Medicare Home Health Utilization as a Function of Nursing Home Market Factors

James H. Swan and A. E. Benjamin

Rapid increases in the size and costs of the home health market, unknown impacts of Medicare's DRG hospital reimbursement on the posthospital market, and general lack of knowledge about factors that explain interstate variation in home health utilization all suggest the importance of developing and testing models of Medicare home health use. This article proposes and tests a model of state home health utilization as a function of the nursing home market. This model proposes that home health utilization is a function of nursing home bed capacity, of the utilization of nursing home beds by Medicaid patients, of other demand factors, and of supply factors. This model is supported by the data. Specifically, Medicare home health use in the 1978–1984 period was found to be negatively related to nursing home bed stock, positively related to Medicaid nursing home utilization, and related to several other supply and demand factors, as hypothesized by the model. The further model assumption that home health utilization does not affect the nursing home market could not be tested in this analysis, but will be addressed in future research by the authors.

Address correspondence and requests for reprints to James H. Swan, Ph.D., Associate Professor, Health Care Administration Program, California State University, Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840. A. E. Benjamin, Ph.D. is Adjunct Associate Professor and Associate Director, Institute for Health and Aging, University of California, San Francisco.

The rapid increase in home health use and expenditures and continued growth of nursing home use and costs generate interest in the relationships between these long-term care and posthospital options. Home health receives public support primarily through Medicare, and to a lesser extent Medicaid, and has been seen as an important alternative to institutionalization and as a means of providing more appropriate care, at lower cost to insurers and individuals (Stockton and Rabin 1987; Kramer, Shaughnessy, and Perrigrew 1985; Evashwick 1985). Recent evidence suggests that home health and other home and community-based services, although having positive outcomes, are unlikely to reduce overall institutional use or expenditure rates (Hughes 1985; Hedrick and Inui 1986). Despite such findings, levels of home health use continue to grow. The implementation, starting in 1983, of Medicare's prospective payment system (PPS) for general hospitals has been an important factor in increasing demand for home health care and all forms of posthospital care, including nursing home care (Neu and Harrison 1988; U.S. General Accounting Office 1982; Wood 1986).

Estimations of total national growth in home health care provision are necessarily incomplete and imprecise because of the peculiar nature of the home health market. In this market, a subset of agencies is licensed and certified for Medicare and Medicaid payment, and a second subset is unlicensed and generally excluded from all forms of health provider regulation. Data on Medicare, the dominant payer for home health care (Van Gelder and Bernstein 1986), reflect the dramatic growth in public sector reimbursement for health care services at home. Between 1978 (when growth began to accelerate) and 1984, the number of Medicare-certified home health agencies more than doubled, from 2,768 to 5,984, while the number of Medicare users of care nearly doubled, from 770,000 to just over 1.5 million (U.S. Health Care Financing Administration 1987). As a result the number of home health visits, which can be considered both the "supply" of care actually available and the "output" of the market at any given point in time, increased from 17.3 million in 1978 to 40.3 million in 1984. Medicare reimbursement for home health care nearly quadrupled during this period to $1.7 billion in 1984.

For various reasons (Swan, Harrington, and Grant 1988; Harrington, Swan, and Grant 1988), expansion of supply and use of nursing home beds slowed in the 1980s, but previous rapid growth had made nursing home care the most visible and expensive of the long-term care and posthospital options available to the aged. Although much research has examined the extent to which various forms of home and community-based care reduce nursing home use, surprisingly little

attention has been given to how nursing home market characteristics may affect patterns of home health care use (U.S. General Accounting Office 1982; Benjamin 1986).

This article presents and tests a model of Medicare home health use across states, giving explicit attention to nursing home factors. Home health use is considered to be a function of the nursing home market but to have little or no effect on that market. This model is similar to one developed to explain Medicaid inpatient psychiatric utilization as a function of the nursing home market (Swan 1987).

A MODEL OF MEDICARE
HOME HEALTH CARE
UTILIZATION

The model holds that interstate differences in Medicare home health use is influenced by nursing home factors in two ways. First, variations in nursing home bed stock affect access to nursing homes as a posthospital care option, thus influencing the size of the pool of those who are referred to home health care following hospitalization. For example, where nursing home bed stock is low, nursing home placement will not be as feasible an alternative at hospital discharge and will increase pressure on hospitals and physicians to refer to Medicare home health care. Although decisions regarding eligibility are made by Medicare regional fiscal intermediaries, not by hospitals or community physicians, we argue that the size of the patient pool for whom home health care is sought will be affected by the availability of discharge options, which in turn varies with nursing home bed stock.

The second path of influence is more complex. Interstate variation in Medicaid nursing home utilization affects total access to nursing home placement. For given bed stock, higher nursing home occupancy means lower accessibility for posthospital placements and, thus, larger pools of persons requiring home health care. Levels of Medicaid occupancy relative to beds affect both the availability of nursing home beds and the demand for home health care in several ways: Medicaid nursing home residents average longer stays than non-Medicaid residents (Shaughnessy, Schlenker, and Polesovsky 1986), thus increasing pressure on occupancy and limiting the number of available beds; Medicaid residents have historically been hospitalized less frequently than others, although this may be changing following implementation of the prospective payment system (PPS) (Sager, Leventhal, and Easterling 1987); and

hospitalized Medicaid eligibles are less likely to have homes to which to return (Shaughnessy, Schlenker, and Polesovsky 1986), so they are less likely to be considered for and to qualify for home health care.

Several assumptions of this model require elaboration. First, considerable overlap exists between the aged population in nursing homes and that using home health care, in spite of discernible differences in overall medical and functional status (Kramer, Shaughnessy, and Perrigrew 1985; Sager, Leventhal, and Easterling 1987). The heterogeneity of nursing home patients has been well documented (Secord 1986), and high utilization levels among the oldest old have been observed for both nursing home and home health care (Leader 1986). More generally, there are important similarities among aged users of various forms of care outside the hospital (Sherwood, Morris, and Ruchin 1986).

Second, because the largest home health care market for the aged is Medicare financed, the analysis can reasonably focus on Medicare use to the exclusion of other payment sources. Medicaid-financed home health care is not examined for several reasons: the availability of such care remains low in many states (Benjamin 1986); utilization levels are skewed toward a few states (notably New York); half of current utilization is by the nonelderly, mostly mothers and children; and Medicaid home health care data remain unreliable in many states (e.g., Medicaid 2176 waiver program data are included in reporting by some states but not by others). An effort has been made to clean up some of the Medicaid home health care data, however, and these data will be considered in upcoming analyses. Medicare health maintenance organization (HMO) enrollment under the Tax Equity and Fiscal Responsibility Act (TEFRA) may affect use of home health care by Medicare beneficiaries; but because such risk-contracting did not begin until 1985, it does not affect use in the study period of 1978–1984. Non-Medicare-certified, unlicensed home health care agencies may be "where the action is" currently, as they greatly expand their market share. They are not considered here, however, because of (1) a decision to focus on public payers and, thus, on Medicare, the major public payer for home health care; and (2) the nonavailability of national data by state on uncertified home health care agencies.

Third, the largest, most important nursing home market is financed by Medicaid, and the impact of Medicaid on home health care should command primary attention. Percentages of nursing home care covered by Medicaid increased steadily during the 1970s but began to decrease by 1984 (Rymer and Adler 1984; Levit et al. 1985). Paradoxically, skilled nursing facility (SNF) care covered by Medicare may have much less effect on Medicare home health use, because use

of the Medicare SNF benefit has always been low (Feder and Scanlon 1980; Smits, Feder, and Scanlon 1982), and because it did not increase in total volume after 1983–1984, when PPS was introduced along with general pressures to expand posthospital options (Neu and Harrison 1988). Therefore, Medicare SNF use is not considered here, although it will be examined in future analysis.

Finally, the nursing home market is assumed to affect home health care, but not the reverse. The impact of home health care on nursing home markets should be minimal, because (a) home health care is oriented to the acutely ill and is very restrictive with respect to the chronically ill, the population most likely to fill nursing home beds; (b) even if Medicare home health care services were to substitute for some nursing home care, under widespread conditions of undersupply this would only shorten the queue for nursing home beds, rather than reduce actual use — an argument similar to Scanlon's (1980) regarding Medicaid eligibility policies and nursing home utilization; and (c) research evidence of substitution of home health care for nursing home care is sparse (Hughes 1985).

METHODS

This article combines data collected by the Institute for Health and Aging with secondary data to test the model. State-level data for 1978–1984 are used in yearly ordinary least-squares (OLS) regression and in pooled cross-sectional/time-series analyses.

OUTCOME MEASURE: MEDICARE HOME
HEALTH CARE UTILIZATION

The Medicare program's collection of data on home health care utilization, for all 50 states and the District of Columbia, includes numbers of users, total visits, and visits per user. To provide a meaningful comparison of the volume of home health care use across states for this analysis, the total number of Medicare home visits was standardized to the state population for each year between 1978 and 1984. Analysis of Medicare program statistics suggests that national growth in visits across years has been driven primarily by changes in the number of persons using these services, which has grown steadily, rather than in visits per user, which have grown very slowly during this period (Bishop and Stassen 1986).

Table 1 gives data on Medicare visits per 100,000 state population for each state for 1978 and 1984, as well as the rate of change during

Table 1:   Medicare Home Health Visits per 100,000 Aged
Population — 1978, 1984, and Change

State	1978	1984	Change	% Change
Alabama	732.50	1818.84	1086.34	148.3%
Alaska*	181.10	335.87	154.77	85.5
Arizona*	358.01	519.36	161.35	45.1
Arkansas	160.91	954.86	793.95	493.4
California	635.28	1154.81	519.54	81.8
Colorado*	710.10	1284.94	574.84	81.0
Connecticut	1404.48	2310.51	906.03	64.5
Delaware	972.25	3025.51	2053.25	211.2
District of Columbia*	810.81	1265.48	454.67	56.1
Florida	953.08	1988.56	1035.48	108.6
Georgia	410.29	1221.42	811.12	197.7
Hawaii*	573.22	606.61	33.38	5.8
Idaho	887.46	1407.74	520.28	58.6
Illinois	754.80	1276.60	521.80	69.1
Indiana	251.03	843.18	592.15	235.9
Iowa	325.82	688.89	363.07	111.4
Kansas	295.71	1187.97	892.26	301.7
Kentucky	382.08	773.64	391.56	102.5
Louisiana	1102.34	1920.76	818.42	74.2
Maine	1050.74	1108.26	57.53	5.5
Maryland	565.17	1365.80	800.63	141.7
Massachusetts	1222.94	2185.85	962.91	78.7
Michigan	473.75	1258.90	785.16	165.7
Minnesota	339.85	461.75	121.90	35.9
Mississippi	1709.61	4171.94	2462.32	144.0
Missouri	1099.14	2041.04	941.90	85.7
Montana	477.11	903.36	426.25	89.3
Nebraska	339.90	710.05	370.15	108.9
Nevada	626.16	874.89	248.72	39.7
New Hampshire	1044.02	1311.75	267.73	25.6
New Jersey	1218.16	1769.05	550.89	45.2
New Mexico	646.21	1103.28	457.07	70.7
New York*	764.60	1331.56	566.96	74.2
North Carolina	604.98	994.49	389.52	64.4
North Dakota	257.71	604.29	346.58	134.5
Ohio	549.32	824.47	275.15	50.1
Oklahoma	176.21	812.98	636.76	361.4
Oregon	521.95	983.00	461.05	88.3
Pennsylvania	1067.19	2416.14	1348.96	126.4
Rhode Island*	1067.43	1896.67	829.24	77.7
South Carolina	689.33	1783.65	1094.32	158.8
South Dakota	277.15	439.22	162.07	58.5
Tennessee	700.81	2717.31	2016.50	287.7
Texas	600.32	1464.88	864.56	144.0
Utah	468.60	1230.13	761.53	162.5

Table 1:   Continued

State	1978	1984	Change	% Change
Vermont	1844.56	1840.46	−4.10	−0.2
Virginia	304.81	951.38	646.57	212.1
Washington	506.27	1008.29	502.03	99.2
West Virginia*	516.97	1146.09	629.12	121.7
Wisconsin*	503.63	1045.89	542.26	107.7
Wyoming*	791.97	1599.67	807.69	102.0
U.S. Total	712.02	1438.81	726.79	102.1
Study States†	724.35	1486.54	762.19	105.2

*State excluded from analysis. All states with missing data on any regressor for any year are excluded for all years.

†Totals for the 40 states included in the analysis.

this period. Both annual and change data indicate wide variation across states in the volume of care reimbursed by Medicare. In 1984, for example, the number of visits per 100,000 aged population varies from 336 (Alaska) to 4,172 (Mississippi), and the percentage change in the six-year period varies from a decline of 0.2 percent (Vermont) to an increase of 493 percent (Arkansas). This degree of variation is extraordinary in a federally run program that does not directly involve state discretionary policy and that should be largely explainable with reference to state supply and demand factors (Neu and Harrison 1988).

The selection of the 1978–1984 period is not arbitrary; rather, it spans the years of greatest change in Medicare home health care. The importance of the 1980 Omnibus Reconciliation Act (ORA) in liberalizing access to home health care benefits has been widely noted and debated (Pillemer and Levine 1981). Because the rise in utilization actually began before that legislation, the analysis begins in 1978 and covers a period in which ORA, the Medicare PPS amendments, and other federal legislative and administrative actions stimulated widespread growth in the availability and use of home health care.

EXPLANATORY VARIABLES

Variations in Medicare home health care utilization across states are considered to be a function of certain state demand and supply factors. Specific measures of demand and supply are included in this analysis, although separate demand and supply equations are not estimated.

Demand Factors

The model used here, based on nursing home bed capacity and Medicaid nursing home utilization, is concerned mostly with the demand side of home health care utilization. As noted above, it is expected that nursing home bed stock will be negatively related to Medicare home health care utilization, while Medicaid days will be positively associated with home health care utilization. Data on nursing home beds are drawn from the work of Harrington and Swan that has corrected existing data sets and has analyzed changes in bed stock across states (Swan and Harrington 1986; Harrington, Swan, and Grant 1988).

Only total nursing home bed stock is examined here. It has been suggested to us, however, that Medicare-certified SNF beds may be more critical to substitution for home health care. Likewise, hospital-based nursing home beds may be of greater importance than are free-standing nursing home beds. Finally, hospital rehabilitation beds and hospital swing-beds may be important. This first analysis focuses on total nursing home beds, rather than on any of these specific nursing home and other bed types; but each of these bed types will be considered in future analysis.

Other demand factors in the analysis include (a) the percentage of the state population age 85 or older, (b) the spend-down level for Medicaid eligibility, (c) personal income per capita, (d) the percentage of women in the labor force, and (e) general hospital beds per 1,000 population.

The size of the "old-old" population is important to the analysis for two reasons. First, persons 85 and over are at greatest risk of nursing home placement, thus representing a large share of those for which substitution of care may occur. Second, this group uses home health care services at a higher rate than other Medicare eligibles (Neu and Harrison 1988; Manton and Soldo 1985). Variations across states in the relative size of the oldest segment of the aged, therefore, should positively influence home health care utilization. Census data are not available yearly by state for this age group; but yearly data by state on the population aged 85 and over were estimated as enrollment in either Medicare Part A or Part B by this age group.

The measure of Medicaid eligibility, created to explain Medicaid nursing home utilization (Harrington and Swan 1987), is based on the income level to which the individuals can spend down to become eligible for Medicaid. It is defined as the highest of a state's (a) medically needy spend-down level, if any; (b) special institutional spend-down

level, if any; and (c) SSI/SSP (State Supplementary Payment) level for an individual living in an institution. The higher this spend-down level, the greater the number of nursing home residents and potential nursing home residents eligible for Medicaid. A higher spend-down level, then, defines a larger pool of individuals who may receive nursing home benefits under Medicaid, even if they are not currently receiving such benefits. Just as greater Medicaid nursing home utilization should lead to higher levels of Medicare home health care utilization, a widening of the pool of Medicaid nursing home eligibles should have a similar result. Therefore, Medicare home health care use should be positively related to spend-down levels.

Personal income directly measures the ability of at-risk persons to bear the costs of living in the community, and it indirectly measures the support received by community agencies providing in-home care. Because the ability to maintain oneself at home is an implicit precondition for qualifying for Medicare home health care benefits, higher incomes may enhance the general viability of noninstitutional living arrangements (assisted by short-term posthospital care and long-term care) and may reinforce expectations that older persons will be maintained at home. Personal income should therefore positively influence the level of home health use.

The percentage of women in the labor force is important because women predominate as informal caregivers (Stone, Cafferata, and Sangl 1987; Doty 1986), and formal employment may decrease women's availability to provide care in the home (Swan, Harrington, and Grant 1988). In the case of home health care, constraints on informal caregiving associated with labor force participation may reduce demand for Medicare home health care (Benjamin 1986) because of the implicit importance of informal caregiving in home health care under Medicare, often effectively requiring that a caregiver be available in the home. The percentage of women in the labor market should thus negatively influence Medicare home health care utilization.

Hospital discharges represent a major source of referrals to Medicare home health care and thus may be an important demand factor for Medicare home health care. Because data on Medicare discharges by state were not forthcoming for the period of the analysis (but will be included in future analysis), the stock of general hospital beds per capita is used as a surrogate measure. The greater the stock of hospital beds, the greater the assumed number of discharges — and the greater the expected demand for Medicare home health care. General hospital bed stock is therefore hypothesized to have a positive influence on Medicare home health care utilization.

Supply Factors

Three supply factors are included: (a) home health care agencies per
100,000 population, (b) percentage of the state population in metropol-
itan areas, and (c) percentage of the work force that is unionized.
Numbers of Medicare-certified home health care agencies (standard-
ized to population) represent an estimate of the supply of home health
care available to the elderly across states. Unlike nursing homes, where
bed stock provides a unit of capacity, home health care supply can only
be approximated. Home health care capacity is relatively elastic
because agencies are generally able to use nursing registries and other
flexible hiring mechanisms to respond to changes in demand. Because
of variations in home health care agency (staff) size, an agency tabula-
tion is a far from ideal supply measure. Other research suggests, how-
ever, that it is a reasonable measure and is likely to influence positively
state home health care utilization (Benjamin 1986).

Urbanization represents costs to providers and availability to
patients. Where greater proportions of state populations are urban-
ized, travel costs may be lower, translating into greater supply; and
other factors such as economies of scale suggest that urban areas are
better supplied with agencies. Although percentage living in metropoli-
tan areas is not as precise a measure of urbanization as is percentage in
urbanized areas, it is used because it is available by state for more
years. Data on percentage metropolitan were gathered for 1977, 1980,
1983, and 1984; and previous values were used for intervening years.
Higher percentages metropolitan should result in more home health
use.

Unionization represents a cost to providers. It may be direct,
where formal caregivers are unionized; but it is particularly important
indirectly, insofar as greater unionization increases the overall average
wage, including that of nonunionized workers. As a supply factor,
unionization should increase the cost of operations, and may represent
a constraint on market entry and expansion for home health providers,
thus negatively influencing utilization. At the same time, because
Medicare reimbursement is cost based, the effect of unionization on
utilization may be attenuated. Unionization data for 1978 are
employed.

The explanatory variables are intercorrelated. This is important
in interpreting coefficients because the latter estimate the effects of
variables while controlling for other variables. For example, bed stock
is considered while controlling for demand factors, so that its effect is
that of adequacy of bed stock. Likewise, personal income per capita is

higher where more women are in the labor force (reflecting the effects of second earners in families), so the effects of women in the labor force are estimated controlling for income effects. Moreover, this is desired, because the female labor force measure is meant to assess the availability of informal supports rather than income effects.

HYPOTHESES

Several hypotheses drawn from the preceding discussion will be tested. Rates of Medicare home health care visits should be:

- negatively related to nursing home bed capacity;
- positively related to Medicaid nursing home utilization;
- positively related to percentage aged 85 or over;
- positively related to the Medicaid spend-down eligibility level;
- positively related to income per capita;
- negatively related to the percentage of women in the labor force;
- positively related to general hospital beds per capita;
- positively related to numbers of Medicare-certified home health care agencies per 1,000 population; and
- negatively related to percentage of the work force unionized.

Finally, because of substantial increases in Medicare home health care utilization over time, not all of which will likely be explained by the factors included in the model, utilization levels are also expected to be a positive function of time, controlling for these other factors.

DATA SOURCES

Data on Medicare and Medicaid service utilization are drawn from HCFA data tapes (U.S. Health Care Financing Administration 1986). Nursing home bed data derive from surveys conducted by the Institute on Health and Aging (Harrington, Swan, and Grant 1988). Data on hospital beds are drawn from American Hospital Association surveys. Because Census Bureau estimates of aged population, by state by year, are made only for the population aged 65 or over, data on numbers aged 85 or over are based on enrollment by age in Medicare Parts A and/or B, using data published by the Social Security Administration. All other data are drawn from publications of the U.S. Bureau of the Census (1982, 1984). Data on unionization and on metropolitan-area population were available for only some of the years, and earlier-year values substituted for missing later-year values.

METHODS OF ANALYSIS

The hypotheses refer to effects of variables controlling for those of others, thus requiring multivariate analysis. Because data are available for a seven-year period, a more complex analysis is both desirable and possible. First, separate regression analyses are performed by year in the 1978–1984 period. Cross-sectional/time-series analysis is then used for the pooled data for the entire 1978–1984 period, with the Fuller and Battese option (Fuller and Battese 1974) used to adjust for correlated error within units. Finally, interaction terms are used to test for changes in selected coefficients over time. For this article, no attempt was made to estimate separate demand and supply equations.

FINDINGS

Table 2 reports yearly analyses of Medicare home health visits per 100,000 aged population in 1978–1984 as a function of nursing home beds per 1,000 population, Medicaid nursing home care days per beds available, numbers of Medicare-certified home health care agencies per 100,000 population, and other demand and supply factors. Because of missing data, only 41 states are included in the yearly analysis for any year — any inconsistent results are not due to changes in the states represented in the equations. (In fact, the results are highly consistent across years.)

Number of nursing home beds explains Medicare home health care visits negatively, as expected, in every year of the 1978–1984 period. Larger nursing home bed stocks appear to result in reduced home health care use under the Medicare program. Medicare home health care visits are not, however, shown to be related to Medicaid nursing home utilization. Number of home health care agencies per population also explains Medicare home health care utilization, positively as expected.

Among other factors, percentage aged 85 or over explains home health care utilization in 1980 and 1981. The coefficients are positive, as hypothesized.

Medicaid spend-down level, percent of women in the workforce, personal income per capita, unionization, and general hospital beds per capita fail to show effects in any year. The unionization coefficients are all positive, contrary to the hypothesis. Although unionization was thought to be a cost factor limiting utilization, there is evidence that it might in fact have the opposite effect. Because per capita income is

Table 2: Medicare Home Health Utilization by Selected Model Elements: Yearly, Common States for 1978–1984

Independent Variable	Home Health Visits/Population, Coefficient and (t-score)						
	1978	1979	1980	1981	1982	1983	1984
Intercept	-1616.11	-1587.19	498.69	932.17	1673.38	2515.19	2942.04
Percentage of population aged 85+	633.12	663.99	960.36*	1070.84*	885.86	823.51	624.14
	(1.22)	(1.42)	(1.99)	(2.18)	(1.67)	(1.25)	(0.84)
Nursing home beds/1,000 population	-123.02**	-111.69***	-123.54**	-119.59*	-120.54*	-163.90*	-243.50**
	(-3.00)	(-2.60)	(-2.70)	(-2.31)	(-2.03)	(-2.03)	(-2.67)
Medicaid nursing home days/100 bed days	-0.13	-3.26	1.90	-0.03	-4.25	-3.68	-1.79
	(-0.03)	(-0.74)	(0.36)	(-0.00)	(-0.58)	(-0.41)	(-0.19)
Spend-down level ($100s)	43.52	45.46	13.76	6.85	9.81	30.81	32.95
	(1.06)	(1.06)	(0.30)	(0.15)	(0.18)	(0.47)	(0.42)
Home health agencies/100,000 population	152.91*	153.32**	187.32**	241.15***	275.94***	296.34***	296.80**
	(2.44)	(2.51)	(2.78)	(3.24)	(3.54)	(3.33)	(3.30)
General hospital beds/1,000 population	-27.87	-48.87	-32.07	-44.38	21.17	6.36	84.94
	(-0.33)	(-0.58)	(-0.38)	(-0.50)	(0.20)	(0.05)	(0.60)
Percentage of women in labor force	40.78	50.44	-24.39	-28.47	-43.49	-59.10	-64.50
	(1.04)	(1.23)	(-1.06)	(-1.17)	(-1.54)	(-1.66)	(-1.61)
Percentage of work force unionized	18.52	17.91	8.13	9.39	4.04	8.10	14.09
	(1.58)	(1.49)	(0.73)	(0.77)	(0.28)	(0.46)	(0.69)
Income per capita ($1,000s)	43.46	-12.21	102.54	45.05	84.21	140.45	201.98
	(0.45)	(-0.13)	(0.82)	(0.34)	(0.57)	(0.75)	(0.91)
N = 41†							
R² =	.473*	.454*	.476*	.469*	.476*	.477*	.460*
R² adjusted =	.297	.273	.301	.292	.301	.302	.279

*Significant at .05 level, using one-tailed tests for the coefficients.

**Significant at .01 level, using one-tailed tests for the coefficients.

†All states with missing data for any year are excluded for all years: Alaska, Colorado, District of Columbia, Hawaii, New York, Rhode Island, West Virginia, Wisconsin, and Wyoming. Arizona, with no Medicaid institutional program, is excluded.

controlled for, unionization does not simply reflect greater average income (which does predict higher utilization as expected). Unionization may represent higher wages for larger segments of the working population, and thus be an income factor, partially independent of per capita income, that explains higher utilization.

Although they are not significant, the coefficients for 1980 through 1984 for women's labor force participation are all negative, as hypothesized (see the pooled analysis further on). Although not significant, the estimated coefficients for income per capita are positive, as hypothesized for all but one year (and see the findings in Table 4).

Overall, the percentage of variance explained varies in the narrow range of 45–48 percent for each year 1978–1984, showing consistency and stability in the capacity of the model to explain the variation in Medicare home health care utilization. Despite consistency in variance explained, there are apparent changes in coefficients over time. This is true even for the strongest regressors that have significant effects in every year: the coefficients of nursing home bed stock and home health care agencies per capita almost double between 1978 and 1984. This change in coefficients occurs over a period of dramatic increases in home health care utilization (as well as of some of its predictors) and suggests the need for further consideration of change over the entire 1978–1984 period. To do this, the data were pooled across years, and time-series/cross-sectional analysis was employed to estimate coefficients for the 1978–1984 period, adjusting for correlated error within states over years. The Fuller and Battese option in the TSCSREG procedure from SAS Institute was employed for this analysis (Drummond and Gallant 1986).

ANALYSIS OF POOLED DATA FOR THE 1978–1984 PERIOD

Table 3 shows most of the model's regressors to be significantly related to Medicare home health visits in the directions hypothesized. Personal income per capita, percentage metropolitan, unionization, and general hospital beds per capita do not have significant estimates. For the period as a whole, the findings strongly support all of the hypotheses supported by the yearly findings in Table 2.

An important difference from the yearly analysis is that the coefficient for Medicaid days of care per bed stock ("Medicaid access") is significantly positive. This supports a central hypothesis arising from the model: greater Medicaid access to nursing home beds results in

Table 3:   Time-Series/Cross-Sectional Analysis of Medicare
Home Health Utilization by Selected Model Elements,
1978–1984

Coefficient and (t-score) for	*Medicare Home Health Visits/100K Aged Population*	
	Equation 1	*Equation 2*
Intercept	–750.24	–139.60
1982–1983 period		421.00**
		(3.53)
1984 period		550.15**
		(3.54)
Percentage of population	978.12**	563.22
aged 85 or over	(2.81)	(1.65)
Nursing home beds/	–78.04*	–61.21*
1,000 population	(–2.23)	(–1.80)
Medicaid nursing home days/	4.75*	4.42*
100 bed days	(1.81)	(1.73)
Medicaid spend-down	132.41**	120.46**
eligibility level ($100s)	(5.51)	(5.14)
Home health agencies/	140.92**	128.39**
100,000 population	(5.00)	(4.66)
Percentage of population	–0.53	–1.80
in metropolitan areas	(–0.15)	(–0.53)
General hospital beds/	–31.23	–1.83
1,000 population	(–0.45)	(–0.03)
Percentage of women in	–11.12*	–20.99**
labor force	(–1.88)	(–3.41)
Percentage of work force	21.51	22.71
unionized	(1.73)	(1.88)
Personal income per	80.09	82.73
capita ($1,000s)	(1.37)	(1.43)
N = 287†		
Mean-square error adjusted =	42944	40255

*Significant at .05 level, using one-tailed tests for the coefficients.

**Significant at .01 level, using one-tailed tests.

†There are 41 states for seven years. States with missing data are excluded: Alaska, Colorado, District of Columbia, Hawaii, New York, Rhode Island, West Virginia, Wisconsin, and Wyoming. Arizona, with no Medicaid institutional program, is excluded.

greater overflow of non-Medicaid recipients into the home health care market, leading to greater Medicare home health care utilization.

Another difference from the yearly analysis is that the Medicaid spend-down eligibility level is positive as hypothesized. The more generous the Medicaid eligibility policy is for nursing home patients, the greater the Medicare home health care utilization. This adds support

Table 4:   Time-Series/Cross-Sectional Analysis of Medicare
Home Health Utilization: 1978-1984 Change Model

Coefficient and (t-score) for	Medicare Home Health Visits/100K Aged Population	
	Equation 1	Equation 2
Intercept	-520.64	-563.67
1982-1983 period	567.50$	585.78*
	(2.68)	(2.36)
1984 period	1180.89***	1367.79$
	(4.26)	(3.93)
Percentage of population aged 85 or over	718.96*	
	(2.04)	
Percentage aged 85 or over, 1978-1981		815.42*
		(2.03)
Percentage aged 85 or over, 1982-1983		808.32*
		(2.20)
Percentage aged 85 or over, 1984		592.80
		(1.56)
Nursing home bed stock, 1978-1981	-71.77*	-77.73*
	(-2.13)	(-2.20)
Nursing home bed stock, 1982-1983	-75.94*	-82.01**
	(-2.08)	(-2.16)
Nursing home bed stock, 1984	-139.32$	-126.04**
	(-3.66)	(-3.11)
Medicaid nursing home days, 1980-1981	4.73*	4.78*
	(1.89)	(1.88)
Medicaid nursing home days, 1981-1982	2.57	2.45
	(0.80)	(0.76)
Medicaid nursing home days, 1984	1.25	0.34
	(0.34)	(0.09)
Medicaid spend-down eligibility level ($100s)	116.51**	117.94**
	(5.02)	(50.4)

Continued

to the substitution model, in that a larger pool of potential Medicaid
nursing home patients is related to more Medicare home health care
use.

Equation 1 shows the effect for population aged 85 or over to be
positive, as hypothesized; but Equation 2, controlling for change over
time in home health care utilization, does not show a significant effect.
Thus, it may be that an apparent effect of old-old population is due
simply to parallel increases over time in aged population and in home
health care utilization (but see the analysis in Table 4).

An important difference from the yearly analysis is that the per-
centage of women in the labor force significantly explains home health
care visits, negatively as hypothesized. This suggests that women's

Table 4:   Continued

Coefficient and (t-score) for	Medicare Home Health Visits/100K Aged Population	
	Equation 1	Equation 2
Home health agencies/	138.86**	133.18**
100,000 population	(5.13)	(4.66)
Percentage of population	-2.19	-1.92
in metropolitan areas	(-0.66)	(-0.57)
General hospital beds/	20.17	19.14
1,000 population	(0.30)	(0.29)
Percentage of women in	-20.60**	-21.62**
labor force	(-3.46)	(-3.51)
Percentage of work force	22.73	21.46
unionized	(1.89)	(1.76)
Personal income per	104.73*	110.41*
capita ($1,000s)	(1.86)	(1.94)
N = 280§§		
Mean-square error adjusted =	37466	37560

* Significant at .05 level, using one-tailed tests for the coefficients.

** Significant at .01 level, using one-tailed test.

*** Significant at .01 level, using one-tailed tests for the coefficients. Value significantly different at .05 level from that for previous period.

§Significant at .01 level, using one-tailed tests for the coefficients. Value significantly different at .01 level from that for previous period.

§§There are 41 states for seven years. States with missing data are excluded: Alaska, Colorado, District of Columbia, Hawaii, New York, Rhode Island, West Virginia, Wisconsin, and Wyoming. Arizona, with no Medicaid institutional program, is excluded.

participation in the labor force may be associated with less time availability for the informal caregiving roles traditionally filled by women, or with a greater ability to purchase home care privately, or both.

Including dummy variables for the 1982–1983 and 1984 time periods improves overall prediction (Equation 2 of Table 3). This reflects the expansion in Medicare home health care visits per population, without greatly altering the estimated coefficients for the predictors. Thus, the time-series cross-sectional analysis strongly supports the model as specified.

Earlier discussion of federal legislation, notably ORA (P.L. 96–499) and the Social Security Amendments of 1983 (P.L. 98–21) authorizing Medicare PPS, suggested that the effects of some factors should change over time. Table 4 reports analyses of changes over the periods 1978–1981, 1982–1983, and 1984 in the effects of nursing

home bed stock, Medicaid nursing home utilization, and percentage aged 85 or over. Two-tailed tests are used of differences in coefficients across time periods because the hypotheses do not specify the direction of change over time. Because of steady growth in home health care visits, unlikely to be explained totally by this state-level model, later time periods should be more positively related to utilization than are earlier time periods.

Equation 1 shows the coefficients for nursing home bed stock to be negative as hypothesized in each of the three time periods and to become significantly more negative in 1984 than in 1982–1983, suggesting that home health care utilization became more strongly tied to nursing home bed stock by the end of the 1978–1984 period. Medicare's implementation of hospital PPS, combined with a slowdown in nursing home bed construction relative to the aged population (Harrington, Swan, and Grant 1988), may have heightened the substitution of home health care for nursing home care following hospital discharge.

The coefficient for Medicaid nursing home utilization is significant only for 1978–1981. It is not, however, significantly less positive in each succeeding period — neither the change in coefficients between 1978–1981 and 1982–1983 nor between 1982–1983 and 1984 is significant. Thus, although Medicare home health care utilization appears to substitute for nursing home care under conditions of a relatively short supply of nursing home beds, it may have been more strongly tied to Medicaid nursing home utilization in the earlier 1978–1981 period than in the subsequent periods. This is consistent with the PPS explanation suggested earlier.

Equation 2 reports estimates of separate effects over time for those aged 85 or over. The measure has positive effects in the first two time periods, and the estimates do not differ significantly across periods. Controlling for these time-period effects of age 85 and over, the effects of nursing home bed stock do not vary significantly over time.

In contrast to findings in Tables 2 and 3, when changes in coefficients for nursing home bed stock, Medicaid nursing home days, and population percentage aged 85 or over are controlled for, the coefficients for income per capita are significantly positive, as hypothesized. This suggests that higher average income does result in greater utilization of home health care, perhaps in the greater ability of the elderly to establish and maintain adequate housing and thus a stable home environment in which to recuperate.

In this as in the other equations, general hospital beds per population does not have a significant coefficient. This was surprising

because home health care utilization was expected to be a function of the general hospital market.

Likewise, percentage metropolitan shows no significant effect in any of the equations. Insofar as there are differences induced by rural versus urban distribution of state populations, these may be partially controlled away by other variables in the model — especially per capita income.

The model developed to explain home health care utilization performs well, but its explanatory factors change over time in their ability to explain home health care utilization. In particular, Medicaid nursing home utilization does not explain home health usage after the 1978–1981 period. It may be that the substantial expansion in home health care, coupled with the decline in the percentage of nursing home care covered by Medicaid, decreased the influence of Medicaid nursing home occupancy on the home health care market. By contrast, the explanatory power of nursing home bed capacity increases in 1984, perhaps reflecting the effect of the implementation of Medicare PPS on the posthospital market. The inclusion of data only through 1984 may not represent sufficient time following the implementation of PPS, however, and so may limit the extent to which the effects of hospital prospective payment on home health care substitution can be judged.

CONCLUSION

Our research tested a model of Medicare home health care use in 1978–1984 as a function of overflows from the nursing home market and of other demand and supply factors. The heart of the model is the argument that state variation in Medicare home health care visits is negatively related to nursing home bed stock but positively related to access to beds by Medicaid recipients. Insofar as the model explains home health care use, it increases the ability to describe interstate variations in home health care use as part of a larger posthospital market.

The findings strongly support the model. Medicare home health care visits per population are negatively related to nursing home bed stock, and this relationship becomes stronger toward the end of the 1978–1984 period. Home health care visits are positively related to Medicaid access to nursing home beds, but only in the early portion of the period.

Other demand and supply factors acted much as expected. An exception was that unionization appeared more like a demand factor

(explaining greater utilization) than a supply factor (showing lower utilization). Another exception was that hospital bed stock did not show any power to explain home health care utilization. Future analysis will use Medicare general hospital discharges per population as a regressor that may explain Medicare home health care visits.

These findings suggest that a major factor in explaining the home health care market is what is going on in the nursing home market. Greater demand for Medicare home health care is generated by a relative scarcity of nursing home beds and perhaps by greater access of Medicaid recipients to those beds. The relationship of home health care utilization to nursing home bed stock may be stronger since the implementation of PPS reimbursement to hospitals.

Both Medicare and Medicaid are important financing sources of health care for the aged. In part because the former covers acute care and the latter primarily supports institutional long-term care, health services research frequently considers the programs separately. Even before the implementation of PPS, however, there was reason to argue that these programs were interrelated in important ways, although primary attention has been paid to the effect of Medicare on Medicaid (Sager, Leventhal, and Easterling 1987). With regard to home health care, the importance of addressing program relationships is reinforced by the limited success of most empirical attempts to model persistent interstate variation in the use of Medicare home health care (Neu and Harrison 1988; Benjamin 1986). This analysis of the role of nursing home factors in accounting for state differences in Medicare home health care use suggests that a substantial portion of the unexplained variance in the latter may be accounted for elsewhere — across the boundaries between Medicare and Medicaid, and between acute and long-term care.

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