ulcer or cellulitis[d]	11.6	UT/MD	AZ CO DE GA ID LA ME MA MS MO MT NV RI SC SD TX VT
138	Cardiac arrythmia and conduction disorders[d]	18.6	RI/MA	AK AS ME MN MS NV NM SD VT WY
96	Bronchitis and asthma[d]	81.5	UT/TX	AK AS DE DC ID KS ME MS NE NV NH NM NC SD VT WI WY
79	Respiratory infections and inflammations[d]	46.5	UT/GA	AK AZ CO DE DC KS LA MA MN MS MO MT NV NH NM ND TN WI WY
174	Gastrointestinal hemorrhage[d]	168.4	ND/TX	AK DE ME MS MO WY
239	Pathological fractures and musculoskeletal and connective tissue malignancy	39.3	HI/NY	AL AS CO DE DC KS LA MS NM ND SD TN TX UT VT WV WI
416	Septicemia age ≥ 18	25.0	KY/TX	AK AS CO DE DC ID KS ME MA MS MT NV NH NM SD VT WY
130	Peripheral vascular disorders[d]	29.8	KY/AS	AK DE DC HI MN NM RI WY
113	Amputation for circulatory disorders except upper limb and toe	49.3	ND/MS	AK CO KS MT NM
82	Respiratory neoplasms	18.7	MT/TX	AK CO DC ID MA MS VT WY
253	Fractures, sprains, strains and dislocation of upper arm and lower leg (except foot)[d]	23.6	FL/TX	AK DC ME MS VT VA WV WY
271	Skin ulcers	14.6	NH/MO	AK AS DE ME MS MT VT WY

SOURCE: C. R. Neu and Scott Harrison, Prospective Payment for Medicare Posthospital Services: Some Empirical Considerations, The RAND Corporation, R-3435-HCFA, December 1986, pp. 30–31.

[a]Fraction of patients using care in state where such care is most common divided by the fraction of patients using care in the state where such care is least common, excluding states in which fraction of patients using care is zero.

[b]State with highest percentage of patients using SNF care/state with lowest percentage of patients using SNF care, excluding states with zero use of SNF care.

[c]States having Medicare discharges in the DRG but making no use of SNF care.

[d]Age >= 70 and/or complications.

of the FIs agree, and in only two instances did any two intermediaries agree on all the cases.[8] While the cases were designed to reflect difficult decisions, the study did show that it can often be difficult for nursing homes to predict successfully whether a patient will be covered. In fact, during FY 1982, nursing homes resubmitted almost 12 percent of the claims that were initially denied, and 21 percent of the denials were overturned.[9]

Successful prediction is important to nursing home operators because FIs do not make the coverage determination when the patient is admitted. Coverage determinations are made only after the patient has been in the SNF for some time and the SNF has submitted medical records along with a claim.[10] Also, the amount of coverage is usually granted for short periods, such as a week or two.[11] Therefore, it is not uncommon for a nursing home to have Medicare coverage for a patient fully or partially retroactively denied. From data presented by HCFA in a report to Congress, I estimate that during FY 1982, at least 13 percent of the claims submitted by SNFs were denied.[12] If an SNF has less than 5 percent of its claims denied, then it has a waiver of liability status, which means that it is not financially liable for bills submitted in error with respect to the medical necessity coverage rules. Twenty percent of the SNFs that deliver care to Medicare patients do not meet the waiver conditions[13] and are thus liable for the uncovered charges. This uncertainty is one reason that the nursing home industry gives for the reluctance of some nursing homes to participate in Medicare.

One unmistakable interpretation of the Medicare SNF benefit is that it is not to be used as long-term or custodial care, as is allowed under the Medicaid program. Currently, Medicare patients are only covered for up to 100 days of SNF care following an inpatient hospital stay.[14]

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[8]Helen L. Smits, Judith Feder, and William Scanlon, "Medicare's Nursing Home Benefit: Variations in Interpretation," *The New England Journal of Medicine*, Vol. 307, No. 14, 1982, pp. 855–862.

[9]U.S. Department of Health and Human Services, Health Care Financing Administration, Office of Policy Analysis, *Report to Congress: Study of the Skilled Nursing Facility Benefit Under Medicare*, January 1985.

[10]*Report to Congress*, p. 188.

[11]Feder and Scanlon, *Medicare*, pp. 11–12.

[12]This figure is the absolute lowest bound. The true figure could be much higher. Data provided on page 68 of the *Report to Congress* state that 33.5% of claims from FY 1982 were denied, but that 70% of the denial notices were sent to beneficiaries to inform them that certain services were not covered by Medicare. The 13% lower bound is derived by assuming that all of the claims that did not result in denial notices being sent to beneficiaries were submitted by SNFs and not by beneficiaries. If we assume that there were X claims, they can be apportioned into three groups as follows: 0.235X are denials sent to beneficiaries ((0.335)(0.7); .1X are denials sent to SNFs ((.0335)(.03); and 0.665X are accepted claims submitted by SNFs ((1-.335)X). The denial rates for claims submitted by SNFs would be: 0.1X / (0.1X + 0.665X) = 0.0131. Of course, if there were some claims submitted by beneficiaries that were not denied, then the number of accepted claims submitted by SNFs would have been overestimated, and thus the denial rate would be underestimated.

[13]*Report to Congress*, p. 68.

[14]This limit has been raised to 150 days, and the hospital stay requirement has been removed in the Medicare Catastrophic Coverage Act.

The average covered stay of a Medicare patient is about 25 days.[15] Statistics from the early 1980s show that 86 percent of Medicare SNF patients have stays of less than 60 days, while more than half of the Medicaid SNF patients stay longer than 180 days.[16] Clearly, the nature of the benefits under the two programs is quite different. Nursing home operators who concentrate on providing care to the beneficiaries of one program may not be well equipped to service the beneficiaries of the other program.

Unfortunately for patients seeking SNF services under the Medicare program, the nursing home industry is generally targeted more toward serving the Medicaid program. Medicare provides about 2 percent of the nursing home industry's total revenue, while the state Medicaid programs contribute about 50 percent.[17] Medicaid's importance to the industry is even larger than the 50 percent figure indicates because Medicaid patients must also make substantial "copayments" to the nursing homes, and these payments are counted as private out-of-pocket payments in the above figures. Naturally, under these financial conditions, the nursing home industry is going to be more responsive to the needs of the Medicaid program than the needs of the Medicare program. If a nursing home is going to go through the effort to become certified to provide skilled care, then it must feel it can attract Medicaid patients. Otherwise, since Medicare patients make up such a small part of the nursing home market, it would be much more difficult for an SNF to survive. For example, Urban Institute researchers Feder and Scanlon estimated that if a nursing home were to survive on Medicare patients alone, it would take a community of 500,000 to support one 60-bed SNF.[18] These facts help explain why the data used for this study show that 29 percent of the SNFs that participate in Medicaid do not also participate in Medicare, but only 3.6 percent of those that participate in Medicare do not also participate in Medicaid.

Feder and Scanlon found that the supply of Medicare-certified SNF beds varied greatly across states, ranging in 1980 from 51 certified SNF beds per 1000 elderly in Connecticut to only 1 bed per 1000 elderly in Arkansas.[19] They found a positive correlation between the supply of beds and covered SNF days across states.

Feder and Scanlon also found that many counties had no Medicare-certified SNFs at all. They found that half of the nonmetropolitan counties and 17 percent of the metropolitan counties contained no SNFs. Overall, 13 percent of the elderly lived in counties without SNFs. Naturally,

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[15]C. R. Neu and Scott C. Harrison, *Posthospital Care Before and After the Medicare Prospective Payment System*, The RAND Corporation, R-3590-HCFA, March 1988, p. 8.

[16]U.S. Department of Health and Human Services, Health Care Financing Administration, Office of Research, Demonstrations, and Statistics, *Study of Skilled Nursing Facilities Mandated by Section 919 of Public Law 96-499*, 1982, p. 15.

[17]*Report to Congress*, p. 3.

[18]Feder and Scanlon, *Medicare*, p. 51.

[19]Feder and Scanlon, *Medicare*, p. 60.

it is often the case that a patient could receive SNF care very conveniently in an adjacent county. However, Feder and Scanlon found that some states had severe supply problems in that over half of the elderly populations in Iowa, Louisiana, Nebraska, New Mexico, and Oklahoma lived in counties without SNFs.[20]

Even if there are some SNF beds in an area, that does not necessarily mean that they are available to Medicare patients. Nursing homes have been reported to be operating at or near capacity all across the country, and long waiting lists are commonly found. The 1985 HCFA-sponsored "Report to Congress: Study of the Skilled Nursing Facility Benefit Under Medicare" reported that demand for SNF services was greater than the available supply in most parts of the country.[21]

STRUCTURE OF THE NOTE

This Note will present two separate sets of analyses based on data from July 1, 1984 to June 30, 1985, that seek to discover the sources of variation in Medicare SNF utilization. The first set of analyses are performed with health care market areas as the units of analysis. These analyses are designed to discover the effects that market-area characteristics may have on the utilization of Medicare SNF services in that area. The primary analytic technique used for the market-area analyses is two-stage, least-squares regression. One reason for this technique is to find the indirect effects that some variables may have on utilization through their effect on the SNF bed supply.

The second set of analyses uses individual Medicare patients as the units of analysis. The purpose of this set of analyses is to discover which local market characteristics may affect the likelihood that patients will receive Medicare SNF care. Maximum likelihood logistic estimation is used to analyze the patient-level data.

Section II of this paper will develop the hypotheses, relating state and local market characteristics to Medicare SNF utilization, that will be tested by the health care market-level analyses in Sec. III. Section III contains the health care market-level analyses. The patient-level analyses presented in Sec. IV will be built upon the hypotheses developed in Sec. II and the findings from the market-level analyses. Conclusions and recommendations will be discussed in Sec. V.

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[20]Feder and Scanlon, *Medicare*, p. 51.
[21]*Report to Congress*, p. 73.

II. HYPOTHESES RELATING STATE AND LOCAL CHARACTERISTICS TO SNF UTILIZATION

GENERAL CONCEPTUAL MODEL

In the previous section, I have shown that there is interstate variation in the utilization of the Medicare SNF benefit, and I have discussed potential barriers to access for Medicare patients that may vary by state, or even county. In this section I will develop hypotheses that link utilization and local market characteristics and that take into account these potential barriers, as well as differences in local medical practice patterns. These specific hypotheses contribute to the general model, which states that the utilization of Medicare SNF services is a function of local market characteristics. However, several of the specific hypotheses posit that market characteristics have an effect on the utilization of SNF services only indirectly, as a result of the effects that the characteristics have on the Medicare SNF bed supply in a market. Therefore, the general conceptual model expands to state that the supply of Medicare SNF beds in a local health care market is a function of other market characteristics. Thus, the full model states that the Medicare SNF bed supply is a function of local health care market characteristics, and in turn, the utilization of Medicare SNF services is a function of the bed supply and other local market characteristics. The specific hypotheses developed here will be tested in the market-level analyses presented in Sec. III.

MEASUREMENT OF UTILIZATION

For the purposes of this paper, the definition of *SNF utilization* is the proportion of eligible patients who use Medicare SNF services. During the time covered by this study, and up through the present, the only people who could use Medicare SNF services were those Medicare patients who were discharged alive from an inpatient hospital.[1] Therefore, the measure of utilization used here is: (number of SNF users)/(number of live Medicare discharges).

Other than in recent work at RAND, this particular measure has never been used to measure SNF care utilization. Other measures have been used, such as users per Medicare enrollee, or SNF patient–covered days per enrollee. Enrollees are probably used to standardize comparisons because it is easier to find geographic information on enrollees than on Medicare discharges. Since the data allow measurement of the Medicare discharges in an area, the more accurate denominator of live Medicare hospital discharges will be used. SNF covered days per discharge is not used as the measure because questions about access to care can be answered more

[1]The Medicare Catastrophic Coverage Act of 1988 changes the eligibility requirements to allow patients to receive SNF care even if they have not been in a hospital beforehand.

effectively by examining factors relating to the probability that the patient will be successfully placed in an SNF, rather than by examining factors that may determine the length of stay in an SNF.

THE EXCLUSION OF RURAL AREAS FROM THE STUDY

In this study, local health care markets will be considered to be Metropolitan Statistical Areas (MSAs). Rural areas will not be included in the analyses because it is difficult to associate the rural areas with health care markets and, subsequently, to find data describing the market characteristics. As a result, 24 percent of the nationwide sample of patients will be excluded because they were discharged from hospitals located in rural areas. Rural areas seem to differ in their use of SNF services, so findings generated from this study will not be generalizable to rural areas. The average Medicare SNF utilization in urban areas was 3.3 percent, while the average utilization was only 2.3 percent in rural areas, during the time period of this study.

SNF BED SUPPLY HYPOTHESES

In the next section, a hypothesis relating the Medicare SNF bed supply to the Medicare SNF utilization in an area is developed. This section, however, will present the development of hypotheses that relate other market characteristics to the Medicare SNF bed supply. Most of the hypotheses in this section focus on state Medicaid nursing home policies.

Mix of Medicaid-Certified Nursing Home Beds

Medicaid nursing home programs vary from state to state. There are federal guidelines that states must follow to receive federal funding, but the states have significant latitude within those guidelines to develop their specific programs.

One of the major differences among state Medicaid nursing home programs is the type of care the program is oriented toward. The state Medicaid programs all allow for nursing care in both SNFs and in Intermediate Care Facilities (ICFs). The ICFs generally provide less skilled nursing care and usually have less stringent certification requirements. Each state has a different mix of SNF and ICF Medicaid beds. In addition, 40 states have beds that are "dual-certified" for both SNF and ICF care. The mix of SNF-only, ICF-only, and dual-certified beds, displayed in Table 3, will illustrate the orientation of the nursing home community in each state with respect to the two types of care. As the percentage of beds that are SNFs increases, the nursing home community becomes more oriented toward providing the higher SNF-level care that Medicare patients require. Anecdotal evidence suggests that nursing homes often cannot provide an intense enough level of care to meet the needs of most Medicare patients. Therefore, if the nursing home community is accustomed to providing the SNF level of care, it is more likely that the providers

will be willing and able to participate in Medicare. An HCFA report suggests that the more heavily oriented the state's program is toward ICF beds, the lower the likelihood that the state will be able to support enough SNF beds to handle the Medicare population adequately.[2] I thus hypothesize that the higher the percentage of Medicaid beds in a state that are certified as SNF beds, the higher the Medicare SNF bed supply will be.

State Medicaid SNF Utilization

The amount of nursing home care that the Medicaid program pays for varies by state for a variety of reasons. For example, some states may be more "generous" than others: they make it easier for Medicaid beneficiaries to qualify for SNF care, or the Medicaid program may cover a larger portion of the state's population. In any case, since the majority of most states' nursing home residents are supported by Medicaid, the amount of SNF care demanded through the state's program is likely to influence the size of the state's nursing home industry, and thus the number of beds in the state. Therefore, I hypothesize that the more SNF care the Medicaid program supports, the more Medicare SNF beds there will be—and thus, the higher Medicare SNF utilization will be in the state.

Prospective or Retrospective Reimbursement to Medicaid SNFs

States have many different systems for reimbursing nursing homes for the delivery of SNF care to Medicaid patients. One major distinction between the reimbursement systems is whether the SNFs are reimbursed on a prospective or retrospective basis. Most states (38 in FY 1985) reimburse nursing homes on a prospective basis. Under a prospective system, the nursing home receives a predetermined amount for each day of care that it provides to Medicaid patients. Some states, however, reimburse SNFs on a retrospective basis, meaning that they reimburse the SNF for each patient, based on the cost of the care provided to that patient. Since payment is tied to costs, retrospective systems are more likely to require—and to audit more strictly—cost information from nursing homes.[3] It is therefore likely that a larger administrative burden will be placed on facilities in retrospective payment states. In fact, Medicare reimburses for SNF care on a retrospective basis. Surveys by the Urban Institute in the early 1980s found that Medicare SNFs reported expenses ranging from $250 to $10,000 to prepare the cost reports required by Medicare.[4]

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[2]*Report to Congress*, pp. 190–191.

[3]Judith Feder and William Scanlon, "The Underused Benefit: Medicare's Coverage of Nursing Home Care," *Health and Society*, Vol. 60, No. 4, 1982, p. 619.

[4]Feder and Scanlon, "Underused Benefit," p. 619.

Table 3

MIX OF MEDICAID BEDS BY STATE

(Percent)

State	SNF Only	ICF Only	Dual Beds
Alabama	41.9	28.6	29.4
Alaska	0.0	95.1	4.9
Arkansas	63.5	35.6	0.8
California	90.9	3.0	6.1
Colorado	1.0	20.3	78.7
Connecticut	7.1	20.2	72.7
Delaware	25.8	59.6	14.6
Florida	0.1	2.6	97.3
Georgia	7.1	10.8	82.0
Hawaii	22.0	31.3	46.7
Idaho	0.0	5.3	94.7
Illinois	4.5	42.8	52.7
Indiana	15.6	77.3	7.1
Iowa	1.8	97.1	1.1
Kansas	3.4	89.5	7.1
Kentucky	20.3	79.5	0.2
Louisiana	5.1	93.3	1.6
Maine	4.6	95.4	0.0
Maryland	0.0	50.2	49.8
Massachusetts	44.2	55.8	0.1
Michigan	8.4	23.8	67.7
Minnesota	31.1	34.4	34.5
Mississippi	17.0	14.7	68.3
Missouri	1.7	36.1	62.2
Montana	0.0	40.1	59.9
Nebraska	5.5	81.9	12.7
Nevada	10.3	7.4	82.3
New Hampshire	9.6	90.4	0.0
New Jersey	1.9	9.1	89.0
New Mexico	5.3	94.7	0.0
New York	75.3	24.7	0.0
North Carolina	47.1	52.9	0.0
North Dakota	0.0	26.5	73.5
Ohio	4.9	47.7	47.4
Oklahoma	0.4	99.6	0.0
Oregon	13.2	86.8	0.0
Pennsylvania	0.5	50.0	49.5
Rhode Island	23.0	77.0	0.0
South Carolina	4.8	33.3	61.9
South Dakota	1.2	40.6	58.3
Tennessee	7.5	85.0	7.5
Texas	8.5	86.7	4.8
Utah	1.1	45.3	53.6
Vermont	21.4	78.6	0.0
Virginia	10.1	89.9	0.0
Washington	0.0	7.8	92.2
Washington D.C.	7.1	72.7	20.1
West Virginia	0.1	52.7	47.1
Wisconsin	7.2	6.0	86.8
Wyoming	0.0	14.5	85.5
U.S. Total	21.4	44.8	33.9

Thus, it is likely that Medicare patients will require a larger additional administrative effort than Medicaid patients in prospective states, than in retrospective states where nursing homes have to go through a similar process to get paid through Medicaid. Therefore, I hypothesize that nursing homes in retrospective payment states would be more willing to participate in the Medicare program, and thus the Medicare SNF bed supply will be higher in retrospective states.

Degree of Medicaid Orientation in the Local Market

Previous discussion has explained why nursing homes are more likely to be responsive to state Medicaid programs rather than the national Medicare program. Previous discussion also explained why SNFs must attract Medicaid patients in order to survive. Because Medicaid patients make up the bulk of consumers of SNF services, it is reasonable to expect that there will be more SNF beds in MSAs that have markets more oriented toward Medicaid beneficiaries. The best variable available to measure market orientation is the percentage of hospital discharges in the MSA that are Medicaid beneficiaries. Therefore, I hypothesize that the higher the percentage of hospital admissions in an MSA that are Medicaid patients, the higher the SNF bed supply will be.

UTILIZATION HYPOTHESES

Metropolitan areas differ in the many factors that comprise their local health care markets. Some of these local health care market variables are hypothesized to have an effect on the Medicare SNF utilization in the MSA. In this section, specific hypotheses will be developed relating local health care market characteristics to SNF utilization. These hypotheses will be tested in the next section.

Bed Supply

Several studies have found that the nursing home occupancy rate is high all across the country.[5] Many health care analysts have concluded that the high occupancy rate is evidence that there is a shortage of nursing home beds, and that this shortage has restricted utilization of the Medicare SNF benefit. In addition, the number of Medicare-certified SNF beds varies tremendously among MSAs, even when standardized for the Medicare population in the MSA. This variation suggests that the utilization of Medicare SNF services is constricted, by varying degrees, depending on the supply of SNF beds in each MSA. I therefore hypothesize that MSAs

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[5]Several sets of figures are cited in James H. Swan and Charlene Harrington, "Estimating Undersupply of Nursing Home Beds in States," *Health Services Research*, Vol. 21, No. 1, April 1986, p. 62.

with a larger supply of Medicare-certified SNF beds per elderly population would be less constrictive and therefore would have higher SNF utilization.

Data from 1984 and 1985 show that there are substantial numbers of Medicare patients that do not have access to any SNF beds in their counties. Thirteen percent of the Medicare Prospective Payment System (PPS) discharges were discharged from hospitals in counties that did not have any certified Medicare SNF beds. This rate may not be alarming, in that patients from one county may easily be placed in SNFs in nearby counties, and the apparent holes in coverage may just be artifacts of the way county borders are drawn. However, the probability of a patient being placed in an SNF was dramatically higher in counties with Medicare SNFs. In counties where there were SNFs, 3.2 percent of the patients utilized SNF services, while only 0.4 percent used SNF services when there were no Medicare SNFs in the county in which they were discharged. Some of this rate difference is due to urban/rural differences, but even within urban areas, there is still almost a fivefold difference in the utilization rates, 3.2 percent to 0.7 percent. Table 4 illustrates the above figures. More than 5 percent of the MSAs that will be examined in this study have no Medicare-certified SNF beds at all. Patients in those MSAs are less likely to seek SNF services since they would have to be moved outside of the MSA where they were hospitalized in order to receive those services. Utilization in those MSAs may thus be even lower than might be predicted with only a continuous measure of bed supply. Therefore, a separate dummy variable that will differentiate the 15 MSAs with no Medicare SNF beds from all other MSAs will also be included in the analyses.

Fiscal Intermediaries and Coverage Determination

The coverage policies of the intermediaries acting in an area could well influence the degree of utilization of SNF services in the area. If intermediaries are more lenient in approving coverage, then utilization may be higher, both because a higher percentage of claims will be approved and because SNFs in the area will be likely to accept more Medicare patients and submit more claims due to the higher likelihood that such claims will be approved. I hypothesize

Table 4

USE OF SNF CARE FOR COUNTIES WITH AND WITHOUT MEDICARE-CERTIFIED SNFs
(As percentage of live hospital discharges)

County Type	Overall	Urban	Rural
With Medicare-certified SNF beds	3.2	3.2	3.2
Without Medicare-certified SNF beds	0.4	0.7	0.3

that the more lenient the intermediaries servicing an MSA are, the higher the SNF utilization rate will be. The choice of a measure for intermediary leniency will be discussed in the next section.

Hospital-Based and Freestanding SNFs

Some SNFs are hospital-based, meaning that the SNF is a distinct part of an acute-care hospital. I hypothesize that the higher the proportion of an MSA's Medicare SNF beds that are hospital-based, the higher will be the SNF utilization rate. This hypothesis is based on both economic and organizational arguments. Economically, hospital-based SNFs have greater incentives to make beds available to Medicare patients because the hospitals the SNFs are attached to have incentives to transfer Medicare patients into the SNF units. Under Medicare's PPS, hospitals are generally reimbursed a predetermined amount for the entire hospital stay of a patient. Skilled nursing care, however, is reimbursed separately. Thus, a hospital has economic incentives to discharge a patient as quickly as possible. Sometimes, however, a patient might be ready for discharge from the hospital into an SNF but cannot be discharged because there is no available SNF bed. Therefore, if a hospital has an SNF unit, then it can increase its reimbursement if it can discharge the patient to the SNF unit. The hospital-based unit thus has incentives to ensure that there are available beds for Medicare discharges from its attached hospital.

In addition to these economic incentives for the hospital-based SNFs to admit Medicare patients, these SNFs have fewer organizational disincentives to admitting Medicare patients. Experts in the health care field have charged that many nursing homes are reluctant to admit Medicare patients because Medicare requires a lot of paperwork and special accounting procedures. Hospitals, however, are accustomed to working with the Medicare program and are already likely to have the special accounting procedures in place.

Hospital Admission Propensity

Medical practice patterns vary from one locality to another.[6] In fact, because of differences in local practice patterns, it is likely that there will be a large amount of unexplainable variation in SNF utilization. One facet of local practice, however, may be identifiable and used to help explain variation in SNF utilization. Different localities have different hospital admission propensities, defined here as hospital admissions per population. It seems reasonable to assume that, aside from differences traced to age or sex variations in the local population, differences in hospital admission propensities across areas as large as MSAs are functions of local practice

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[6]John Wennberg and Alan Gittelsohn, "Variations in Medical Care among Small Areas," *Scientific American*, Vol. 246, No. 4, April 1982, pp. 120–135.

patterns rather than differences in the incidence of acute health problems that require hospital admission. If the age/sex-adjusted Medicare admission propensity is higher in one MSA than another, then that would mean that the locally prevailing practice in that area is to treat less-severe cases in the hospital than is the practice in the MSA with the lower admission propensity. Since the average case should be less severe, I hypothesize that a lower percentage of patients will require and utilize SNF services in MSAs where there are high Medicare hospital admission propensities than in areas with lower propensities.

State Medicaid SNF Utilization

In the bed supply hypotheses section, it was hypothesized that increased Medicaid SNF utilization would lead to an increase in the Medicare SNF bed supply. Aside from this indirect positive effect on Medicare utilization through the bed supply, there could also be a direct negative effect between Medicaid utilization and Medicare utilization. This effect could occur if there was some substitution of Medicaid SNF services for Medicare SNF services. SNF operators may admit patients who might also be eligible for Medicaid, but instead of risking denial and perhaps their Medicare liability waiver, they may simply submit the claim to Medicaid.[7] The ability of a nursing home to bill Medicaid rather than Medicare for dually entitled patients may depend on state Medicaid regulations.[8] The amount of SNF care paid for by the Medicaid program may also be a good proxy for the ease of charging Medicaid rather than Medicare for the dually entitled patients. In addition, there is also a possibility that Medicare patients will have to compete with Medicaid patients for available SNF beds, and thus the more Medicaid utilization there is in the state, the lower the Medicare utilization will be. Therefore, the overall effect of the number of days paid for by Medicaid will likely increase the Medicare SNF bed supply but decrease Medicare SNF utilization

Utilization of Substitute Medicare Services

The use of other Medicare services as substitutes for SNF care may be determined by another set of practice patterns that are local or regional in nature. There are three types of Medicare services that could potentially substitute for SNF care. If a patient requires rehabilitative care, then the patient may be able to receive that care in a Medicare rehabilitation care facility. Or, if a patient can be cared for at home, the patient may be eligible for Medicare home health services. Finally, an extra couple of days on the end of a hospital stay may eliminate

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[7]Feder and Scanlon, "Underused Benefit," p. 619.
[8]Feder and Scanlon, "Underused Benefit," p. 619.

the need for SNF care. Therefore, we may hypothesize that the higher the use of these other services, the lower the SNF utilization will be.

Local Demographic Control Variables

In related work, age and sex were found to be large factors in determining the utilization of SNF care.[9] Older Medicare patients and women are more likely to use SNFs. Therefore, the age and sex distributions of the population in the MSA will be included as control variables in all models. Also, since health care utilization is often higher for higher income people, the MSA's per capita income will be included to control for income effects in the models. Similarly, the physician supply will also serve as a control variable because other studies have found higher levels of health care use where there is a greater density of physicians.

PPS Waiver States

During the time period that the data for this study was collected, there were four states that were exempt from the Medicare PPS. Those "waiver states" were Maryland, Massachusetts, New Jersey, and New York. Each of those states had a different method of paying hospitals. While some of those methods had incentives that encouraged hospitals to discharge patients as quickly as possible, there might still have been less of an incentive, in at least some of those states, than under PPS. Thus, hospitals in waiver states may be more likely to keep their patients longer, which might also mean that those patients may be less likely to require SNF services. I therefore hypothesize that there will be lower SNF utilization rates in MSAs in waiver states.

Other State Factors

There are other state-level factors that may affect Medicare SNF utilization within the state. Those factors include regulation of the construction and operation of nursing homes, and medical practice patterns. There are several reasons for expecting a strong state component in medical practice patterns. States have regulations that affect the licensing of physicians. There are state medical boards, associations, and peer review organizations; all affect the way medicine is practiced within the state. The calculation of a "state effect" variable will be discussed in the next section.

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[9]Neu and Harrison, *Prospective Payments*, 1986.

III. MSA-LEVEL ANALYSIS

This section presents analyses of the variation in Medicare SNF utilization at the metropolitan area level. Included in these analyses is an analysis of the variation in the Medicare SNF bed supply. The hypotheses developed in the previous section will be tested through these analyses. Data for the analyses come primarily from the 12-month time period beginning July 1, 1984 and ending June 30, 1985. The units of analysis are the 314 MSAs in the 50 states and the District of Columbia that existed in 1984. Appendix A lists those MSAs.

DATA SOURCES

There are three computer files that provided the primary sources of data used in these analyses. The first source is a patient-level file that was built at RAND and is referred to as the Episode File. The second source of data is the 1985 nursing home Provider-of-Service (POS) File maintained by HCFA. The third source of data is the Area Resource File (ARF), which is a county-level file that is constructed for HCFA. While other computer files were needed to link the data from these three files, virtually all of the data used in the analysis came from these three files.

The Episode File

The Episode File was built by RAND for HCFA to analyze the difference in posthospital care patterns before and after the advent of PPS. The file contains a 20 percent sample of Medicare patients discharged from acute-care hospitals between July 1, 1984 and June 30, 1985. Each patient record contains information about the patient's hospital stay and information about subsequent use of Medicare SNF, home health, and rehabilitation facility services. The file also includes the age and sex of the patient, as well as the DRG for the hospital stay, along with primary and secondary diagnoses. This file provides the data for calculating SNF utilization rates. Individual patients are designated as users if the following criteria are met:

- The patient must be admitted to an SNF within 30 days of discharge from the Medicare-covered hospital stay.
- The patient must have Medicare-covered charges while in the SNF.
- The patient must not have been admitted to a rehabilitation facility or received home health services during the period between discharge from the hospital and admission to the SNF.

The same criteria are used to designate rehabilitation facility users and home health services users.[1]

Nursing Home Provider-of-Service File

The 1985 nursing home POS File contains records for all nursing homes that had Medicare- or Medicaid-certified beds as of November 1984. Each nursing home's record contains the total number of beds in the facility, the total number of certified beds, and a breakdown of the types of care for which each bed is certified. There are six categories of certified beds: Medicare SNF only, Medicaid SNF only, Medicare and Medicaid SNF, Medicaid only SNF and ICF, Medicare and Medicaid SNF and Medicaid ICF; and Medicaid ICF only. The file also contains an indication of whether the home was hospital-based or freestanding. All of the data relating to certified beds come from this file.

Area Resource File

The ARF is a county-level public use file that includes the demographics and the health-related resources in each county. The file contains 1980 census data that includes overall population, population by age group and sex, per capita income, and physicians per capita.

Other Sources

State Medicaid data were obtained from published HCFA program statistics. One set of tables designated state Medicaid SNF reimbursement systems as prospective or retrospective, as of fall 1984.[2] The number of Medicaid-covered SNF days by state for fiscal year 1985 was also obtained from HCFA program statistics.[3] An HCFA hospital POS file was used to obtain data on the percentage of hospital admissions that were covered by Medicaid.

VARIABLES

Dependent Variables

There are two dependent variables used in the analyses presented here. The first one is the Medicare SNF utilization rate in the MSA. It is measured using data for patients who were discharged alive from hospitals located in the MSA. The utilization rate is calculated by dividing

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[1]A patient could actually be considered a home health services user if care began up to 60 days after discharge from a Medicare-covered hospital stay. These definitions were created for other posthospital care studies at RAND and reflect the pre-PPS definition of *spell of illness*.

[2]*Report to Congress*, pp. 37–38.

[3]U.S. Department of Health and Human Services, Health Care Financing Administration, Office of the Actuary, *Health Care Financing: Program Statistics: Analysis of State Medicaid Program Characteristics, 1986*, August 1987, p. 87.

the number of live discharges who are SNF users by the total number of live discharges. Note that only the location of the discharging hospital, and not the residence of the patient or the location of the nursing home, is used to decide to which MSA a patient is assigned.

The histogram in Fig. 1 shows the range of utilization rates across MSAs. Although 20 MSAs are shown as having a utilization rate of zero, in fact, only six MSAs had no SNF utilization: Alexandria, LA; Las Cruses, NM; Lawton, OK; Odessa, TX; Texarkana, AR-TX; and Victoria, TX. The other 14 MSAs that show up in the lowest category of utilization actually have SNF utilization rates as high 0.0025, but they still fall within the lowest category. Two MSAs had utilization rates above 10 percent: Waterloo-Cedar Falls, IA at 11.7 percent; and Salinas-Seaside-Monterey, CA at 11.5 percent. The mean utilization rate was 3.2 percent with a standard deviation of 0.0216. The median utilization rate was 2.9 percent.

Appendix B shows the level of SNF utilization in each MSA in rank order. Inspection of Appendix B reveals two regional trends. MSAs in Texas, Oklahoma, Arkansas, Louisiana, and Mississippi tend to have very low utilization rates; metropolitan areas west of the Rockies tend to have high utilization rates.

While MSAs within a state usually tend to have similar utilization rates, there can still be large intrastate differences. Perhaps the best example of a state with such large intrastate differences is Iowa. Table 5 shows the utilization rates for MSAs in Iowa. The MSAs in Iowa include those with the highest and lowest utilization rates in the country.

The other dependent variable is the Medicare SNF bed supply in an MSA, which is calculated as the number of Medicare-certified SNF beds in an MSA per 1000 persons age 65 or older. The histogram in Fig. 2 displays the values of the variable across MSAs. There are 15 MSAs that have no Medicare-certified SNF beds at all within their borders. Bismark, ND has the highest bed supply: 65 beds per 1000 elderly. The mean SNF bed supply is 18.6 beds per 1000 elderly, and the median is 15.9 beds. Appendix C presents the bed supplies of all the MSAs in rank order.

Table 5

SNF UTILIZATION IN IOWA'S METROPOLITAN AREAS

Metropolitan Area	Utilization Rate (%)
Waterloo–Cedar Falls	11.7
Dubuque	9.0
Cedar Rapids	7.7
Davenport–Rock Island–Moline	5.4
Omaha	5.1
Des Moines	2.7
Iowa City	1.1
Sioux City	0.1

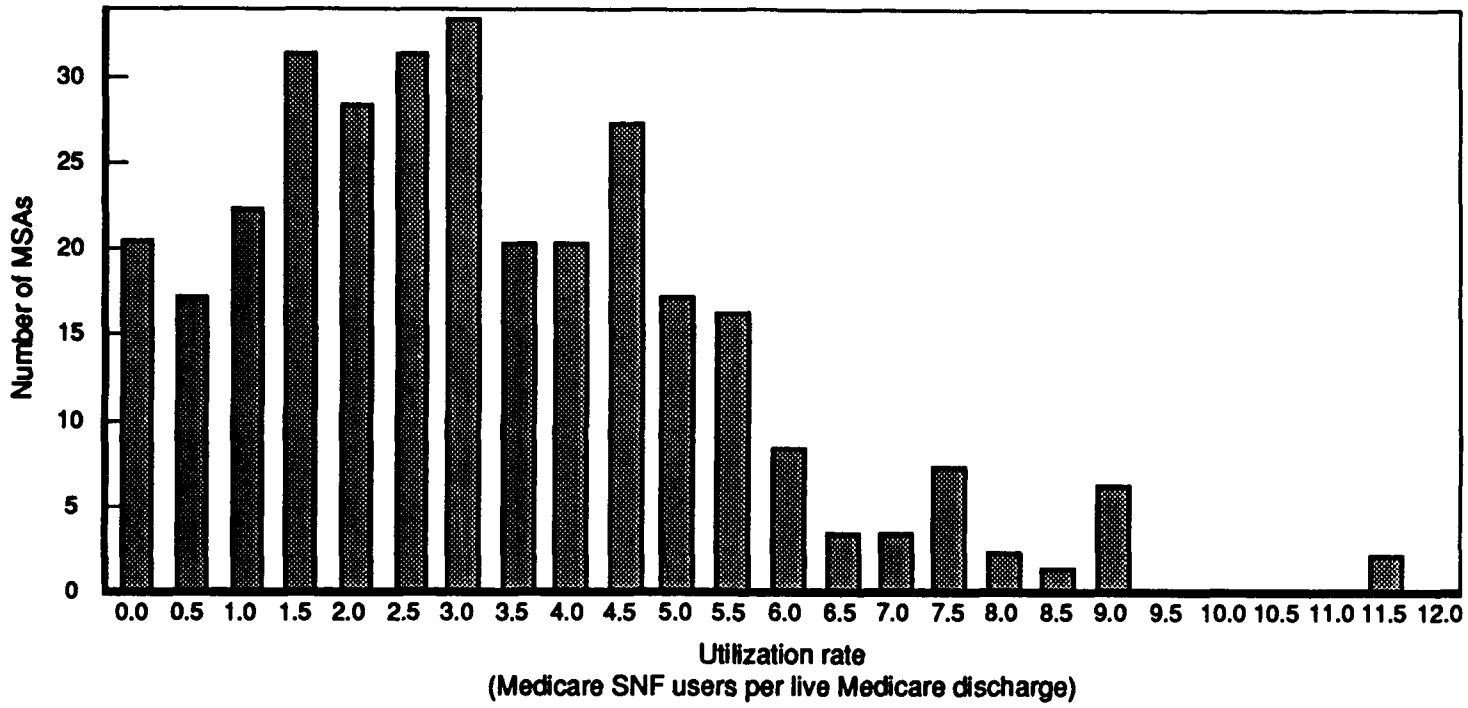

Fig. 1—Distribution of SNF utilization rates by MSA

Derived Variables

The most complicated variable to derive was the "intermediary-effect" variable. Since it appears that intermediaries have a good deal of latitude in coverage decisions, a variable was needed to measure the effect that the intermediaries in an MSA have on SNF utilization. The intermediary-effect variable chosen is a basic measure of how strict or lenient the intermediaries operating in a given MSA are. Basically, the variable is constructed by measuring the SNF utilization rates in the other MSAs in which those intermediaries operate. The utilization rates for the different intermediaries operating in an MSA are aggregated to form a simple measure for the MSA that combines the leniency measures derived from utilization outside of the MSA.[4] In essence, the higher the intermediary effect, the more lenient are the intermediaries operating in the MSA.

Unfortunately, there is a problem with the interpretation of any findings associated with the intermediary effect. Of the 82 intermediaries serving SNFs during 1985, 56 of them operated entirely within one state, and most of the others operated almost entirely within a single state. This situation is not particularly surprising since most of the intermediaries are state Blue Cross organizations. The problem is that the intermediary-effect variable may therefore be simply measuring a state effect. In order to test this problem, a state-effect variable was created. This variable can also be used to control for other state Medicaid policies or local practice patterns that cannot otherwise be measured. The state-effect variable is the SNF utilization rate in MSAs in the state, except for the MSA for which the variable is being calculated. For example, the state-effect variable for Los Angeles is the utilization rate over all California MSAs, with the exception of Los Angeles itself. The exclusion of the MSA being measured from calculation of both the intermediary-effect and the state-effect variables is done so that their inclusion does not automatically cause correlation between the "effects" variables and the SNF utilization in the MSA.

The hospital admission propensity variable also had to be created. A complicating factor was that not all people could be expected to be equally likely to be admitted to the hospital as Medicare patients. The age and sex of the person are large determinants of the probability of being admitted to a hospital. Therefore, national Medicare admission propensities for several

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[4]The actual calculation of this variable is complex and cannot be explained completely without a lengthy example. Since the variable is not included in any of the models presented in this paper, the detailed explanation will not be included here.

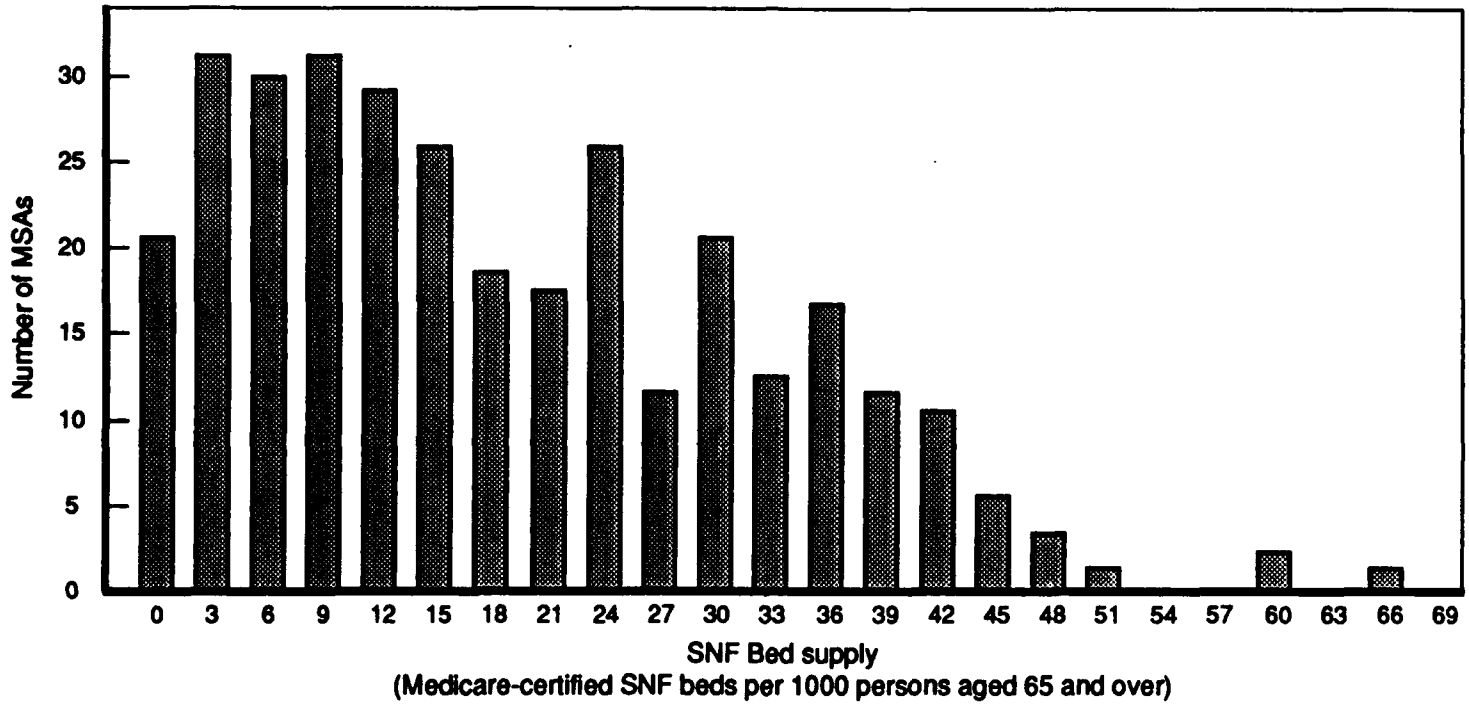

Fig. 2—Distribution of SNF bed supply by MSA

age/sex categories were calculated,[5] applied to each city's age/sex population distribution, and an expected number of Medicare discharges was estimated. Then, in order to create a variable that compared the MSA's admission propensity to the national average, the expected number of admissions for the MSA was subtracted from the actual number of hospital discharges, and the difference was divided by the expected discharges. The result is the percentage of admissions over or under the number expected from national averages. Those MSAs with more hospital admissions than expected will have positive values for the admission propensity variable, while hospitals with fewer than expected admissions will have negative values. Table 6 presents a summary of the independent variables in the two equations that will be estimated.

MODELING PROBLEMS

There are several problems with doing an ordinary least-squares (OLS) regression analysis to see how the proportion of Medicare patients using SNFs depends on local market variables. There are problems with using the SNF utilization rate as a dependent variable. There are potential problems of simultaneity with some of the independent variables. And there are problems with giving all of the MSAs equal weight in the analysis.

Forms of the Dependent Variables

Figure 1 shows a histogram of the MSAs' utilization rates. A major problem is apparent. There are many MSAs that have no use, or utilization rates very close to zero. This fact means that OLS estimates will likely yield predictions of negative utilization for some MSAs: obviously an infeasible situation. A common solution is to transform the utilization rates into a log-odds, or logit function. If the utilization rate is represented by P, then the transformed dependent variable is: $LOG(P/(1-P))$. Note that since the log of 0 is undefined, a small increment must be added to P when P is 0. A commonly used technique in this situation is to set P to $1/2N$ where N is the number of trials (live hospital discharges in this case).[6] This adjustment should not produce any serious distortions in the six MSAs that had no SNF users, and thus, this procedure was adopted.[7]

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[5]Six age/sex categories were used: male under 65, female under 65, male 65–74, female 65–74, male 75 and older, and female 75 and older.

[6]John Neter, William Wasserman, and Michael H. Kutner, *Applied Linear Statistical Models: Regression, Analysis of Variance, and Experimental Designs*, Richard D. Irwin, Inc., Homewood, IL, 1985, p. 366.

[7]The smallest number of live discharges in those MSAs occurred in Lawton, OK, which had 585. The largest distortion in the utilization rate occurs here where P actually is zero but is set to 0.00085. The smallest utilization rate that occurred with nonzero users was 0.00060 in Lafayette, LA, a rate lower than the value for Lawton, but since the mean utilization rate is more than .03, both Lawton and Lafayette effectively have no SNF utilization.

Table 6

INDEPENDENT VARIABLES USED IN MSA ANALYSIS

Variable	Description	Type
Bed Supply Equation		
Retrospective state Medicaid SNF reimbursement	1 - Retrospective system 0 - Other System	Dummy
Percent of state Medicaid beds—SNFs	SNF beds/total beds	Continuous
Medicaid SNF days per elderly	SNF days/elderly population (State-Level)	Continuous
Percent of hospital admissions—Medicaid	Medicaid admissions/total admissions	Continuous
Log-odds of SNF utilization	Log(P/(1-P))	Continuous
Utilization Equation		
SNF bed supply	Log(Medicare SNF beds/1000 elderly)	Continuous
No Medicare SNF beds in MSA	1 - No Medicare SNF beds in MSA 0 - Otherwise	Dummy
Percent of hospital-based SNF beds	Medicare Hospital. SNF beds/Total Medicare SNF beds	Continuous
Hospital admissions versus average	(Admissions—national average admissions)/national average admissions	Continuous
Physicians per capita	Physicians/population	Continuous
Per capita income	Average personal income	Continuous
% of population age 75 and over	Population 75 and over/total population	Continuous
% of elderly female	Females 65 and over/total population	Continuous
Medicaid SNF days per elderly	SNF Days/Elderly population (State-Level)	Continuous
State effect	SNF utilization rate in other MSAs in state	Continuous
Intermediary effect	SNF utilization rate in other MSAs under intermediaries	Continuous
MSA in a waiver state	1 - MSA is in a waiver state 0 - Otherwise	Dummy

The skewed distribution of the SNF bed supply variable, illustrated in Fig. 2 suggests that a log transformation of that variable might be preferable to leaving it on a linear scale. Indeed, residual plots of equations with the untransformed bed supply variable indicated that a transformation would improve the fit of the model. Therefore, the dependent variable for the bed supply equation is the log of Medicare-certified SNF beds per 1000 elderly persons.

Simultaneity

There are also potential simultaneity problems with using OLS regression in this case. The most urgent problem concerns potential simultaneity between the SNF utilization rate and the

SNF bed supply. Although this paper has already discussed why an increased bed supply could be expected to lead to increased utilization, it is also plausible that increased utilization could lead to an increased bed supply. If Medicare patients utilized more SNF care, then more nursing home operators would seek Medicare certification in order to attract business from the increased Medicare market. Aside from problems involved in deciding the direction of the causation, this simultaneity creates econometric problems.

The econometric problem introduced by simultaneity comes about because one of the assumptions required by OLS regression is that the error term is uncorrelated with the independent variables. In the case of simultaneity, this assumption is violated. Intuitively, in this particular example where there is simultaneity between utilization and bed supply in metropolitan areas where utilization is higher than predicted by a model (a positive residual), the bed supply will also tend to be high because it is fueled by high utilization. The opposite would tend to occur when utilization is lower than expected. Therefore, the bed supply would be positively correlated with the error term.

The most common econometric solution to the problem of simultaneity is to perform a two-stage, least-squares regression analysis.[8] In this technique, the actual values of the variables with the simultaneity problems are not used as independent variables. Instead, estimates of those variables are calculated; these estimates are then used as the independent variables. In this particular case, OLS is used to predict the bed supply and utilization rate for an MSA using variables other than the bed supply or the utilization rate. The results of these first-stage regressions are only used to provide predicted values for the two dependent variables to be used as independent variables in the second stage. In the second stage, the predicted bed supply is used as an independent variable in the equation that estimates the utilization rate, and the predicted utilization rate is used in the bed supply equation. The final product is two regression equations, one for the supply of Medicare SNF beds per elderly population, and one for a form of the SNF utilization rate. These products are especially convenient because many of the hypotheses actually suggest that several of the policy variables will affect Medicare SNF utilization only through the impact that they have on the Medicare SNF bed supply. These two equations thereby allow analysis of the variables' effect on the bed supply and utilization separately.

It should be noted that there were also potential simultaneity problems between SNF utilization and the variables measuring the use of substitute services. Exploratory regressions on the utilization equation, which included substitute service variables, however, yielded results that showed virtually no substitution of other services for SNF care at the MSA level. There were

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[8]Peter Kennedy, *A Guide to Econometrics*, The MIT Press, Cambridge, MA, 1985, p. 134.

some indications that there may have been some substitution of extra hospital care, but the substitution was not statistically significant. Therefore, rather than complicating the model unnecessarily, the substitute service variables were dropped from this set of analyses. They will, however, be included in the patient-level analyses presented in the next section. The exclusion of the substitute services should not be taken to mean that there is no substitution, only that the substitution cannot be seen at this highly aggregated level.

Weights

The last econometric problem that will be discussed here is the problem of weighting the observations. There are two sources of error in these utilization equations. The first source of error is due to random variation in the dependent variable. Deriving the proper weights to account for this source of error is a standard procedure in which the weight attributed to an observation is set to be proportional to the inverse of the variance of its dependent variable.[9] In this case, where the dependent variable has been transformed using a logistic function, the procedure results in weights for the observations equal to $Np(1\text{-}p)$ where N is the number of discharges and p is the predicted value of the utilization rate in the MSA.[10]

The weights described in the previous paragraph, however, do not take account of the second source of error in the equation. The second source of error is due to the lack of fit in the equation. If the error due to the lack of fit dominates the random error, then the appropriate weights would be $p(1\text{-}p)$. The examination of residual plots produced evidence that neither set of weights was entirely appropriate. Unfortunately, the most appropriate weights could not be determined with available software. The second-stage utilization equations are thus estimated twice: once weighted by $Np(1\text{-}p)$, and once weighted by $p(1\text{-}P)$. Neither of these sets of estimates are biased, but the standard errors on the coefficients are not precise.

Another way to address the weighting problem is to use an iterative maximum likelihood estimation technique. In essence, this technique uses logistic regression to estimate the parameters. Normally, logistic regression is performed on data in which the dependent variable takes on the value of either 0 or 1. The technique used here takes the utilization rate for the MSA and produces N records that represent individual patients. For example, suppose that MSA X has a number of discharges (N) and a number (S) of those discharges use SNF care after their discharge from the hospital. Instead of having one record for MSA X, the technique transforms the data so that there are S records with a dependent variable value of 1, and $N\text{-}S$ records with a dependent variable value of 0. All N of the records will have all of MSA X's values for all of the

[9]Neter, Wasserman, and Kutner, p. 167–168.
[10]Neter, Wasserman, and Kutner, p. 364.

independent variables. While this technique will produce unbiased estimates, the standard errors of the parameters are understated because there are not really N independent pieces of information on which to base the estimates. The estimates from this technique will also be presented, but the estimates of the statistical significance of the coefficients will be excluded.

None of the three methods of estimating the second-stage utilization equation will produce precise estimates of the standard errors of the coefficients on the independent variables. All three, however, will produce unbiased estimates of the coefficients themselves. Therefore, the results of all three versions will be presented. While none of the individual results should be used to determine the statistical significance of a variable, agreement among the three equations may allow some conclusions to be drawn. Note that only the second-stage utilization equation requires this special treatment; the bed supply equation did not involve a logistic transformation, and thus an unweighted regression was adequate.

REGRESSION RESULTS

There were 306 MSAs used in the analysis. MSAs that were the only MSA in their state had to be excluded from the regression analysis because there was no way to calculate a state-effect variable for those MSAs. The eight excluded MSAs were: Anchorage, AK; Boise, ID; Burlington, VT; Casper, WY; Honolulu, HI; Sioux Falls, SD; Washington, DC; and Wilmington, DE.

Bed Supply Results

Table 7 presents the results of the bed supply equation from the two-stage, least-squares regressions. The equation estimates the natural log of the number of Medicare-certified SNF beds per 1000 elderly persons in an MSA. In this table, the reported coefficients for the continuous variables are in terms of standard deviations. For example, an increase of one standard deviation in the Medicaid-covered SNF days per elderly person in the state in which an MSA is located will increase the natural log of the number of Medicare SNF beds per 1000 elderly by 0.281. This method of presentation is used because the independent variables are measured on such different scales that the relative magnitudes of the different variable effects would be indecipherable if the coefficients were not standardized in some manner.

All of the variables in the bed supply equation have the expected sign on their coefficients, and all except the reimbursement system variable and the variable that measures the percent of hospital admissions that are Medicaid, were statistically significant at the 1 percent level. Both of the coefficients that are not statistically significant had t-statistics greater than 1, indicating that they probably should not be eliminated from the equation. State Medicaid and local variables both seemed to have an effect on the Medicare SNF bed supplies in the MSAs.

Table 7

REGRESSION COEFFICIENTS FROM THE BED SUPPLY EQUATION OF TWO-STAGE, LEAST-SQUARES REGRESSIONS

(Log(Medicare SNF beds/1000 elderly))

Variable	Coefficient
Retrospective state Medicaid SNF reimbursements	0.165
Percent of State Medicaid beds—SNF	0.257[b]
Medicaid SNF days per population	0.281[b]
Percent of hospital admissions—Medicaid	0.052
Predicted log-odds of SNF utilization	0.611[b]

NOTES: R-square = 0.58. Continuous variable coefficients are in standard deviations.

[a]Coefficient is significant at the 5 percent level.

[b]Coefficient is significant at the 1 percent level.

The coefficient on the dummy variable for the MSA being in a state that has a retrospective Medicaid SNF reimbursement system had a positive value. This result means MSAs in states with retrospective payment systems had more Medicare SNF beds per elderly than MSAs in states with prospective systems, all other things being equal. I hypothesized that since Medicare reimburses retrospectively, nursing homes in states whose Medicaid programs also reimbursed retrospectively would be more willing to participate in Medicare, and thus the Medicare SNF bed supplies in those states would be higher. That hypothesis is given some support by these findings, but the support is not very strong since the coefficient does not reach statistical significance at the 5 percent level.

The coefficient on the variable that measures the SNF versus the ICF orientation of the state Medicaid program is statistically significant in the hypothesized direction. The variable measured the percentage of the state's total number of Medicaid-certified beds that were certified to provide SNF care. The higher the percentage of beds that were SNFs, the more the nursing home community would be accustomed to providing the higher SNF level of care required to participate in Medicare. The hypothesis is that the higher the percentage of Medicaid beds that are certified as SNFs, the higher the supply of Medicare SNF beds would be. The results strongly support this hypothesis.

The last state Medicaid policy variable included in the bed supply equation is the number of SNF days per elderly population that was covered by the state Medicaid program. The

hypothesis is that the more days covered by Medicaid, the more SNF beds can be supported in the state, and thus the more Medicare SNF beds there will be. The significance of the coefficient on the variable that measured the number of Medicaid-covered days shows that there was very strong support for this hypothesis in these results.

Since Medicaid patients are the bulk of the market for SNFs, it seems reasonable to hypothesize that there will be more SNF beds in areas where there are more Medicaid patients. The percentage of hospital admissions in an MSA should be a good proxy for the relative size of the Medicaid market in the MSA. Therefore, the hypothesis is that the higher the percentage of Medicaid hospital admissions in an area, the higher the Medicare SNF bed supply will be. The results presented in Table 7 provide only weak support for this hypothesis because, while the coefficient was positive, it was not statistically significant. Perhaps the hypothesized effect did not fully materialize either because increased Medicaid demand results instead in more ICF beds in some areas, or because there is no supply response in states where the Medicaid nursing home benefit is tightly constricted.

The last variable in the bed supply equation is the predicted value of the log-odds of the SNF utilization rate, predicted from the first-stage regression. It was expected that areas with higher Medicare SNF utilization would have higher SNF bed supplies in response to the higher "demand." Indeed, there is a significantly positive coefficient on the utilization variable, thus supporting the hypothesis that increased utilization would increase the supply of beds. In fact, the coefficient on the utilization variable was by far the highest of any variable in the equation, showing that the nursing home industry seems responsive to increases in Medicare demand.

Utilization Results

Table 8 displays results from the three different versions of the second-stage utilization equation from the two-stage, least-squares regression. The table is designed to facilitate comparison of the effects predicted by the different versions. The three versions are: a weighted least squares (WLS) with observations weighted by $Np(1\text{-}p)$, a WLS weighted by $p(1\text{-}p)$, and a maximum likelihood logit estimation. For each of the three versions, the table shows the effect, on the predicted SNF utilization in an MSA, of having a value on an independent variable that is one standard deviation below or above the mean value for that variable. For example, the entries in the upper right of the table indicate that if an MSA had mean values for all of the independent variables, except for an SNF bed supply that was one standard deviation below the mean, the regression using weights of $Np(1\text{-}p)$ would predict a utilization rate of 0.027. If the bed supply were one standard deviation above the mean then the predicted rate would be 0.038.

A comparison of the results indicates substantial agreement among the three versions. Physician supply is the only variable for which the three versions do not completely agree upon

the direction of the effect. The magnitudes of the predicted effects, as well as the directions, are remarkably consistent across versions. The three versions often agree enough to overshadow doubts about the imprecision of the individual equations.

The results in Table 8 consistently show that the Medicare SNF bed supply is one of the stronger predictors of SNF utilization in an MSA. In all three equations, the bed supply variable has one of the strongest effects on the utilization predictions of the continuous variables. In each case, the effect is in the positive direction and significant at the 1 percent level. These results provide support for the hypothesis that the limited supply of SNF beds in some MSAs may be constraining utilization.

Related to the bed supply hypothesis is the hypothesis that MSAs with no Medicare-certified SNF beds have utilization rates even lower than would be predicted by their low bed supply. The results show that the dummy variable denoting that there were no Medicare-certified SNF beds in an MSA was consistently negative and large. Using the third equation, the dummy variable had a coefficient large enough to change the prediction for the SNF utilization in an MSA with average values (for all variables other than bed supply) from 1.5 percent for an MSA with a very low bed supply, to 0.1 percent for an MSA without any SNF beds.[11]

The hypothesis that hospital-based SNFs are likely to serve more Medicare patients finds some support in these results. The higher the percentage of SNF beds in an MSA that are hospital based, the higher the utilization. The coefficients on the hospital-based beds percentage variable are positive in all three equations. In the one equation, however, the coefficient is not significant at the 5 percent level.

The coefficients on the admission propensity variable are negative and significant at the 1 percent level in all three equations. These results show that MSAs with higher-than-expected hospital admissions used SNF care less often than MSAs with fewer-than-expected admissions. The hypothesis was that in areas where the practice was to admit patients to the hospital under a wider range of circumstances, there would be more patients admitted who were not in as bad shape, and thus less likely to need SNF care later. This hypothesis is strongly supported by these results, which show that areas that were more discriminating in their hospital admissions had a higher percentage of their patients use SNF care after hospital discharge.

There was no support for two other local market hypotheses. The hypotheses were that more physicians and higher income per capita will lead to higher utilization of medical care in general, and thus higher utilization of SNF care.

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[11]This calculation was performed assuming an SNF bed supply value of 1 per 1000 elderly.

Table 8

COMPARISON OF ESTIMATES OF MSA UTILIZATION RATES FROM THREE REGRESSIONS

(variables 1 standard deviation below and 1 standard deviation above the mean)

Variable	Weight $Np(1-p)$ (percent)	Weight $p(1-p)$ (percent)	Maximum Likelihood Estimation (percent)
	Below Above	Below Above	Below Above
SNF bed supply (predicted)	2.7 – 3.8 (3.29)	2.7 – 3.8 (2.68)	2.8 – 3.6
No Medicare SNF beds in MSA	3.6 – 0.3 (-2.16)	3.6 – 0.3 (-3.23)	3.7 – 0.2
% of SNF beds hospital-based	3.0 – 3.4 (1.70)	2.9 – 3.5 (2.82)	2.9 – 3.5
Hosp. admissions versus average	3.7 – 2.7 (-2.86)	3.8 – 2.6 (-3.29)	3.6 – 2.8
Physicians per population	3.2 – 3.2 (0.16)	3.1 – 3.3 (0.33)	3.2 – 3.1
Per capita income	3.1 – 3.2 (0.37)	3.2 – 3.2 (0.22)	3.2 – 3.2
% of population age 75 and over	3.0 – 3.4 (2.49)	3.1 – 3.3 (1.33)	3.0 – 3.4
% of elderly female	3.1 – 3.2 (0.38)	3.2 – 3.2 (0.20)	3.1 – 3.3
Medicaid SNF days per population	3.4 – 3.0 (-1.42)	3.6 – 2.8 (-2.60)	3.2 – 3.1
State effect	2.6 – 3.9 (5.05)	2.5 – 4.1 (5.64)	2.6 – 3.9
Waiver state	3.4 – 1.9 (-5.29)	3.4 – 1.8 (-3.91)	3.4 – 1.9

NOTES: T-statistics from the maximum likelihood equation are inflated and thus excluded. All variables except physician supply and per capita income were highly significant.
Mean MSA utilization rate is 3.2%.
R-square = 0.53 for $Np(1-p)$; R-square = 0.44 for $p(1-p)$.
p = Predicted utilization rate; N = Number of live hospital discharges.
T-statistics for the regression coefficients are in parentheses.
Estimates for dummy variables are for dummy = 0 and dummy = 1.

Age was used as a control variable because the nursing home literature consistently shows that older patients are more likely to use SNF care than younger patients. This hypothesis will be tested more rigorously in the patient-level analysis in the next section, but these results do show that MSAs with a higher percentage of their population 75 years of age and older tend to have higher utilization rates than MSAs with a lower percentage of their people over 75.

Similarly, there was an effort to control for the gender distribution of each MSA. Earlier work showed that women were more likely to use SNF care than men. Therefore, the percentage of the elderly population in the MSA that was female was included as a variable. The results from the MSA regressions show only a small positive relationship between a higher percentage of females and higher utilization. The importance of the sex of the patient as a determinant of SNF care utilization will be tested more completely in the patient-level analysis.

The Medicaid SNF utilization rate for the MSA's state was included as an independent variable to test the hypothesis that there may be some substitution of Medicaid services for Medicare services, or at least some competition for SNF beds between patients supported by the two programs. The coefficients on the variable that measured Medicaid-covered SNF days per elderly person were negative in all three of the equations, indicating that there may indeed be some substitution or competition between Medicare and Medicaid SNF use. The coefficients, however, were not consistently significant. Therefore, the hypothesis that there is some trade-off between Medicaid and Medicare SNF care finds some support in these results, but further tests at the patient level may be helpful.

The last variable in the utilization equation presented in Table 8 is the state effect. This variable was included to test whether there were other state policies, not measured with the other state-level variables, that affect utilization in an MSA. The other reason that the state-effect variable was included was to see whether the intermediary-effect variable discussed earlier was measuring something different than a state effect. It turned out that while the intermediary-effect variable showed early promise, that variable was highly correlated with the state effect. When the two variables were both included in the regressions, the state effect rendered the intermediary effect completely insignificant while remaining strongly significant itself. Therefore, I concluded that the intermediary-effect variable was really picking up a state effect, and thus I removed intermediary effect from the equation. It is conceivable, however, that since intermediaries operate almost entirely within state lines, one of the unmeasured variables that the state effect picks up is intermediary effects. The state-effect variable was positive and significant at the 1 percent level in all three equations, strongly supporting the hypothesis that there are state policies other than those already accounted for that a[illegible] Medicare SNF utilization.

IV. PATIENT-LEVEL ANALYSES

This section will present an analysis of the determinants of SNF care at the patient level. In addition to patient-level variables, the models will include hospital-level variables, metropolitan area–level variables, and some state-level variables. Data for this set of analyses come mostly from the same data sources used for the metropolitan area analyses. The unit of analysis is the patient. The estimation sample is drawn from the Episode File that was described in the previous section.

MODELING CONSIDERATIONS

The unit of observation in this set of analyses is the individual discharged hospital patient. The dependent variable is therefore limited to a simple determination of whether the patient used SNF care or not. The dependent variable is a binary variable that takes on the value of 1 when the patient is an SNF user, and 0 when the patient does not use SNF services. A natural choice of model with a 0–1 dependent variable is logistic regression.

At the patient level, the most important determinant of the probability that a patient uses SNF care after hospital discharge is the reason for which the patient was hospitalized. The best available variable to approximate the reason for hospitalization is the DRG to which the patient was assigned. Utilization of SNF care has indeed been found to vary tremendously across DRGs.[1] Since the patterns of treatment will be different for patients in different DRGs, patient-level analyses should be performed on groups of patients with the same DRG who have been discharged from the hospital.

Separate logistic regressions were estimated for patients in five DRGs. The five DRGs included in the analysis are numbers 14, specific cerebrovascular disorders except transient ischemic attack (stroke); 88, chronic obstructive pulmonary disease; 127, heart failure and shock; 209, major joint and limb reattachment procedures; and 210 hip and femur procedures except major joint.[2] These DRGs were chosen for different reasons. DRGs 14, 209, and 210 were chosen because in earlier work they were found to have the most SNF users. Therefore, these DRGs would be the most important ones to look at when making recommendations affecting Medicare SNF policy. DRGs 127 and 88, on the other hand, were chosen because they had large numbers of patients, but made relatively little use of SNF care. The inclusion of these two DRGs will thus keep the findings

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[1]Neu and Harrison, *Posthospital Care.*

[2]Beginning in FY 1986, cases that included two or more of the major joint procedures were assigned to a new DRG. The new DRG, 471, is titled: bilateral or multiple major joint procedures of the lower extremity. Approximately 1 of every 200 of the DRG 209 cases in this study would now be assigned to DRG 471.

from reflecting only high-use DRGs. Patients in DRG 210 use SNF care about one-third of the time, while patients in DRGs 14 and 209 use SNF care in about 15 percent of the cases, and patients in DRGs 127 and 88 use SNF care less than 2.5 percent of the time. Table 9 lists the exact utilization figures and sample sizes for the DRGs examined in this section.

VARIABLES

Table 10 presents a summary of all the variables used in the patient-level regressions. This section describes those variables and discusses why they are included.

Patient-Level Variables

All of the patient-level variables are obtained from the Episode File described in the last section. The variables available include age, sex, race, diagnoses, and hospital length of stay (LOS).

Since previous work found that older patients used SNF care more frequently, it was expected that the patient's age would have an effect on SNF utilization. Rather than leaving age as a continuous variable, however, age was divided into four categories—under 65, 65–74, 75–84, and 85 and older—so that other than linear relationships might be detected. The 65–74 age group was the omitted group in the regression equations; thus, all age effects are for the relevant age group relative to the excluded group. Also, because previous work indicated that women used SNF care more frequently than men, a simple dummy for female was used in the regressions.

Findings from other studies[3] suggested that there could be racial differences in SNF utilization. Race was included in the regressions with a dummy variable indicating if the patient was listed as white. Thus, the utilization of white patients is compared to the utilization of other patients.

There are some variables that could help indicate the severity of the individual case within the DRG. A simple measure of severity is whether or not the patient has any secondary diagnoses. In related work, I found that patients who had secondary diagnoses indeed utilized SNF services more frequently than those patients who had no secondary diagnoses. Therefore, in order to help control for severity, a dummy variable for the existence of secondary diagnoses is included.

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[3]William J. Scanlon, "A Theory of the Nursing Home Market," *Inquiry*, Vol. 17, Spring 1980, pp. 25–41.

Table 9

SNF UTILIZATION AND SAMPLE SIZES
FOR SELECT DRGs

DRG Number	Live Discharges	Percentage Live Discharges Using SNF Care
14	36,897	15.7
88	24,536	1.6
127	65,335	2.3
209	25,079	16.0
210	17,688	33.4

Table 10

INDEPENDENT VARIABLES IN PATIENT-LEVEL EQUATIONS

Patient Variables	Description	Type
Age: Under 65	1 - If patient is under 65	Dummy
75–84	1 - If patient is between 75 and 84	Dummy
Over 84	1 - If patient is 85 or older	Dummy
Female	1 - If patient is female	Dummy
White	1 - If patient is white	Dummy
Secondary diagnosis	1 - If patient has a secondary diagnosis	Dummy
Fracture	1 - If primary diagnosis is a fracture	Dummy
Hospital length of stay (LOS)	Log of patient's hospital LOS	Continuous
Hospital Variables	**Description**	**Type**
Teaching hospital	1 - If hospital has interns or residents	Dummy
For Profit	1 -If hospital is for profit	Dummy
Government hospital	1 - If hospital is government owned	Dummy
Less than 100 beds	1 - If hospital has less than 100 beds	Dummy
500 beds or more	1 - If hospital has 500 or more beds	Dummy
Average adjusted LOS	Hospital's DRG-adjusted LOS versus national average	Continuous
Disproportionate share	Additional PPS payment for disproportionate share	Continuous
MSA Variables	**Description**	**Type**
SNF bed supply	Medicare SNF beds/elderly population	Continuous
Percent of SNF beds—hospital	Hospital SNF beds/total Medicare SNF beds	Continuous
Admissions for DRG	DRG-specific admission rate versus national average	Continuous
Rehabilitation Utililities—DRG	DRG-specific rehabilitation users/discharge	Continuous
Home health utililities—DRG	DRG-specific home health users/discharge	Continuous
Average. LOS for DRG	Log of the DRG-specific LOS	Continuous
Per capita income	Income/population	Continuous
Physicians per capita	Physicians/population	Continuous
State Variables	**Description**	**Type**
Medicaid SNF utilities	Medicaid SNF days/elderly population	Continuous
State SNF utilities—DRG	DRG-specific SNF users/discharge	Continuous

Another patient-level variable also has some value as a measure of severity. The longer that a patient must stay in the hospital, the more severe the case would be expected to have been. It could also be argued, however, that if hospital days and SNF care are substitutes for each other, then SNF patients could be expected to have shorter lengths of stay than nonusers. It is an empirical question as to which of these two hypothesized relationships between hospital LOS and SNF utilization is stronger. Therefore, the patient's hospital LOS is included in the regressions to help control for severity, but there is no firm hypothesis on the direction of the overall effect.[4]

In related work, I found that patients in DRG 209 tend to follow two different treatment patterns depending on whether or not the primary diagnosis is a bone fracture. If the primary diagnosis is a bone fracture, then the patient is at least twice as likely to use SNF care as other DRG 209 patients. Therefore, in the DRG 209 equation, a dummy variable indicating that the patient had a fracture is included.

Hospital-Level Variables

Seven hospital-level variables are included as control variables. Similar variables have been used as controls in other recent studies.[5] While there are no specific hypotheses relating most of the hospital characteristics to SNF utilization, the inclusion of these variables may provide further insight into questions about practice patterns at different categories of hospitals. These variables were obtained from an HCFA-maintained provider-level file that includes American Hospital Association survey information.

The first variable is a dummy variable indicating whether the hospital is a teaching hospital. A hospital was considered a teaching hospital if it received additional payments for treating Medicare patients because of teaching activities.

The next two variables give an indication of the ownership of the hospital. Hospitals were divided into three groups: for profit, private nonprofit, and government owned. Dummy variables for whether the hospital was for profit and government owned were included in the regressions, leaving private nonprofit as the excluded group.

Similarly, the hospitals were broken into three groups based on size: less than 100 beds, 100–499 beds, and 500 or more beds. Dummies for the smallest and largest groups were included in the regressions, leaving the middle group as the comparison group.

The sixth hospital-level variable is an approximate measure of the proportion of a hospital's patients that are low-income patients. The variable is the additional payment that the

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[4]Actually, the variable used is the log of the patient's length of stay. The log is used because the distribution of the LOS variables had very long tails, suggesting the use of a log transformation.

[5]Michael A. Morrisey, Frank A. Sloan, and Joseph Valvona, "Medicare Prospective Payment and Posthospital Transfers to Subacute Care," *Medical Care*, Vol. 26, No. 7, July 1988.

hospital received in fiscal year 1987 from Medicare for treating a "disproportionate share" of low-income patients. The higher the value of the disproportionate share variable, the higher the percentage of a hospital's patient load is accounted for by low-income patients.[6]

The last hospital-level variable compares the lengths-of-stay of the Medicare patients discharged from a particular hospital to the national average length-of-stay. This measure is adjusted for the hospital's case mix. Higher values for this variable mean that the hospital keeps its patients longer than the national average, while lower values mean that the hospital tends to discharge its patients in less time than the national average.[7] I hypothesize that hospitals that tend to keep their patients longer will have lower SNF utilization.

Metropolitan Area–Level Variables

All of the data sources and hypotheses for the MSA-level variables have already been discussed in previous sections. However, some of the variables that could not be used in the MSA-level analyses are used in the patient-level analyses, and some of the variables have been modified.

Tests of the substitution of other Medicare services for SNF care are undertaken in these analyses where there is not a problem with simultaneity. The variables used to test substitution include the MSA's rehabilitation facility utilization rate, the home health care utilization rate, and the natural log of the average hospital LOS. All of those variables are DRG specific.

In addition to the three substitute services variables, the admission propensity variable in these analyses is also DRG specific. National age- and sex-adjusted admission propensities for each DRG were calculated and compared to the admission propensities in each MSA. In these regressions, the admission propensity variable compares the actual admissions in an MSA for a particular DRG, with the expected admissions given the age- and sex-adjusted national admission propensity.

The other five MSA-level variables are the same measures that were used in the MSA-level analysis. Those variables include the Medicare SNF bed supply, the dummy variable

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[6]HCFA calculates this variable from data included on hospital cost reports. The variable is the multiplier that HCFA uses to make additional payments to a hospital if it serves a disproportionate share of low-income patients. For more than two-thirds of the hospitals, there is no additional payment and the value of the variable is 0. If there is to be an additional payment, that payment will range from an extra 2.5 percent of Medicare payments to an extra 15 percent. Therefore, aside from 0 the only values that the variable will take on will be between 0.025 and 0.15.

[7]The figure was calculated by taking the natural log of the patient's LOS, subtracting the national geometric mean of the LOS for the patient's DRG, and then summing up those differences for all Medicare patients discharged from the relevant hospital. Therefore, hospitals with lengths of stay shorter than the national average will have negative values for the "adjusted hospital LOS" variable, while hospitals with longer-than-average stays will have positive values.

indicating that there are no Medicare SNF beds in the MSA, the percentage of Medicare SNF beds that a[illegible]pital-based, the physician supply, and the per capita income.

State-Level Variables

Two state-level variables are also included in these patient-level analyses. The number of Medicaid SNF days per person reimbursed by Medicaid was included to test for the substitution of Medicaid coverage for Medicare coverage. MSA-level variables would have been preferable, but could not be constructed from available data. The state DRG-specific SNF utilization rate is included to control for any unmeasured state effect or difference in practice pattern.

RESULTS

Table 11 presents a summary of the results of the five logistic regressions on the patient-level data. There are consistent trends in the effects of the patient-level, MSA-level, and state-level variables. These results also appear to be consistent with the results of the MSA-level analyses. The results, however, do not show consistent effects for many of the hospital-level variables.

Patient-Level Results

The patient-level variables had consistent and significant effects in all five equations. The age variables show that SNF utilization increases with age. Females are more likely to use SNF care than males. The results also showed that white patients had a higher probability of using SNF care than nonwhite patients. Those patients who had recorded secondary diagnoses used SNF care more frequently than those patients with no secondary diagnoses. DRG 209 patients with fractures were much more likely to use SNF care after discharge from the hospital. Patients with longer hospital lengths of stay were more likely to use SNF care than patients with shorter lengths of stay.

Hospital-Level Results

The effects of the hospital-level variables are much less consistent than those of the patient-level variables. Only one hospital-level variable had significant effects in as many as four of the DRGs. There were some distinguishable trends, however.

Table 11 shows that patients discharged from teaching hospitals tended to make more use of SNF care than patients from nonteaching hospitals. Although the coefficients reached significance at the 5 percent level in only two of the equations, the coefficient was positive in all five of the equations.

Table 11

PATIENT-LEVEL LOGISTIC REGRESSION RESULTS

Patient Variables	DRG:14	DRG 88	DRG 127	DRG 209	DRG 210
Age: Under 65	-0.347b	0.010	-1.143b	-0.540b	-0.707b
75–84	0.625b	0.759b	0.746b	0.782b	0.594b
Over 84	1.041b	1.653b	1.296b	1.306b	0.914b
Female	0.281b	0.162	0.138a	0.369b	0.190b
White	0.258b	0.324	0.399b	0.314b	0.290b
Secondary diagnosis	0.371b	0.477b	0.531b	0.258b	0.183b
Fracture	(c)	(c)	(c)	1.382b	(c)
Hospital LOS	0.941b	0.847b	0.921b	0.108b	0.082b
Hospital Variables:					
Teaching hospital	0.036	0.179	0.176b	0.054	0.102a
For profit	0.069	-0.005	0.068	-0.011	0.137a
Government hospital	0.175b	-0.298	0.107	-0.111	-0.108
Less than 100 beds	-0.167b	0.077	-0.043	-0.320b	-0.199a
500 beds or more	-0.210b	-0.310	-0.122	-0.088	-0.055
Average adjusted LOS	-0.242b	-0.173	-0.371b	-0.025	-0.066a
Disproportionate share	-0.106b	-0.046	-0.085b	-0.094b	-0.115b
MSA Variables:					
SNF bed supply	0.122b	0.234b	0.139b	0.098b	0.095b
% SNF beds—hospital	0.099b	0.186b	0.003	0.116b	0.058b
Admissions for DRG	0.008	-0.060	0.043	-0.136b	-0.131b
Rehabilitative utilities—DRG	-0.119b	0.038	0.023	-0.017	-0.112b
Home health utilization—DRG	-0.050a	-0.008	-0.078a	-0.092b	-0.197b
Average LOS for DRG	-0.157b	-0.185a	0.071	-0.154b	-0.024
Per capita income	0.051a	0.096	0.124b	0.090b	0.041
Physicians per capita	-0.024	-0.117	-0.043	0.012	0.046a
State Variables:					
Medicaid SNF utilization	-0.128b	-0.189a	-0.142b	-0.142b	-0.113b
State SNF utilization—DRG	0.490b	0.461b	0.464b	0.479b	0.481b

NOTE: Coefficients of continuous variables are in standard deviations.

[a] significant at the 5 percent level

[b] significant at the 1 percent level

The coefficient on the dummy variable denoting that the patient's hospital is operated for profit is significant in only one equation. In the other four equations, the coefficients are not significant at the 5 percent level, and in addition, the signs are not consistent. The coefficients on the government-hospital variable behaved in a similar manner. Therefore, the control groups of for profit, nonprofit, and government owned did not seem to have any consistent effect on the probability that a hospital's patients would use SNF services.

The size of the hospital seemed to have an effect on its patients' likelihood of utilizing SNF care. Hospitals with less than 100 beds had lower utilization in four of the equations, and those with 500 or more beds had lower utilization in all five DRGs. The variable for small hospitals is significant in three equations, but the large hospital indicator is significant in only one.

Table 11 presents strong evidence that patients discharged from hospitals that serve a higher proportion of low-income patients are less likely to use SNF care. The coefficient on the disproportionate-share variable is negative in all equations and significant at the 1 percent level in four of them. This finding, combined with the finding that nonwhite patients are less likely to use SNF care, may indicate that low-income patients are not using SNF care as often as other patients.

The log of average adjusted hospital LOS was included as a measure of practice patterns at the hospital. The hypothesis was that hospitals that tend to keep their patients longer will discharge patients that have a lower probability of requiring SNF care. The results in Table 11 lend some support to this hypothesis. The negative coefficients in all five equations indicate that patients discharged from hospitals that retain patients longer utilize SNF care less frequently. Those coefficients were significant in three of the equations.

Metropolitan Area–Level Results

The MSA-level variables generally had consistent and significant effects on Medicare SNF utilization. In addition, the results from the logistic regressions were consistent with the findings from the MSA-level analysis discussed in the previous section.

The logistic regressions were initially estimated with the no-beds variable. The variable, however, was such a powerful predictor that it had to be removed from the equations because it prevented the estimates from converging properly. In fact, for two of the DRGs, 88 and 127, no patients used SNF care if there were no SNF beds in their metropolitan area. In all five equations, the no-beds variable had negative and significant coefficients. While the estimates produced with the no-beds variable were similar to those presented in Table 11, the equations were reestimated because of the possibility that some of the estimates were distorted due to the convergence problems. The equations that generated the results presented here were estimated with a sample that excluded all patients discharged from hospitals in MSAs with no Medicare-certified SNF beds.

The supply of Medicare-certified SNF beds in an MSA appears to have a positive effect on SNF utilization. The SNF bed supply variable had a positive and significant coefficient in all five of the logistic regressions. These results, combined with the results from the MSA-level

analyses, strongly support the hypothesis that a larger supply of SNF beds will result in higher SNF utilization rates.

As in the MSA-level analyses, these results show that patients in MSAs with higher proportions of hospital-based SNF beds tend to use SNF care more frequently. Only for DRG 127 was the coefficient not statistically significant. These results support the hypothesis that hospital-based SNFs may be more willing and able to accept Medicare patients.

The results for the admission propensity variables are more difficult to interpret than in the MSA-level analysis. In the MSA analysis, the hospital admission rate was a metropolitan area practice pattern variable that was intended to indicate whether patients who might not have problems that were as acute as other patients would be admitted to the hospital or be treated in an outpatient setting. In the equations presented in Table 11, however, the DRG-specific admission rates may not only be affected by medical practice patterns, but may also be affected by hospital DRG coding practices. For example, suppose that an MSA has a higher admission rate for DRG X than the average MSA. This situation could have occurred for one of two reasons: more DRG X patients are admitted because the physicians in the area prefer to treat some of the less-acute patients in the hospital rather than in an outpatient setting; or more patients who are usually coded into other DRGs by hospitals in other MSAs, are coded into DRG X. If the second reason is more accurate, then the admission rate would be expected to affect the SNF utilization rate in DRG X differently, depending on whether the patients in the DRGs into which the patients would have otherwise been coded, use more or less SNF care than patients in DRG X. The bottom line here is that the coefficients on the admission rate variables are significant for only two of the five DRGs. Fortunately, those two DRGs, 209 and 210, are the ones that would allow less hospital discretion in the coding process, since they are determined by the surgical procedure that is performed on the patient, and not by diagnoses. The coefficients on the other three DRGs are insignificant and, in two cases, have signs opposite the originally hypothesized direction. Therefore, there is some support for the hypothesis that local practice patterns that result in lower admission rates will lead to higher SNF utilization rates for those patients that are hospitalized, but the evidence is not overwhelming.

Table 11 also presents results that indicate that local practice patterns may be important in determining SNF utilization when the use of substitute services is concerned. Only three of the fifteen coefficients on variables that measure potential Medicare substitute service utilization do not show substitution for Medicare SNF care; two of those exceptions are for the substitution of rehabilitative services in DRGs 88 and 127, where both rehabilitative and SNF services are very rarely used. For nine of the substitute service utilization variables, the coefficient is negative and significant. Therefore, there is strong support for the hypothesis that inpatient hospital care,

home health care services, and care in PPS-exempt rehabilitation facilities are used as substitutes for care in an SNF.

The logistic regressions yielded results that did not provide any support for the hypothesis linking physician supply in a metropolitan area and SNF utilization. The signs on the physician supply coefficient were inconsistent, and for only one DRG was the coefficient significant.

The patient-level regressions, however, showed that patients from higher-income MSAs tend to use SNF care more often than patients from lower-income MSAs. All five of the equations included per capita income coefficients with positive signs, and three of the coefficients were significant at the 5 percent level or better. Once again, there is an indication that lower-income people do not make as much use of the Medicare SNF benefit as other patients. Naturally, the best way to have checked the hypothesis would have been to include a patient-level measure of income. Unfortunately, information on patient income was not available.

State-Level Results

The two state-level variables used in these analyses had consistent effects across the five equations. The coefficients on the variables were always significant at the 5 percent level and were significant at the 1 percent level in nine of the ten cases. The results from the patient-level equations strongly reinforce the results from the MSA-level analysis.

The results in Table 11 indicate that there is more Medicare SNF use in states that pay for fewer days of Medicaid SNF care per capita. The results are consistent across the five equations. These results are also consistent with results from the previous section. The hypothesis that there may be some substitution of care, or competition for beds, between the Medicaid and Medicare SNF programs is strongly supported by the results.

The statewide SNF utilization rate was positively correlated with the probability of using SNF care in all of the equations. This variable was again included to account for other state variables, including fiscal intermediaries, that may have been overlooked. It was highly significant in all equations.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The purpose of this Note was to examine the question of whether local market characteristics affect Medicare SNF utilization. Within that context, this Note has attempted to address two questions: Are there local Medicare factors that help explain local SNF utilization? And, do state Medicaid programs affect the national Medicare program's SNF utilization? Based on the results of this study, the short answer to both these questions is yes.

Local Factors

As can be seen by looking at Fig. 1 and Appendix 2, there was a great deal of variation in the utilization of the Medicare SNF benefit across metropolitan areas. The MSA-level analyses presented in Sec. III showed that local health care market characteristics helped to explain that variation. The patient-level analyses presented in Sec. IV, showed that market characteristics played a part in determining the probability that individual patients would receive Medicare SNF services.

One of the most important factors affecting the utilization of SNF services was the supply of Medicare-certified SNF beds in the metropolitan area. The 15 metropolitan areas that had no Medicare SNF beds expectedly had much lower SNF utilizations than other areas. Even when those areas were removed from the sample, it was found that the more Medicare-certified SNF beds there were in an area per elderly population, the higher the probability that a Medicare patient would use SNF services after discharge from a hospital. This finding provides support for the claim that Medicare patients may have trouble gaining access to SNF care because there is a shortage of available beds in many areas.

The results produced from the patient-level analyses seem to point to special access problems for the poor. Nonwhite Medicare patients received SNF care significantly less frequently than whites. Hospitals that served a larger percentage of low-income patients placed their patients in SNFs less often than did other hospitals. And finally, metropolitan areas with lower per capita incomes used less SNF care than more wealthy areas. Unfortunately, these findings offer little help to explain why low-income patients seem to have trouble gaining access to SNF care. It could be that the large copayment that Medicare patients were responsible for after the 20th day of coverage discouraged low-income patients from seeking SNF care under the Medicare benefit. Another possibility is that nursing homes discriminate against low-income patients, either because they believe that low-income patients are more expensive to treat, or because they fear that those patients will become Medicaid patients when their Medicare

eligibility expires, or because they are afraid those patients may not be able to pay their bills if they do not qualify for federal assistance. One more possibility, raised by Feder and Scanlon, is that the nursing home operators may prefer simply to bill Medicaid for low-income patients whose claims could be retroactively denied by Medicare.

Access problems seemed to be alleviated by the presence of hospital-based SNFs. I hypothesized that hospital-based SNFs would be more likely to admit Medicare patients, and this hypothesis found strong support from the results in this Note. It would perhaps have been more interesting to see whether increased utilization occurs because hospitals that own SNFs discharge their patients to SNFs more often. Unfortunately, data on which hospitals owned SNFs were not available.

Aside from differences in access to SNF care, there seemed to be another set of factors that helped to explain variations in SNF utilization. The other set of factors can be loosely grouped together as indications of practice patterns. For instance, the MSA-level analyses found that metropolitan areas where the local practice was to admit Medicare patients to the hospital more readily than other areas generally had lower utilization rates. This result was hypothesized because those areas that admitted more patients were expected to have a lower percentage of cases that were more severe, and consequently more likely to require SNF care. Thus, a preference for treating less severe cases in the hospital rather than in an outpatient setting will lower the apparent SNF utilization rate.

Another example of the finding that the preferences of different healthcare providers may affect the probability of a patient utilizing SNF care is the result showing that patients in hospitals that tend to keep their patients longer use SNF care less frequently than patients in hospitals that discharge their patients faster. This result, from the patient-level analyses, shows that hospital staff preferences for allowing or not allowing recovery time in the hospital rather than in a subacute setting will affect the SNF utilization rate.

Other local practice patterns that affected SNF utilization were the utilization rates of potential substitute services at the MSA level. If there is a local practice pattern that includes heavier use of a potential substitute Medicare service, then there is a decreased probability that patients in that area will use SNF care. In essence, the use of home health care, rehabilitation facility care, or longer stays in hospitals does seem to substitute for the use of SNF services in many cases.

Practice patterns also seemed to extend to the state level. States have licensing regulations, malpractice laws, medical boards, medical societies and associations, and peer review organizations that can all affect medical practice patterns. The results from all analyses in this study show state effects on SNF utilization to be very strong.

State Medicaid Program Effects

State Medicaid program variables affected Medicare SNF utilization both directly and indirectly through the effect that the state programs have on the Medicare SNF bed supply.

The state Medicaid programs had a large effect on the Medicare SNF bed supply in a metropolitan area. The results displayed in Table 7 show that areas in states with retrospective reimbursement systems, a stronger orientation toward skilled care, and more Medicaid use of SNFs tend to have more Medicare SNF beds. Also, local areas with more Medicaid hospital patients tend to have more Medicare SNF beds. In essence, Medicaid demand affects the Medicare SNF bed supply.

While it seems clear that Medicaid demand for SNF services leads to an increase in the Medicare SNF bed supply, which in turn leads to increased Medicare SNF utilization, the utilization of Medicaid SNF services also seems to offset the utilization of Medicare SNF services. The results from both the patient-level and MSA-level analyses indicate that an increase in the state's use of Medicaid SNF care would mean a decrease in the utilization of Medicare SNF care within the state. There are two likely reasons why this trade-off might occur. First, there may be competition for available SNF beds between patients supported by the two programs. Given that there seems to be a shortage of beds in some areas and nursing home occupancy rates are very high across the country, competition for the SNF beds seems very likely.

A possible second reason for the trade-off lies in the fact that, even though Medicare is supposed to pay for all patients who are eligible for both Medicare and Medicaid, nursing home operators often have the choice of submitting the bill for a patient's stay to either Medicare or Medicaid. If a patient is eligible for both programs, then a nursing home owner may wish to submit the bill to Medicaid because the owner may not wish to risk a retroactive denial of the claim by Medicare. In addition, since Medicare does not cover long stays, the nursing home operator may feel that the patient is going to end up on Medicaid before long anyway, so submitting the bill to Medicaid initially may save trouble. States are different, however, in how much billing discretion is given to the nursing home. Some states more strictly enforce requirements that a bill be submitted to Medicare first. Therefore, a trade-off between Medicare and Medicaid SNF utilization may occur because the two programs sometimes serve the same patients.

RECOMMENDATIONS

This Note's results suggest five recommendations. They are as follows:

- *HCFA should be aware that state Medicaid programs have a great deal of influence over the supply of Medicare SNF beds, and thus, the utilization of SNF services.* Unless Medicare becomes a much larger consumer of nursing home services, it is likely that the nursing home industry will remain more responsive to Medicaid policies than Medicare policies. This situation means that Medicare policies that attempt to alter nursing home behavior may have widely varying success across the country, depending on the Medicaid program in each state. The bed supply analysis in this Note found that the supply of Medicare SNF beds was higher in states whose Medicaid nursing home programs more closely resembled the Medicare program on such variables as a retrospective payment system and reliance on SNFs rather than ICFs. To be successful, it may be wise for Medicare policy to follow the lead of Medicaid policy, because if there are costs involved in participating in Medicare that do not have to be met for participation in Medicaid, then those costs may lower SNF participation in Medicare.

- *Some method of increasing the supply of Medicare SNF beds may help some Medicare patients gain access to SNF care.* There were 15 MSAs that had no Medicare-certified SNF beds at the time of this study. There were Medicaid SNF beds in eight of these MSAs, and there were Medicaid-certified ICF beds in all of them. This situation underscores the importance of finding a way to entice more Medicaid-certified homes to participate in Medicare.

  While not being suggested to address this problem, the Institute of Medicine recommends that the Medicaid programs drop the distinction between SNF and ICF care since they found little difference between the two. The supply of Medicare SNF beds could increase as a by-product of such a change in Medicaid policy.

  The enactment of the Medicare Catastrophic Coverage Act may bring about an increase in the Medicare SNF bed supply. Since the act is expected to increase Medicare demand for SNF services, nursing home operators may respond to the increased demand by increasing the supply of beds. However, it is not yet clear whether the increase in Medicare demand would be large enough to get the nursing home industry to pay more attention to the needs of the Medicare program.

- *A special study of the poor's access to Medicare SNF care should be undertaken.* This study's findings provided some evidence that low-income patients may have

special difficulty in gaining access to Medicare SNF services. The findings, however, were not based on data that had income measures for individual patients, nor were the findings able to discover why this difficulty may be occurring. One possibility is that low-income patients chose to avoid Medicare SNF care because of the high copayments that they were responsible for after the 20th day of the SNF stay. The 1988 Medicare Catastrophic Coverage Act eliminated the copayment and extended the limit from 100 days of care to 150. It would be interesting therefore, to see whether the act results in higher SNF utilization among low-income patients.

- *The potential for substitution between SNF services, home health care services, rehabilitation facility services, and inpatient hospital services should be noted before making any changes in the bundling of Medicare services into a reimbursement system.* Any payment system that might seek to bundle the payment for SNF care services with inpatient services should probably also include home health care and rehabilitative care in the bundle. Otherwise, providers might try to decrease the utilization of SNF care and increase the use of home health and rehabilitation care to increase total reimbursement. Further research into the substitutability among the different forms of posthospital care may be desirable and could lead to increased efficiency in the Medicare system.

- *HCFA should realize that any system that bundles the payment for SNF care with the payment for inpatient care, or that seeks to create a prospective payment system for SNFs, would be setting a national payment schedule for a benefit strongly affected by state and local practice patterns.* While there may be long-run efficiencies to be gained by bundling the payment for hospital and posthospital care, or by creating a system of national SNF payment rates, there will be short-run problems caused by practice pattern differences. HCFA faced a similar problem with differences in practice patterns related to hospital utilization when implementing PPS. A phase-in period was necessary to allow hospitals time to adjust to a national set of standards. A similar phase-in period would probably be necessary to avoid having SNFs leave the Medicare program. In addition, any nationalization of the SNF payment system should include nationalization, or at least more coordination at the national level, of coverage determinations issued by the fiscal intermediaries. The fact that local practice patterns seem to vary so much indicates that there is probably inefficient use of the mix of inpatient and different types of posthospital care in some areas. Some national policy direction may therefore increase the efficiency of the system.

Appendix A

MSAs EXISTING IN 1984

ABILENE, TX
AKRON, OH
ALBANY, GA
ALBANY-SCHENECTADY-TROY, NY
ALBUQUERQUE, NM
ALEXANDRIA, LA
ALLENTOWN-BETHLEHEM, PA-NJ
ALTOONA, PA
AMARILLO, TX
ANAHEIM-SANTA ANA, CA
ANCHORAGE, AK
ANDERSON, IN
ANDERSON, SC
ANN ARBOR, MI
ANNISTON, AL
APPLETON-OSHKOSH-NEENAH, WI
ASHEVILLE, NC
ATHENS, GA
ATLANTA, GA
ATLANTIC CITY, NJ
AUGUSTA, GA-SC
AURORA-ELGIN, IL
AUSTIN, TX
BAKERSFIELD, CA
BALTIMORE, MD
BANGOR, ME
BATON ROUGE, LA
BATTLE CREEK, MI
BEAUMONT-PORT ARTHUR, TX
BEAVER COUNTY, PA
BELLINGHAM, WA
BENTON HARBOR, MI
BERGEN-PASSAIC, NJ
BILLINGS, MT
BRADENTON, FL
BRAZORIA, TX
BREMERTON, WA
BRIDGEPORT-MILFORD, CT
BROCKTON, MA
BROWNSVILLE-HARLINGEN, TX
BRYAN-COLLEGE STATION, TX
BUFFALO, NY
BURLINGTON, NC
BURLINGTON, VT
CANTON, OH
CASPER, WY
CEDAR RAPIDS, IA
CHAMPAIGN-URBANA-RANTOUL, IL
CHARLESTON, SC
CHARLESTON, WV
CHARLOTTE-GASTONIA-ROCK HILL, NC-SC
CHARLOTTESVILLE, VA
CHATTANOOGA, TN-GA
CHICAGO, IL
CHICO, CA
CINCINNATI, OH-KY-IN
CLARKSVILLE-HOPKINSVILLE, TN-KY
CLEVELAND, OH
COLORADO SPRINGS, CO
COLUMBIA, MO
COLUMBIA, SC
COLUMBUS, GA-AL
COLUMBUS, OH
CORPUS CHRISTI, TX
CUMBERLAND, MD-WV
DALLAS, TX
DANVILLE, VA
DAVENPORT-ROCK ISLAND-MOLINE, IA-IL
DAYTON-SPRINGFIELD, OH
DAYTONA BEACH, FL
DECATUR, IL
DENVER, CO
DES MOINES, IA
DETROIT, MI
DOTHAN, AL
DUBUQUE, IA
DULUTH, MN-WI
EAU CLAIRE, WI
EL PASO, TX
ELKHART-GOSHEN, IN
ELMIRA, NY
ENID, OK
ERIE, PA
EUGENE-SPRINGFIELD, OR
EVANSVILLE, IN-KY
FALL RIVER, MA-RI
FARGO-MOORHEAD, ND-MN
FAYETTEVILLE, NC
FAYETTEVILLE-SPRINGDALE, AR
FLINT, MI
FLORENCE, AL
FLORENCE, SC
FORT COLLINS-LOVELAND, CO
FT LAUDERDL-HLYWD-POMPANO BCH, FL
FORT MYERS-CAPE CORAL, FL
FORT PIERCE, FL
FORT SMITH, AR-OK
FORT WALTON BEACH, FL
FORT WAYNE, IN
FORT WORTH-ARLINGTON, TX
FRESNO, CA
GADSDEN, AL
GAINESVILLE, FL
GALVESTON-TEXAS CITY, TX
GARY-HAMMOND, IN
GLENS FALLS, NY
GRAND FORKS, ND
GRAND RAPIDS, MI

GREAT FALLS, MT
GREELEY, CO
GREEN BAY, WI
GREENSBORO-WINSTN-SALEM-HIGH PT, NC
GREENVILLE-SPARTANBURG, SC
HAGERSTOWN, MD
HAMILTON-MIDDLETOWN, OH
HARRISBURG-LEBANON-CARLISLE, PA
HARTFORD, CT
HICKORY, NC
HONOLULU, HI
HOUSTON, TX
HUNTINGTON-ASHLAND, WV-KY-OH
HUNTSVILLE, AL
INDIANAPOLIS, IN
IOWA CITY, IA
JACKSON, MI
JACKSON, MS
JACKSONVILLE, FL
JACKSONVILLE, NC
JANESVILLE-BELOIT, WI
JERSEY CITY, NJ
JOHNSON CITY-KINGSPORT-BRISTOL, TN-VA
JOHNSTOWN, PA
JOLIET, IL
JOPLIN, MO
KALAMAZOO, MI
KANKAKEE, IL
KANSAS CITY, MO-KS
KENOSHA, WI
KILLEEN-TEMPLE, TX
KNOXVILLE, TN
KOKOMO, IN
LA CROSSE, WI
LAFAYETTE, LA
LAFAYETTE, IN
LAKE CHARLES, LA
LAKE COUNTY, IL
LAKELAND-WINTER HAVEN, FL
LANCASTER, PA
LANSING-EAST LANSING, MI
LAREDO, TX
LAS CRUCES, NM
LAS VEGAS, NV
LAWRENCE, KS
LAWTON, OK
LEWISTON-AUBURN, ME
LEXINGTON-FAYETTE, KY
LIMA, OH
LINCOLN, NE
LITTLE ROCK-NORTH LITTLE ROCK, AR
LONGVIEW-MARSHALL, TX
LORAIN-ELYRIA, OH
LOS ANGELES-LONG BEACH, CA
LOUISVILLE, KY-IN
LUBBOCK, TX
LYNCHBURG, VA
MACON-WARNER ROBINS, GA
MADISON, WI
MANCHESTER, NH
MANSFIELD, OH
MEDFORD, OR
MELBOURNE-TITUSVILLE-PALM BAY, FL
MEMPHIS, TN-AR-MS
MIAMI-HIALEAH, FL
MIDDLESEX-SOMERSET-HUNTERDON, NJ
MIDLAND, TX
MILWAUKEE, WI
MINNEAPOLIS-ST. PAUL, MN-WI
MOBILE, AL
MODESTO, CA
MONMOUTH-OCEAN, NJ
MONROE, LA
MONTGOMERY, AL
MUNCIE, IN
MUSKEGON, MI
NAPLES, FL
NASHVILLE, TN
NASSAU-SUFFOLK, NY
NEW HAVEN-MERIDEN, CT
NEW LONDON-NORWICH, CT-RI
NEW ORLEANS, LA
NEW YORK, NY
NEWARK, NJ
NIAGARA FALLS, NY
NORFOLK-VA BEACH-NEWPORT NEWS, VA
OAKLAND, CA
OCALA, FL
ODESSA, TX
OKLAHOMA CITY, OK
OLYMPIA, WA
OMAHA, NE-IA
ORANGE COUNTY, NY
ORLANDO, FL
OWENSBORO, KY
OXNARD-VENTURA, CA
PANAMA CITY, FL
PARKERSBURG-MARIETTA, WV-OH
PASCAGOULA, MS
PITTSBURGH, PA
PITTSFIELD, MA
PORTLAND, ME
PORTLAND, OR
PORTSMOUTH-DOVER-ROCHESTER, NH-ME
POUGHKEEPSIE, NY
PROVIDENCE, RI
PROVO-OREM, UT
PUEBLO, CO
RACINE, WI
RALEIGH-DURHAM, NC
READING, PA
REDDING, CA
RENO, NV
RICHLAND-KENNEWICK-PASCO, WA
RICHMOND-PETERSBURG, VA
RIVERSIDE-SAN BERNARDINO, CA
ROANOKE, VA
ROCHESTER, MN

ROCHESTER, NY
ROCKFORD, IL
SALINAS-SEASIDE-MONTEREY, CA
SALT LAKE CITY-OGDEN, UT
SAN ANGELO, TX
SAN ANTONIO, TX
SAN DIEGO, CA
SAN FRANCISCO, CA
SAN JOSE, CA
STA BARBARA-STA MARIA-LOMPOC, CA
SANTA CRUZ, CA
SANTA FE, NM
SANTA ROSA-PETALUMA, CA
SACRAMENTO, CA
SAGINAW-BAY CITY-MIDLAND, MI
ST. CLOUD, MN
ST. JOSEPH, MO
ST. LOUIS, MO-IL
SALEM, OR
SARASOTA, FL
SAVANNAH, GA
SCRANTON—WILKES-BARRE, PA
SEATTLE, WA
SHARON, PASHEBOYGAN, WI
SHERMAN-DENISON, TX
SHREVEPORT, LA
SIOUX CITY, IA-NE
SIOUX FALLS, SD
SOUTH BEND-MISHAWAKA, IN
SPOKANE, WA
SPRINGFIELD, IL
SPRINGFIELD, MA
SPRINGFIELD, MO
STATE COLLEGE, PA
STEUBENVILLE-WEIRTON, OH-WV
STOCKTON, CA
SYRACUSE, NY
TACOMA, WA
TALLAHASSEE, FL
TAMPA-ST. PETERSBURG-CLEARWATER, FL
TERRE HAUTE, IN
TEXARKANA, TX-AR
TOLEDO, OH
TOPEKA, KS
TRENTON, NJ
TRENTON, NJ
TUCSON, AZ
TULSA, OK
TUSCALOOSA, AL
TYLER, TX
UTICA-ROME, NY
VALLEJO-FAIRFIELD-NAPA, CA
VANCOUVER, WA
VICTORIA, TX
VINELAND-MILLVILLE-BRIDGETON, N
VISALIA-TULARE-PORTERVILLE, CA
WACO, TX
WASHINGTON, DC-MD-VA
WATERLOO-CEDAR FALLS, IA
WAUSAU, WI
W. PALM BCH-BOCA RATON-DELRAY BCH, FL
WHEELING, WV-OH
WICHITA, KS
WICHITA FALLS, TX
WILLIAMSPORT, PA
WILMINGTON, DE-NJ-MD
WILMINGTON, NC
WORCESTER, MA
YAKIMA, WA
YORK, PA
YOUNGSTOWN-WARREN, OH
YUBA CITY, CA

Appendix B

SNF UTILIZATION RATES IN MSAs

Metropolitan Area	Utilization Rate
WATERLOO-CEDAR FALLS, IA	0.117
SALINAS-SEASIDE-MONTEREY, CA	0.115
DUBUQUE, IA	0.090
LINCOLN, NE	0.090
BELLINGHAM, WA	0.089
SANTA CRUZ, CA	0.089
OAKLAND, CA	0.088
SANTA ROSA-PETALUMA, CA	0.087
YUBA CITY, CA	0.083
SYRACUSE, NY	0.081
PROVO-OREM, UT	0.080
VALLEJO-FAIRFIELD-NAPA, CA	0.077
SALT LAKE CITY-OGDEN, UT	0.077
OLYMPIA, WA	0.077
SARASOTA, FL	0.076
ANAHEIM-SANTA ANA, CA	0.076
CEDAR RAPIDS, IA	0.076
BREMERTON, WA	0.075
LOS ANGELES-LONG BEACH, CA	0.070
PANAMA CITY, FL	0.067
COLORADO SPRINGS, CO	0.067
HARRISBURG-LEBANON-CARLISLE, PA	0.065
SAN JOSE, CA	0.063
SAN FRANCISCO, CA	0.062
SACRAMENTO, CA	0.061
GREAT FALLS, MT	0.061
YORK, PA	0.061
BOISE CITY, ID	0.061
FORT COLLINS-LOVELAND, CO	0.060
GRAND RAPIDS, MI	0.060
LAFAYETTE, IN	0.059
KILLEEN-TEMPLE, TX	0.057
MONROE, LA	0.057
BLOOMINGTON-NORMAL, IL	0.056
OXNARD-VENTURA, CA	0.055
KOKOMO, IN	0.055
MOBILE, AL	0.055
MUSKEGON, MI	0.054
CHAMPAIGN-URBANA-RANTOUL, IL	0.054
INDIANAPOLIS, IN	0.054
ALLENTOWN-BETHLEHEM, PA-NJ	0.054
DAVENPORT-ROCK ISLAND-MOLINE, IA-IL	0.054
GADSDEN, AL	0.054
FRESNO, CA	0.053
ROCKFORD, IL	0.053
GREEN BAY, WI	0.053
TULSA, OK	0.053
ELKHART-GOSHEN, IN	0.053
SPRINGFIELD, IL	0.052
ANDERSON, IN	0.051
BLOOMINGTON, IN	0.051

OMAHA, NE-IA	0.051
EVANSVILLE, IN-KY	0.051
LYNCHBURG, VA	0.050
ASHEVILLE, NC	0.050
READING, PA	0.050
VANCOUVER, WA	0.050
HARTFORD, CT	0.050
AURORA-ELGIN, IL	0.050
JANESVILLE-BELOIT, WI	0.049
SPOKANE, WA	0.049
LAWRENCE, KS	0.049
LANCASTER, PA	0.048
RIVERSIDE-SAN BERNARDINO, CA	0.048
DAYTONA BEACH, FL	0.047
MONTGOMERY, AL	0.047
STEUBENVILLE-WEIRTON, OH-WV	0.047
TAMPA-ST. PETERSBURG-CLEARWATER, FL	0.047
SAN DIEGO, CA	0.046
PEORIA, IL	0.046
BURLINGTON, NC	0.046
STOCKTON, CA	0.046
BEAVER COUNTY, PA	0.046
W PALM BCH-BOCA RATON-DELRAY BCH, FL	0.046
ANN ARBOR, MI	0.046
BAKERSFIELD, CA	0.045
OCALA, FL	0.045
ANNISTON, AL	0.045
BENTON HARBOR, MI	0.044
REDDING, CA	0.044
MADISON, WI	0.044
LAKE COUNTY, IL	0.044
CLEVELAND, OH	0.044
PHILADELPHIA, PA-NJ	0.043
SCRANTON—WILKES-BARRE, PA	0.043
TALLAHASSEE, FL	0.043
LANSING-EAST LANSING, MI	0.043
KENOSHA, WI	0.042
SAGINAW-BAY CITY-MIDLAND, MI	0.042
WAUSAU, WI	0.042
ST. LOUIS, MO-IL	0.042
WILLIAMSPORT, PA	0.042
GARY-HAMMOND, IN	0.042
TACOMA, WA	0.042
KANSAS CITY, MO-KS	0.041
FARGO-MOORHEAD, ND-MN	0.040
BATTLE CREEK, MI	0.040
ERIE, PA	0.040
JACKSON, MI	0.040
TOLEDO, OH	0.040
WILMINGTON, NC	0.040
BIRMINGHAM, AL	0.039
SOUTH BEND-MISHAWAKA, IN	0.039
DECATUR, IL	0.039
TUSCALOOSA, AL	0.039
MANSFIELD, OH	0.038
SANTA FE, NM	0.038
FORT LAUDERDALE-HOLLYWD-POMP BCH, FL	0.038
BRADENTON, FL	0.038

SHARON, PA	0.037
CHICO, CA	0.037
VISALIA-TULARE-PORTERVILLE, CA	0.037
BANGOR, ME	0.037
PROVIDENCE, RI	0.036
NEW HAVEN-MERIDEN, CT	0.036
FLORENCE, AL	0.036
SEATTLE, WA	0.036
CANTON, OH	0.036
MELBOURNE-TITUSVILLE-PALM BAY, FL	0.036
SPRINGFIELD, MO	0.035
WHEELING, WV-OH	0.035
NASHVILLE, TN	0.035
SALEM, OR	0.035
PITTSBURGH, PA	0.035
COLUMBIA, SC	0.034
RENO, NV	0.034
BATON ROUGE, LA	0.033
ORLANDO, FL	0.033
GREELEY, CO	0.032
MEDFORD, OR	0.032
ALBUQUERQUE, NM	0.032
MODESTO, CA	0.032
MIAMI-HIALEAH, FL	0.032
BRYAN-COLLEGE STATION, TX	0.032
PORTLAND, OR	0.032
MUNCIE, IN	0.032
RALEIGH-DURHAM, NC	0.032
CHICAGO, IL	0.032
DETROIT, MI	0.032
FORT WAYNE, IN	0.031
FORT PIERCE, FL	0.031
JOLIET, IL	0.031
HUNTSVILLE, AL	0.030
CHATTANOOGA, TN-GA	0.030
FLINT, MI	0.030
JOHNSTOWN, PA	0.030
MILWAUKEE, WI	0.030
TRENTON, NJ	0.030
ANDERSON, SC	0.030
MINNEAPOLIS-ST. PAUL, MN-WI	0.029
SANTA BARBARA-STA MARIA-LOMPOC, CA	0.029
POUGHKEEPSIE, NY	0.029
ST. JOSEPH, MO	0.029
PHOENIX, AZ	0.029
FORT WALTON BEACH, FL	0.028
KALAMAZOO, MI	0.028
STATE COLLEGE, PA	0.028
LAS VEGAS, NV	0.028
ATLANTA, GA	0.028
LAKELAND-WINTER HAVEN, FL	0.028
BISMARCK, ND	0.028
NEW LONDON-NORWICH, CT-RI	0.028
NASSAU-SUFFOLK, NY	0.028
FORT SMITH, AR-OK	0.027
JACKSONVILLE, FL	0.027
NORFOLK-VA BEACH-NEWPORT NEWS, VA	0.027
KNOXVILLE, TN	0.027

DES MOINES, IA	0.027
BRIDGEPORT-MILFORD, CT	0.027
CORPUS CHRISTI, TX	0.026
HONOLULU, HI	0.026
LEWISTON-AUBURN, ME	0.026
YAKIMA, WA	0.026
LOUISVILLE, KY-IN	0.026
TOPEKA, KS	0.026
HOUMA-THIBODAUX, LA	0.026
NAPLES, FL	0.026
TERRE HAUTE, IN	0.025
WILMINGTON, DE-NJ-MD	0.025
BOULDER-LONGMONT, CO	0.025
APPLETON-OSHKOSH-NEENAH	0.025
DENVER, CO	0.025
EUGENE-SPRINGFIELD, OR	0.025
DULUTH, MN-WI	0.025
AKRON, OH	0.025
BUFFALO, NY	0.025
NEW YORK, NY	0.024
COLUMBUS, GA-AL	0.024
FORT MYERS-CAPE CORAL, FL	0.024
PENSACOLA, FL	0.024
RACINE, WI	0.023
COLUMBUS, OH	0.023
CLARKSVILLE-HOPKINSVILLE, TN-KY	0.023
LORAIN-ELYRIA, OH	0.023
ORANGE COUNTY, NY	0.022
NEW ORLEANS, LA	0.022
BINGHAMTON, NY	0.022
TUCSON, AZ	0.021
HAMILTON-MIDDLETOWN, OH	0.021
WICHITA, KS	0.021
PORTSMOUTH-DOVER-ROCHESTER, NH-ME	0.021
GLENS FALLS, NY	0.020
LIMA, OH	0.020
BILLINGS, MT	0.020
ALBANY-SCHENECTADY-TROY, NY	0.020
ROCHESTER, NY	0.020
SAVANNAH, GA	0.020
KANKAKEE, IL	0.020
ALTOONA, PA	0.020
NEWARK, NJ	0.019
GREENVILLE-SPARTANBURG, SC	0.019
JOHNSON CITY-KINGSPRT-BRISTL, TN-VA	0.019
LITTLE ROCK-NORTH LITTLE ROCK, AR	0.019
CINCINNATI, OH-KY-IN	0.019
SAN ANGELO, TX	0.019
GAINESVILLE, FL	0.018
AMARILLO, TX	0.018
RICHLAND-KENNEWICK-PASCO, WA	0.018
FAYETTEVILLE-SPRINGDALE, AR	0.018
AUGUSTA, GA-SC	0.018
DAYTON-SPRINGFIELD, OH	0.018
EAU CLAIRE, WI	0.018
MONMOUTH-OCEAN, NJ	0.018
PARKERSBURG-MARIETTA, WV-OH	0.017
PUEBLO, CO	0.017

GREENSBORO-WINSTON-SALEM-HIGH PT,NC	0.017
MEMPHIS, TN-AR-MS	0.017
JOPLIN, MO	0.017
COLUMBIA, MO	0.017
MANCHESTER, NH	0.016
BEAUMONT-PORT ARTHUR, TX	0.016
MIDDLESEX-SOMERSET-HUNTERDON, NJ	0.016
RICHMOND-PETERSBURG, VA	0.016
CHARLOTTE-GASTONIA-ROCK HILL, NC-SC	0.015
WASHINGTON, DC-MD-VA	0.015
UTICA-ROME, NY	0.015
ROANOKE, VA	0.015
LA CROSSE, WI	0.015
AUSTIN, TX	0.015
SAN ANTONIO, TX	0.015
LEXINGTON-FAYETTE, KY	0.015
MCALLEN-EDINBURG-MISSION, TX	0.014
DALLAS, TX	0.014
CHARLOTTESVILLE, VA	0.014
EL PASO, TX	0.014
DOTHAN, AL	0.014
BERGEN-PASSAIC, NJ	0.014
WORCESTER, MA	0.014
TYLER, TX	0.013
HUNTINGTON-ASHLAND, WV-KY-OH	0.013
GRAND FORKS, ND	0.013
CHARLESTON, SC	0.012
NIAGARA FALLS, NY	0.012
DANVILLE, VA	0.012
HAGERSTOWN, MD	0.012
BOSTON, MA	0.012
BALTIMORE, MD	0.012
HOUSTON, TX	0.012
ATHENS, GA	0.011
BURLINGTON, VT	0.011
CHARLESTON, WV	0.011
FORT WORTH-ARLINGTON, TX	0.011
IOWA CITY, IA	0.011
FLORENCE, SC	0.011
BROCKTON, MA	0.011
JACKSONVILLE, NC	0.010
CASPER, WY	0.010
ENID, OK	0.010
ATLANTIC CITY, NJ	0.009
SHEBOYGAN, WI	0.009
YOUNGSTOWN-WARREN, OH	0.009
FAYETTEVILLE, NC	0.009
HICKORY, NC	0.008
BROWNSVILLE-HARLINGEN, TX	0.008
ELMIRA, NY	0.008
PORTLAND, ME	0.007
ANCHORAGE, AK	0.007
LAKE CHARLES, LA	0.006
VINELAND-MILLVILLE-BRIDGETON, NJ	0.006
GALVESTON-TEXAS CITY, TX	0.005
PITTSFIELD, MA	0.005
OKLAHOMA CITY, OK	0.005
LONGVIEW-MARSHALL, TX	0.005

ROCHESTER, MN	0.005
OWENSBORO, KY	0.005
FALL RIVER, MA-RI	0.005
BRAZORIA, TX	0.005
SPRINGFIELD, MA	0.004
SHREVEPORT, LA	0.004
SIOUX FALLS, SD	0.004
BILOXI-GULFPORT, MS	0.004
JERSEY CITY, NJ	0.003
ST. CLOUD, MN	0.002
MACON-WARNER ROBINS, GA	0.002
PASCAGOULA, MS	0.002
MIDLAND, TX	0.002
WACO, TX	0.001
ALBANY, GA	0.001
CUMBERLAND, MD-WV	0.001
JACKSON, MS	0.001
LAREDO, TX	0.001
SIOUX CITY, IA-NE	0.001
PINE BLUFF, AR	0.001
LUBBOCK, TX	0.001
WICHITA FALLS, TX	0.001
ABILENE, TX	0.001
SHERMAN-DENISON, TX	0.001
LAFAYETTE, LA	0.001
ALEXANDRIA, LA	0.000
LAS CRUCES, NM	0.000
LAWTON, OK	0.000
ODESSA, TX	0.000
TEXARKANA, TX-AR	0.000
VICTORIA, TX	0.000

Appendix C

SNF BED SUPPLIES IN MSAs

Metropolitan Area	SNF Bed Supply
BISMARCK, ND	65.0
HARTFORD, CT	60.7
NEW HAVEN-MERIDEN, CT	59.3
COLUMBUS, OH	50.1
HAMILTON-MIDDLETOWN, OH	48.4
NEW LONDON-NORWICH, CT-RI	47.9
GRAND FORKS, ND	47.5
STOCKTON, CA	45.0
FLORENCE, AL	44.6
ROCHESTER, NY	44.5
COLUMBUS, GA-AL	44.3
COLORADO SPRINGS, CO	44.0
DAYTON-SPRINGFIELD, OH	43.1
MONTGOMERY, AL	43.0
OAKLAND, CA	42.2
SYRACUSE, NY	42.0
SACRAMENTO, CA	41.7
UTICA-ROME, NY	41.6
ERIE, PA	41.3
BRIDGEPORT-MILFORD, CT	41.2
MODESTO, CA	41.0
RENO, NV	40.7
POUGHKEEPSIE, NY	40.3
SAGINAW-BAY CITY-MIDLAND, MI	40.2
LOS ANGELES-LONG BEACH, CA	39.9
VALLEJO-FAIRFIELD-NAPA, CA	39.8
REDDING, CA	38.9
ALBANY-SCHENECTADY-TROY, NY	38.6
GLENS FALLS, NY	38.3
BOISE CITY, ID	38.2
VISALIA-TULARE-PORTERVILLE, CA	38.2
NIAGARA FALLS, NY	38.1
GRAND RAPIDS, MI	37.6
SAN JOSE, CA	37.4
LIMA, OH	37.0
FRESNO, CA	36.9
FORT WALTON BEACH, FL	36.8
JACKSON, MI	36.6
LANSING-EAST LANSING, MI	36.4
GAINESVILLE, FL	36.1
SANTA BARBARA-SANTA MARIA-LOMPOC, CA	36.1
JACKSONVILLE, NC	35.9
BINGHAMTON, NY	35.8
FARGO-MOORHEAD, ND-MN	35.8
FLORENCE, SC	35.7
SANTA ROSA-PETALUMA, CA	35.6
GADSDEN, AL	35.5
SANTA CRUZ, CA	35.5
MUSKEGON, MI	34.5
CINCINNATI, OH-KY-IN	34.4
BUFFALO, NY	34.4

COLUMBIA, SC	34.2
BLOOMINGTON-NORMAL, IL	34.1
BAKERSFIELD, CA	33.9
LANCASTER, PA	33.3
ELMIRA, NY	33.2
AUGUSTA, GA-SC	33.1
OXNARD-VENTURA, CA	32.9
FLINT, MI	32.9
NEW YORK, NY	32.8
NASSAU-SUFFOLK, NY	32.2
SAN FRANCISCO, CA	31.1
SALINAS-SEASIDE-MONTEREY, CA	30.8
BATTLE CREEK, MI	30.8
WILMINGTON, NC	30.7
YUBA CITY, CA	30.6
TALLAHASSEE, FL	30.3
DULUTH, MN-WI	30.2
CHICO, CA	30.2
ANAHEIM-SANTA ANA, CA	30.0
BENTON HARBOR, MI	30.0
MOBILE, AL	29.7
SAN DIEGO, CA	29.5
ANNISTON, AL	29.4
HARRISBURG-LEBANON-CARLISLE, PA	29.4
KALAMAZOO, MI	29.4
TOLEDO, OH	29.3
ST. CLOUD, MN	28.9
RIVERSIDE-SAN BERNARDINO, CA	28.8
KENOSHA, WI	28.8
YOUNGSTOWN-WARREN, OH	28.5
GREENVILLE-SPARTANBURG, SC	28.3
ANN ARBOR, MI	28.0
CHAMPAIGN-URBANA-RANTOUL, IL	27.4
MINNEAPOLIS-ST. PAUL, MN-WI	27.0
WILMINGTON, DE-NJ-MD	26.9
CLEVELAND, OH	26.8
CANTON, OH	26.6
CHARLESTON, SC	26.5
MILWAUKEE, WI	26.2
CASPER, WY	26.1
SAVANNAH, GA	25.8
JANESVILLE-BELOIT, WI	25.4
TRENTON, NJ	25.2
WHEELING, WV-OH	25.1
BALTIMORE, MD	25.1
MANSFIELD, OH	25.0
FORT PIERCE, FL	24.9
MIDDLESEX-SOMERSET-HUNTERDON, NJ	24.9
HONOLULU, HI	24.8
VINELAND-MILLVILLE-BRIDGETON, NJ	24.8
LINCOLN, NE	24.7
INDIANAPOLIS, IN	24.4
LAKELAND-WINTER HAVEN, FL	24.4
ALLENTOWN-BETHLEHEM, PA-NJ	24.2
DETROIT, MI	23.9
MADISON, WI	23.8
GREAT FALLS, MT	23.6
DECATUR, IL	23.5

LAFAYETTE, IN	23.4
ATHENS, GA	23.4
LAS VEGAS, NV	23.0
PHILADELPHIA, PA-NJ	23.0
BOULDER-LONGMONT, CO	22.9
CUMBERLAND, MD-WV	22.7
MUNCIE, IN	22.6
SHARON, PA	22.6
LA CROSSE, WI	22.3
SCRANTON-WILKES-BARRE, PA	21.7
TERRE HAUTE, IN	21.7
PENSACOLA, FL	21.7
AKRON, OH	21.5
ORANGE COUNTY, NY	21.4
TUSCALOOSA, AL	21.3
LORAIN-ELYRIA, OH	21.2
BIRMINGHAM, AL	20.8
CHARLOTTE-GASTONIA-ROCK HILL, NC-SC	20.6
ELKHART-GOSHEN, IN	20.2
BRYAN-COLLEGE STATION, TX	20.0
SHEBOYGAN, WI	19.9
MELBOURNE-TITUSVILLE-PALM BAY, FL	19.9
LEXINGTON-FAYETTE, KY	19.8
ANDERSON, IN	19.5
HICKORY, NC	19.5
ANDERSON, SC	19.3
SALT LAKE CITY-OGDEN, UT	19.2
DOTHAN, AL	19.0
GARY-HAMMOND, IN	18.8
WASHINGTON, DC-MD-VA	18.8
LYNCHBURG, VA	18.7
STEUBENVILLE-WEIRTON, OH-WV	18.7
ASHEVILLE, NC	18.2
GREENSBORO-WINSTON-SALEM-HIGH POINT, NC	18.0
RALEIGH-DURHAM, NC	17.7
ATLANTA, GA	17.4
HUNTINGTON-ASHLAND, WV-KY-OH	17.3
WILLIAMSPORT, PA	17.2
ST. LOUIS, MO-IL	16.9
BEAVER COUNTY, PA	16.7
YORK, PA	16.6
YAKIMA, WA	16.6
ORLANDO, FL	16.5
ATLANTIC CITY, NJ	16.4
LAKE CHARLES, LA	16.2
HAGERSTOWN, MD	16.1
READING, PA	16.0
MONMOUTH-OCEAN, NJ	15.9
DAVENPORT-ROCK ISLAND-MOLINE, IA-IL	15.8
COLUMBIA, MO	15.8
OCALA, FL	15.7
EVANSVILLE, IN-KY	15.6
TAMPA-ST. PETERSBURG-CLEARWATER, FL	15.5
BLOOMINGTON, IN	15.4
PARKERSBURG-MARIETTA, WV-OH	15.3
NEWARK, NJ	15.3
PROVIDENCE, RI	15.1
DENVER, CO	14.8

STATE COLLEGE, PA	14.7
DAYTONA BEACH, FL	14.5
KOKOMO, IN	14.1
PEORIA, IL	14.1
WORCESTER, MA	14.0
SPRINGFIELD, MA	14.0
PITTSBURGH, PA	13.7
KILLEEN-TEMPLE, TX	13.6
ALTOONA, PA	13.5
SPRINGFIELD, IL	13.5
WAUSAU, WI	13.1
FORT WAYNE, IN	12.9
HUNTSVILLE, AL	12.9
ANCHORAGE, AK	12.8
BURLINGTON, VT	12.6
W. PALM BCH-BOCA RATON-DELRAY BCH, FL	12.5
AURORA-ELGIN, IL	12.4
ST. JOSEPH, MO	12.2
NAPLES, FL	12.0
SANTA FE, NM	11.9
JOPLIN, MO	11.9
SOUTH BEND-MISHAWAKA, IN	11.9
BROCKTON, MA	11.8
FORT COLLINS-LOVELAND, CO	11.8
BERGEN-PASSAIC, NJ	11.7
PROVO-OREM, UT	11.7
TYLER, TX	11.7
HARLESTON, WV	11.6
JOHNSTOWN, PA	11.4
TOPEKA, KS	11.1
WICHITA, KS	11.0
CHATTANOOGA, TN-GA	10.9
BREMERTON, WA	10.8
NASHVILLE, TN	10.8
KANSAS CITY, MO-KS	10.7
RACINE, WI	10.7
SARASOTA, FL	10.6
PITTSFIELD, MA	10.5
BURLINGTON, NC	10.4
KNOXVILLE, TN	10.3
LEWISTON-AUBURN, ME	10.2
RICHLAND-KENNEWICK-PASCO, WA	10.2
BILLINGS, MT	10.1
PANAMA CITY, FL	9.9
OWENSBORO, KY	9.8
MEMPHIS, TN-AR-MS	9.7
MIAMI-HIALEAH, FL	9.7
SAN ANGELO, TX	9.7
SPOKANE, WA	9.7
FAYETTEVILLE-SPRINGDALE, AR	9.6
MACON-WARNER ROBINS, GA	9.6
JACKSONVILLE, FL	9.6
LOUISVILLE, KY-IN	9.4
NEW ORLEANS, LA	9.3
SPRINGFIELD, MO	9.2
FALL RIVER, MA-RI	8.7
JERSEY CITY, NJ	8.7
JACKSON, MS	8.6

LAKE COUNTY, IL	8.6
BRADENTON, FL	8.5
FORT MYERS-CAPE CORAL, FL	8.4
GREEN BAY, WI	8.3
LITTLE ROCK-NORTH LITTLE ROCK, AR	8.2
ROCHESTER, MN	7.9
BILOXI-GULFPORT, MS	7.8
TACOMA, WA	7.7
BOSTON, MA	7.7
FAYETTEVILLE, NC	7.6
EAU CLAIRE, WI	7.4
BELLINGHAM, WA	7.3
AMARILLO, TX	7.3
ROCKFORD, IL	7.3
WACO, TX	7.1
GREELEY, CO	6.9
FT LAUDERDALE-HOLLYWD-POMPANO BCH,FL	6.8
OLYMPIA, WA	6.5
MANCHESTER, NH	6.4
CHICAGO, IL	6.3
RICHMOND-PETERSBURG, VA	6.3
DUBUQUE, IA	6.2
SEATTLE, WA	6.2
ROANOKE, VA	5.9
EUGENE-SPRINGFIELD, OR	5.8
McALLEN-EDINBURG-MISSION, TX	5.7
IOWA CITY, IA	5.5
ALBUQUERQUE, NM	5.4
WATERLOO-CEDAR FALLS, IA	5.4
PORTLAND, OR	5.3
MIDLAND, TX	5.2
NORFOLK-VIRGINIA BCH-NEWPORT NEWS, VA	5.2
PUEBLO, CO	5.2
DANVILLE, VA	4.9
OMAHA, NE-IA	4.8
SHREVEPORT, LA	4.7
BANGOR, ME	4.6
CLARKSVILLE-HOPKINSVILLE, TN-KY	4.5
PHOENIX, AZ	4.5
VANCOUVER, WA	4.4
BRAZORIA, TX	4.3
SAN ANTONIO, TX	3.9
CORPUS CHRISTI, TX	3.9
CHARLOTTESVILLE, VA	3.9
PORTSMOUTH-DOVER-ROCHESTER, NH-ME	3.7
BEAUMONT-PORT ARTHUR, TX	3.7
AUSTIN, TX	3.6
LUBBOCK, TX	3.6
ENID, OK	3.6
DES MOINES, IA3.5	3.5
FORT WORTH-ARLINGTON, TX	3.3
MEDFORD, OR	3.3
TUCSON, AZ	3.3
CEDAR RAPIDS, IA	3.2
EL PASO, TX	3.2
JOHNSON CITY-KINGSPORT-BRISTOL, TN-VA	3.0
JOLIET, IL	2.9
MONROE, LA	2.8

BROWNSVILLE-HARLINGEN, TX	2.8
DALLAS, TX	2.2
SIOUX FALLS, SD	2.0
APPLETON-OSHKOSH-NEENAH, WI	2.0
WICHITA FALLS, TX	1.9
KANKAKEE, IL	1.8
HOUMA-THIBODAUX, LA	1.6
SALEM, OR	1.6
BATON ROUGE, LA	1.5
LONGVIEW-MARSHALL, TX	1.5
HOUSTON, TX	1.4
TULSA, OK	1.4
PORTLAND, ME	1.0
OKLAHOMA CITY, OK	0.8
FORT SMITH, AR-OK	0.4
ABILENE, TX	0.0
ALBANY, GA	0.0
ALEXANDRIA, LA	0.0
GALVESTON-TEXAS CITY, TX	0.0
LAFAYETTE, LA	0.0
LAREDO, TX	0.0
LAS CRUCES, NM	0.0
LAWTON, OK	0.0
ODESSA, TX	0.0
PASCAGOULA, MS	0.0
PINE BLUFF, AR	0.0
SHERMAN-DENISON, TX	0.0
SIOUX CITY, IA-NE	0.0
TEXARKANA, TX-AR	0.0
VICTORIA, TX	0.0

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