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THE DEMAND FOR NURSING HOME CARE:
AN ANALYSIS OF THE SUBSTITUTION BETWEEN
INSTITUTIONAL AND NON-INSTITUTIONAL CARE

by

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ABSTRACT

This paper analyzes the demand for nursing home care for the aged. The cross-sectional analysis indicates a high price elasticity of demand (-2.2), and that the demand is greater the less capable are the aged of providing own care, the better the job opportunities of adult women, and the wealthier the SMSA. Utilization increased 67 percent from 1963 to 1973, but 64 percentage points is attributable to changes in these demand shift variables. This casts doubt on the view that the growth in utilization was largely stimulated by changing public policies during the period.

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I.   Introduction

During the last quarter-century one of the most rapidly growing
sectors of the economy has been institutional nursing home care for the
aged.[1] Although this sector grew rapidly after the adoption of Medicare
and Medicaid in 1965, there was also a strong trend in the earlier period
(see Table 1).

Since 90 percent of nursing home residents are age 65 and over, the
quantity or utilization variable in this study is the number of residents
in nursing homes per thousand persons aged 65 or over in the population.[2]
The use rate varies considerably across the country. In 1971, for
example, it ranged from 18 in West Virginia to 92 in Minnesota.[3]

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[1] For the purposes of this study the generic term nursing home shall be
applied to (Skilled) Nursing Care Homes, Personal Care Homes with Nursing
Services, and Personal Care and Domiciliary Care Homes without Nursing
Services. Facilities in which room and board are the only services are
not included in the analysis. The 1.1 million residents in 1971 were
distributed among the various types of homes as follows: Skilled Nursing
Care Homes, 77 percent; Personal Care Homes with Nursing Services, 16
percent; Personal Care Homes without Nursing Services, 7 percent; and
Domiciliary Care Homes, 0.3 percent (Statistical Abstract of the United States,
1974, p. 77).

[2] Statistical Abstract of the United States, 1973, p. 32 and 77.

[3] Statistical Abstract of the United States, 1974, p. 81.

Table 1
The Nursing Home Sector,
(selected Years 1950 to 1973)

(A) Expenditures 1/

	1950	1960	1965	1970	1972
Total spending (millions of dollars)	187	526	1,328	3,070	3,610
Total spending in 1967 dollars (millions of dollars) 2/	259	593	1,405	2,640	2,881
As a percent of National Health Expenditures	1.5	2.0	3.3	4.3	4.0

(B) Residents 3/

	1963	1967	1969	1971	1973
Residents (thousands)	491	756	850	1,076	1,198
Employees per resident	0.49	0.51	0.52	0.53	.53
Facilities (thousands)	14	19	19	22	22
Residents per facility	36	40	45	49	55

1/   Only Skilled Nursing Homes.

2/   Deflated by the CPI, 1967 = 100.

3/   Skilled Nursing Homes and Related Health Care Facilities.

Source: Statistical Abstract of the United States, 1974, pp. 69, 78, 411, and U.S. National Center for Health Statistics.

This paper analyzes the demand for nursing home care in the cross-section and over time. The cross-sectional analysis, using Standard Metropolitan Statistical Areas (SMSAs) as the unit of observation, reveals a high price elasticity of demand for nursing home care and a strong substitution between care provided in an institutional setting, a nursing home, and noninstitutional care. [1] Changes over time in the demand shift variables are found to account for 95 percent of the growth of nursing home utilization per thousand aged persons during the decade 1963 to 1973.

In recent years several states established regulatory agencies to limit the growth of the nursing home sector on the presumption that this growth has arisen from increased public subsidies. The analysis in this paper, however, suggests that the nursing home sector may not have had a substantially smaller growth rate in the absence of the public programs enacted in the last decade.

A supply and demand model for nursing home care is developed in section II, and estimated empirically in section III using 1967 utilization data for 201 SMSAs. The cross-sectional parameters are then used (section IV) in a "growth accounting" analysis to explain statistically the growth of nursing home care from 1963 to 1973. This is followed by a summary and concluding section.

II. The Model

The analysis of nursing home utilization is based on equations for the industry price for and the population's demand for nursing home services. The equations are discussed in turn.

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1/ SMSAs are defined, and the data sources are presented, in Appendix A.

(a) The Supply Price Equation

Industry supply curves can be upward rising either because an expansion of output has the effect of increasing the measured prices of factor inputs or because unmeasured factor price increases are subsumed under the label of decreasing returns to scale. There does not appear to be any input that is specialized to the nursing home sector in an SMSA. Nurses, aides, cleaning workers and cooks are mobile between industries within their occupation, and between SMSAs. Nor would there appear to be any long-term constraint of entrepreneurial ability on nursing home expansion. Nonlabor inputs (food, sheets, beds, electricity, etc.) are purchased in a market in which nursing homes constitute a minor demand for output, and hence the expansion of the nursing home sector would leave the price unchanged. And, nursing homes are not geographic-specific within SMSAs (e.g., they need not be by the ocean, or at the highest elevation). Finally, although in principle firm supply curves may be upward rising because of "lumpy" factor inputs, studies of nursing homes suggest that this is not a characteristic of the industry.[1] Even if it were, it would be relevant only for small areas that have very few (one?) nursing homes, and this is not characteristic of SMSAs.

Thus, there does not appear to be a reason in the long run for the industry supply curve within an SMSA to rise with increasing

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[1] Several studies of nursing homes have found that average costs are invariant with size. See H. S. Ruchlin and S. Levey, "Nursing Home Cost Analysis: A Case Study," Inquiry, September 1973, pp. 3-15; and D. E. Skinner and D. Yett, "Estimation of Cost Functions for Health Services: The Nursing Home Case," mimeo 1970.

demand for nursing home care, in the relevant range. This means that the long-run supply curve is perfectly elastic.

— Appropriate data on the price of nursing home care are not available by SMSA for the period under consideration. Data are available, however, on the average usual monthly charge in the state in which the SMSA is (primarily) located. Because this variable may be subject to substantial error as a measure of nursing home prices within an SMSA, a modified instrumental variables approach is adopted in which the supply price for each SMSA is predicted on the basis of the area's relevant characteristics. The observed price and the predicted price are both applied in the empirical estimation of the demand equation.

The height of the industry supply price depends on the prices of the relevant factors of production and the technology employed. It is assumed that the knowledge of how to provide nursing home care, the production function, is the same in all SMSAs. The speed with which knowledge is transmitted makes this a reasonable assumption. This is facilitated by the nationwide associations of nursing home administrators and of the personnel they employ (nurses, occupational therapists, cooks).

The nursing home price variable is the average "usual monthly charge" for nursing home services in the state. Three wage variables are hypothesized to enter the price equation -- the median earnings of females who worked a full year (50 to 52 weeks in 1969) in the SMSA as (a) Registered Nurses (WRN), (b) Nursing Aides, Orderlies and Attendants (WAIDES), and (c) Cleaning Service Workers (WCLN).

These occupations account for a large proportion of nursing home staffs.[1]
The wage rates are entered as exogenous variables, that is, as variables
whose values are determined outside of the supply and demand model for
nursing home care. This procedure is valid so long as nursing homes
in an SMSA employ a sufficiently small proportion of persons in these
occupations so that an expansion of employment in the nursing home
sector has no significant impact on their wages.[2]

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[1] In 1964, the occupational distribution of employees of nursing
and personal care homes was:

		Number (in thousands)	Percent
1.	Registered Nurses	17.4	6.2
2.	Nurse's Aides, Licensed Practical Nurses, Orderlies	141.1	50.2
3.	Other Nonprofessional Staff (cleaning, cooking, etc.)	98.3	35.0
4.	Administrators [a]	20.7	7.4
5.	Other Professional Staff	3.6	1.2
		281.0	100.0

[a] "Over one-third stated that they also worked as an RN, LPN, or
nurse's aide," p. 3.

Source: Employees in Nursing and Personal Care Homes, May/June, 1964,
U.S. Department of Health, Education and Welfare, National Center for
Health Statistics, Series 12, Number 5, September 1966, Table B.

[2] In 1964, nursing and personal care homes employed 19,200 workers as
registered nurses, dieticians, and physical and occupational therapists.
In 1960 and 1970, the number of persons employed in these occupations
was 669,559 and 945,721, respectively. In 1970, of 249,000 women
cleaners and charwomen, only 38,000 worked in "nonhospital health
services," a category which includes clinics, nursing homes, etc.
Employees in Nursing and Personal Care Homes, May/June, 1964,
U.S. Department of Health, Education and Welfare, National Center
for Health Statistics, Series 12, Number 5, September 1966, Table B.
1970 Census of Population, Subject Report, Occupation by Industry,
Table 1. 1960 Census of Population,

The wage data are available only for the 122 SMSAs with a population in excess of 250,000 in 1970. The smaller SMSAs were assigned the wage rate values of neighboring larger SMSAs on the assumption that labor and firm migration tie together wages in neighboring cities. However, a dichtomous explanatory variable SMSMSA is created which takes the value of unity for small SMSAs and the value of zero for the 122 large SMSAs. This variable would be expected to have no effect on price if wages in small SMSAs are not systematically different from those in neighboring large SMSAs, the productivity of nurses, aides and cleaning service workers does not vary with the size of the SMSA and there are no other cost differences between large and small cities. Because of a tendency toward lower wages (especially for women) and land values in smaller SMSAs, production costs may be lower.[1] It is, therefore, hypothesized that SMSMSA has a negative partial effect on costs.

Approximately 66 percent of the residents in nursing homes are in proprietary institutions, compared to only 24 percent in private nonprofit homes and 10 percent in government operated homes.[2] It is believed that a substantial proportion of private nursing homes are

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[1] For analyses of the effect of city size on wage rates see V. R. Fuchs, Differentials in Hourly Earnings by Region and City Size, 1959, (N.B.E.R. Occasional Paper No. 101, 1967), and Harriet Zellner, "The Determinants of the Occupational Distribution of Women," Ph.D. dissertation, Columbia University, 1974.

[2] Charges for Care in Nursing Homes, 1968, U.S. Department of Health, Education and Welfare, National Center for Health Statistics, Series 12, Number 14, May 1972, Table J.

owned by physicians, in part because of the complementarity of physician services and nursing home services. This ownership pattern is more likely where physicians have light work loads in their primary activity. For example, a study of urban-rural differences in nursing homes in Georgia found a much higher rate of physician ownership in the rural areas where there is a smaller demand for the services of physicians qua physicians.[1]

Thus, a greater number of physicians per capita (PHYS) in an area may increase the supply of potential entrepreneurs for nursing homes and lower the price of this input. The variable PHYS is hypothesized to have a negative effect on the cost (price) of nursing home services.

The price equation, with hypothesized signs in parentheses, is:

$$PRICE = f[WRN, WCLN, WAIDE, PHYS, SMSMSA].$$
$$\quad\quad\quad (+)\quad (+)\quad\ (+)\quad\ (-)\quad\ (-)$$

(b) The Demand Equation

The dependent variable in the demand equation is the number of residents of nursing homes in the SMSA per thousand aged population of the SMSA (RES*).[2] The more costly is nursing home care, other variables held constant, the greater the incentive on the part of those who pay the bill -- the aged, their relatives, county and state welfare officials -- to encourage the use of alternative facilities.

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[1] I. E. Robinson, H. Bronfin, and J. O. Balswick, "Nursing Home Resources and Rural and Urban Needs," Journal of Health and Social Behavior, Vol. II, No. 2, June 1970, pp. 146-51.

[2] Since the demand and supply equations are $Q = f_1 (P, X)$ and $P = f_2 (Z)$ where Q and P are quantity and price and X and Z are exogenous variables, there is no simultaneous equations bias when an OLS regression of Q on P and X is computed.

For the aged, living in one's own residence, with adult children, with others, or in a hospital are alternatives (substitutes) for residing in a nursing home.[1] The more attractive is the noninstitutional environment, relative to institutional nursing home care, the smaller is the demand for nursing home services. However, the extent to which this substitution is made depends on the nature of the required nursing and personal care. Noninstitutional care is a better substitute for a nursing home residence, the less important are the nursing services demanded by the aged person, and the more able is the aged person to provide domiciliary services for himself or herself.

Hence, variables that reflect the demographic structure of the aged population are important demand shift factors. The older the aged population, the greater their demand for nursing services and the less able they are to provide their own routine domiciliary (personal) care. Three age structure variables are created, the percent of those 65 and over who are 70 to 74 years of age (%70-74), 75 to 84 years of age (%75-84), and 85 or over (%85+). The partial effects and significance of these variables are expected to be greater for older age groups. Holding the age structure constant, the poorer the health of the aged, the greater would be the demand for nursing home care. An age-specific death rate for the aged (DEATH) is used as an index of poorer health.

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[1] "The ANHA (American Nursing Home Association) continues to believe that nursing homes have an important role to serve in relieving pressure on hospitals by providing quality nursing care for patients who no longer require acute hospital care at a cost which is much less than that which a hospital must charge." Nursing Home Fact Book, 1970-1971 (American Nursing Home Association, July 1971, Washington, D.C.) p. 46.

Aged men and women may have different capabilities in providing own care. Most aged women devoted a greater proportion of their adult life to operating a household. If this has training components or creates habits which are more difficult to generate when one is older, ceteris paribus, aged women would have a smaller demand for nursing home care. Then, other variables held constant, the greater the proportion of the aged population that is female (%F65), the smaller the demand for nursing home care.

Companionship and care outside of an institutional setting may be provided by adult children and other relatives.[1] Such care is more likely to be provided by adult women than adult men relatives. Then, the higher the value of time in the labor market of adult women, the more costly is providing this care for the aged relatives, and the less it will be provided.[2] The labor force participation rate of married women is sensitive to the value of their time.[3] Thus, the greater the labor force participation rate of adult married women (%MWLF) the greater would be the demand for nursing home care for the aged.

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[1] Companionship appears to be an important input in the physical and mental health of the aged. See, for example, Ruth Bennett, "Social Isolation and Isolation-Reducing Programs," paper presented at New York Academy of Medicine Conference on the Aged, May 1, 1973.

[2] This hypothesis is suggested, but not developed or tested, by Sharon Winn, "Analysis of Selected Characteristics of a Matched Sample of... Nursing Homes...," Medical Care, March 1974, p. 221.

[3] See Jacob Mincer, "Labor Force Participation of Married Women," Aspects of Labor Economics (N.B.E.R. 1962) or Glen Cain, Married Women in the Labor Force (Chicago, 1966).

Support for this hypothesis is provided by data on variations in health status of nursing home residents when they enter the home. The never married, who are less likely to have adult children or other adult relatives to provide companionship or care, are more likely to enter when they have few or no chronic conditions or impairments.[1]

Nursing homes provide companionship for the aged, and may provide a higher quality of personal care and nursing care than the aged could obtain on their own. It is therefore hypothesized that higher income families, and the residents of wealthier SMSAs, would purchase a greater quantity and quality of nursing home care for the aged,

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[1] The percent distribution of residents in nursing and personal care homes in 1964, by the number of chronic conditions and impairments is:

	None or 1-2	3-4	5 or more
Married	40.0	37.9	22.1
Widowed	40.9	37.5	21.6
Divorced or Separated	48.8	32.2	19.0
Never Married	52.1	33.1	14.8
All	43.7	36.1	20.2

Source: Marital Status and Living Arrangements Before Admission to Nursing and Personal Care Homes -- May/June 1964. U.S. Department of Health, Education and Welfare, National Center for Health Statistics, Series 12, Number 12, May 1969, Table B.

holding prices constant.[1/] Thus, the demand for nursing home care is hypothesized to be greater in SMSAs with higher median family incomes (INC).

The Federal Government has been directly or indirectly involved in the subsidization of nursing homes for the aged for nearly 40 years. "Prior to the 1930's, only a few such homes existed. With the enactment of the Social Security Act in 1935, which made Federal funds available to the needy aged, the number of proprietary boarding and nursing homes for elderly persons began to flourish and public almshouses subsequently declined."[2/] While the provisions of Federal social security legislation, including the adoption of Medicare in 1965, lowered the cost of nursing home care to the aged, the legislation was uniform throughout the country.[3/] It is, therefore, not possible to measure Medicare's impact using a single 1967 cross-section analysis.

1/ There is evidence, for example, of more short-term general hospital beds per capita in wealthier SMSAs. See Barry R. Chiswick, "Randomness and Regional Differences in Hospital Capacity," mimeo, 1975.

2/ The Nation's Health Facilities: Ten Years of the Hill-Burton Hospital and Medical Facilities Program, 1946-1956, Public Health Service, Division of Hospital and Medical Facilities, PHS Pub. No. 616, 1968, as quoted in Health Resources Statistics: 1970 (National Center for Health Statistics, 1971), p. 269.

3/ Medicare provided for the "financing of up to 100 days of extended care services for persons 65 and over in a certified facility during a single spell of illness" following at least three days of hospitalization. Health Resources Statistics: 1970, op. cit., p. 269.

Medicaid, also adopted in 1965, resulted in differential subsidization of nursing homes by region for the year under study, 1967.[1] The program is administered by the states with federal-state sharing of financing and became operational in some of the states from January 1, 1966, while others joined in later years. A dichotomous variable MEDAID is created which takes the value of unity for SMSAs in the 27 states for which Medicaid became operational on or prior to January 1, 1967, and takes the value of zero for SMSAs in the remaining 23 states and the District of Columbia.

The variable MEDAID is hypothesized to have a positive effect on the demand for nursing home care since Medicaid lowers the cost of this care to the aged. An alternative explanation for a positive effect is that states in which there is a higher demand for nursing home care would have a greater incentive to pass the Medicaid legislation so as to have the Federal Government (i.e., the rest of the country) contribute to the cost of providing this service. This latter hypothesis implies that state enactment of Medicaid is endogenous to the demand for health services in the state.

A dichotomous variable taking the value of unity for small SMSAs (SMSMSA) is also entered to test the effect of city size on the demand for nursing home care when other variables are held constant. A negative coefficient would imply a smaller demand per aged person in smaller SMSAs. No prediction is offered as to its partial effect.

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[1] Medicaid provides for, among other benefits, "'skilled nursing services' to individuals over 21 who qualify as aged, blind, or permanently, and totally disabled who are eligible for public assistance payments or who, at a state's option, qualify as 'medically needy'." Health Resources Statistics: 1970, op. cit., p. 269.

The demand equation, with hypothesized signs in parentheses is:

$$RES^* = [PRICE, \ INC, \ \%MWLF, \ \%F65, \ \%70\text{-}74, \ \%75\text{-}84, \ \%85+,$$
$$(-) \qquad (+) \qquad (+) \qquad (-) \qquad (+) \qquad (+) \qquad (+)$$

$$DEATH, \ MEDAID, \ SMSMSA].$$
$$(+) \qquad (+) \qquad (?)$$

III. The Estimated Cross-Sectional Equations

Tables 2 and 3 present the estimated price and demand equations respectively for nursing homes in which all of the variables, other than dichotomous variables, are expressed in natural logarithms.

(a) Price

In the first price equation (Table 2, regression (1)), the exogenous variables explain only 21 percent of the variations in the log of the price variable. Because of the nature of the price data, the average usual monthly charge in the state the SMSA is (primarily) located, the dependent variable is subject to substantial error as a measure of the price in the SMSA. If this error is not correlated with the explanatory variables or with measurement error in the explanatory variables, it would not bias the regression slope coefficients, but it would bias downward the explanatory power (R^2) of the equation.

The wage of nursing aides, who comprise about one-half of nursing home employees, is found to have a very strong positive effect on the price variables. The wage of registered nurses has a positive but

Table 2

Nursing Home Analysis -- Price Equations

	Dependent Variable	
	LPRICE1	LPRICE2
LWRN	0.1459 (1.05)	0.0152 (0.50)
LWCLEAN	-0.2347 (-2.52)	0.0424 (0.59)
LWAIDE	0.5263 (5.22)	0.3845 (5.15)
LNHSPMD	-0.1458 (-4.03)	-0.0836 (-3.10)
SMSMSA	-0.0304 (-1.77)	-0.0122 (-0.96)
LEMPL	--	0.7061 (13.17)
CONST.	1.8144 (1.98)	-2.830 (-3.74)
N	201	201
DF	195	194
SE2	0.0126	0.0067
R2	0.2130	0.5775

Note: t-ratios in parentheses.

insignificant effect. The lack of significance may arise from the relatively minor role registered nurses play in the nursing home sector. It is surprising, however, that the wages of cleaning service workers have a significant negative effect on price. As hypothesized, prices are lower where the SMSA has a population less than 250,000, and where there are more physicians per thousand population. The latter effect can be interpreted as arising from a lower price of managerial or entrepreneurial talent where physicians are in greater relative supply.

In regression (2) of Table 2, a crude, and questionable index of quality of services is included in the equation, the number of employees per resident in nursing homes (EMPL) in the SMSA. It is a crude measure of quality of services since it reflects inputs, not the service output. It is a questionable measure since the denominator is the number of residents, which may not be determined independently of price. A simultaneous equations bias does not arise if the ratio of employees to residents is not causally dependent on price, holding the other variables constant.

When the quality variable is included, the regression's explanatory power jumps to 58 percent. The quality variable is highly significant and the variable for the wages of nursing aides and physicians per capita remain significant. The sign of the coefficient of the wage for cleaning workers becomes positive but is not significant. The small SMSA dummy variable is no longer significant, presumably because of a smaller number of employees per resident in smaller SMSAs.

(b) Demand

Table 3 presents three sets of demand equations, one for each price variable. The three variables are the observed price (LPRICE), and the prices predicted on the basis of Table 2 regressions (1) and (2), LPRICE1 and LPRICE2, respectively. The "best" set uses the predicted variable LPRICE1. This variable is not subject to the substantial measurement error of the observed price, or a potential simultaneous equations bias inherent in the second price equation in Table 2. Two regressions are computed for each price variable. Regression (B) includes all 10 explanatory variables discussed above, while regression (A) does not include two variables which are found to be insignificant.

Using the most appropriate price variable, LPRICE1, the demand equation variables explain 34 percent of the variation in the log of the utilization rate. Price has a significant negative effect on quantity demanded, with an elasticity of -2.2.[1]

A significant income elasticity of 0.7 is obtained; a 10 percent increase in an SMSA's median family income (INC) is associated with a 7 percent increase in nursing home use. The measured income effect is not a consequence of greater labor force participation (and hence family income) among adult married women, since this variable is held constant.

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[1] The elasticity is closer to zero for observed price that is subject to substantial measurement error, and the price variable that may be subject to simultaneous equations bias. The slope coefficient and t-ratios for the other explanatory variables are not very sensitive to the choice of the price variable.

Table 3

Nursing Home Analysis -- Demand Equation
(N = 201)

Dep. Variable - LRES*

| | Price Variable | | | | | |
| | LPRICE | | LPRICE1 | | LPRICE 2 | |
	(A)	(B)	(A)	(B)	(A)	(B)
LPRICE	-0.6897 (-2.65)	-0.7332 (-2.81)	-2.2075 (-3.46)	-2.3494 (-3.55)	-1.9782 (-5.44)	-1.9708 (-5.45)
LINC	0.5733 (2.57)	0.5450 (2.19)	0.6677 (2.70)	0.5660 (2.06)	0.7090 (2.98)	0.6699 (2.52)
L&MWLF	1.2959 (4.37)	1.3863 (4.60)	1.3524 (4.24)	1.4675 (4.45)	1.0485 (3.29)	1.1280 (3.47)
L&F65	-1.5725 (-1.81)	-1.3620 (-1.56)	-1.8342 (-1.92)	-1.6498 (-1.70)	-1.0638 (-1.15)	-0.9009 (-0.97)
L&70-74	1.0261 (0.80)	0.9038 (0.70)	1.638 (0.83)	0.9463 (0.66)	0.8818 (0.64)	0.7855 (0.57)
L&75-84	1.0613 (2.01)	0.8548 (1.58)	1.1933 (2.07)	0.9891 (1.66)	0.6781 (1.19)	0.5294 (0.91)
L&85+	1.2952 (3.25)	1.2071 (3.01)	1.2352 (2.83)	1.1696 (2.04)	1.0816 (2.53)	1.0273 (2.40)
LDEATH	0.8821 (6.00)	0.8292 (5.52)	0.9740 (5.90)	0.9370 (5.45)	0.9445 (6.13)	0.9010 (5.69)

Table 3 (con't)

| | Price Variable | | | | | |
| | LPRICE | | LPRICE1 | | LPRICE 2 | |
	(A)	(B)	(A)	(B)	(A)	(B)
SMSMSA	--	0.0520 (0.76)	--	0.0057 (0.07)	--	0.0317 (0.43)
MEDAID	--	0.1122 (1.50)	--	0.1248 (1.51)	--	0.0853 (1.08)
CONST.	4.9802 (1.47)	5.1583 (1.47)	12.2608 (2.75)	13.5504	9.4867 (2.54)	9.6242 (2.50)
DF	192	190	192	190	192	190
SE2	0.1716	0.1694	0.2056	0.1997	0.1951	0.1917
R^2	0.448	0.455	0.338	0.357	0.372	0.383

Note: t-ratios in parentheses. R^2 computed using the predicted price data.

The labor force participation rate of adult married women (%MWLF) has a strong positive partial effect on nursing home use (elasticity of 1.4). This suggests substitution between care provided for the aged by adult women outside an institutional setting and care provided in nursing homes. The more expensive is noninstitutional care (higher market value of time of adult women) the more nursing home care demanded.

The demographic variables have the hypothesized effects. The greater the proportion of the aged who are women, the smaller the demand for nursing homes by the aged, presumably because aged women are better able to provide own care than aged men. An SMSA's demand for nursing home care is greater the older the aged population; the slope coefficients for the three age groups are positive and either the slopes or t-ratios increase with age. And, holding constant the age and sex distribution of the aged, the poorer the health of the aged, as measured by an age-specific mortality rate, the greater the demand for nursing home care.

The existence of a Medicaid program in the state prior to 1967 had a positive but insignificant effect on the demand for nursing homes. The weak Medicaid effect may be due to the newness of the program. Since the program is now nationwide, its impact cannot be tested using current cross-sectional data. Finally, there is no correlation between city size (SMSMSA) and the utilization rate for nursing homes.

In summary, the cross-sectional analysis indicates that the amount of nursing home care demanded for the aged is sensitive to the relative monetary and nonmonetary price of institutional compared to noninstitutional care. The demand is also greater in wealthier areas.

IV. Time Series Analysis

As indicated in Table [1], there has been a rapid increase in nursing home use by the aged in the last quarter of a century. This increase can presumably be related to changing economic and demographic factors. Although the model developed in section II can in principle be applied directly in a time series analysis, in practice, the series is too short and subject to too much autocorrelation. However, if the model is correctly specified and if the population partial effects (elasticities) are the same in the cross-section as in the time series, the estimated cross-sectional coefficients can be used to analyze the time series.

This procedure requires time series data on the quantity variable, residents per thousand aged persons in the country, and on the explanatory variables. Appropriate time series data exist for utilization and for the demand shift variables for the decade 1963 to 1973, but not for price.[1/] The increase over time in median family income, the labor force participation rate of adult married women, and the average

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1/ Adequate price data are not available nationally on an annual basis. In addition, the wage variables in the price equation are not available annually. It is assumed that there has been no change over time in the age-specific health of the aged (DEATH) and the variable for small SMSAs (SMSMSA). The time series variables are described and their sources presented in Appendix A.

age of the aged would increase the demand for nursing home care, while the increasing proportion of the aged who are female would have the opposite effect.

Table 4 presents the contribution of the demand shift variables to the growth of nursing home care for the period 1963 to 1973.[1] The growth due to changing income, female labor force participation and the age-sex composition of the aged would have been 95 percent of the observed growth if all other relevant factors had been unchanged in the interim. Of the predicted 64 percent increase in utilization in the decade, four-tenths is attributable to the increased female labor force participation rate, three-tenths to increased real family income, and the final three-tenths to the changed demographic (age-sex) composition of the aged.

The three shift variables are also important in the four sub-periods. As a set, these variables are more successful for explaining the time

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[1] If the demand equation is $LnQ_i = a_o + b_o LnP_i + \sum_{j=1}^{k} b_j LnX_{j,i} + U_i$ where X_j is the jth shift variable and U is the residual,

$$\partial LnQ_i = b_o \partial LnP_i + \sum_{j=1}^{k} b_j \cdot \partial LnX_{j,i} + \partial U_i .$$

Then, $b_j \partial LnX_j$ is the growth in quantity attributable to the change in X_j and $\sum_{j=1}^{k} b_j \partial LnX_j$ is the growth in quantity attributable to the k shift variables.

Table 4. Time Series Decomposition of the Demand for Nursing Home Care

	Percent Change				
	1963 to 1967	1967 to 1969	1969 to 1971	1971 to 1973	1963 to 1973
Residents per thousand aged	36.1	8.7	19.5	2.8	67.1
Amount attributable to changes in:1/					
a) Income (INC)	10.1	5.3	-0.9	4.4	19.0
b) Female Labor Force Participation (%MWLF)	10.3	8.0	5.7	3.4	27.3
c) Age-Sex Composition2/	9.4	2.8	7.2	-1.6	17.7
Total	29.8	16.1	12.0	6.2	64.0
Difference between observed and attributable change	6.3	-7.4	7.5	-3.4	3.1
Ratio of attributable to observed change	0.83	1.85	0.62	2.21	0.95

1/ Computed from the coefficients in the regression equation in Table 2, equation A, price variable LPRICE1 and the percent increase in the explanatory variables.

2/ The proportion of women in the aged population and the percent of the aged in the three age groups.

Sources: See Apppendix A and Table 2.

series growth in nursing home care during periods of more rapid

observed growth, and the longer the time period.[1]

It appears, therefore, that the nursing home sector would have

experienced rapid growth in the last decade even if there had been

no change in public policies.

V. Summary and Conclusions

This paper has examined the demand for nursing home care for the

aged using cross-sectional and time series data. The variable under

study is the number of residents of nursing and related care homes per

thousand persons age 65 and over. A two-equation model is developed

(section II) and tested empirically (section III) for explaining

regional differences in the utilization of nursing homes, using 1967

data and 201 Standard Metropolitan Statistical Areas (SMSAs) as the

observations.

The industry supply price in an SMSA -- cost per resident -- is

constant in the long run in the relevant range because there is no

input that is specialized to the nursing home industry within an SMSA.

That is, the supply curve is perfectly elastic. The height of this

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[1] Similar conclusions emerge when the parameters from the equation
containing the Medicaid variable are used (Table 2, LPRICE1, regression B):

	Percent Change				
	1963 to 1967	1967 to 1969	1969 to 1971	1971 to 1973	1963 to 1973
Residents per thousand aged	36.1	8.7	19.5	2.8	67.1
Change attributable to demand shift variables[a]	37.8	17.5	17.0	7.5	70.9

[a] Income, female labor force participation, age-sex composition,
Medicaid.

price line is greater, the higher the price of factor inputs, including wages, the higher the quality of service, and the smaller the number of physicians per capita in the area. The latter variable may reflect the supply of entrepreneurial or managerial talent for the nursing home sector in the SMSA, as this is sometimes a part-time employment for physicians.

The amount of nursing home care demanded in an SMSA is a negative function of price, with an elasticity of -2.2. Such a large price elasticity implies that there are good alternatives to or substitutes for nursing home care. Care outside of an institutional setting is an obvious substitute.

Nursing home care would be preferred, the less able the aged are to provide their own personal and nursing services and the more expensive it is for adult (nonaged) relatives to provide these services. Empirically, the demand for nursing home care is greater, the older the aged population and the poorer their health, as measured by age-specific death rates. The demand is also greater the larger the proportion of men among the aged. This presumably arises because aged men are less likely than aged women to have acquired the training, and perhaps more important, the habits of providing for their own home-oriented personal care services. The demand is also greater, the higher the value of time in the labor market of adult married women, as reflected in a greater labor force participation rate. A higher value of time in the labor market raises the cost of the family's providing noninstitutional care for aged relatives.

The demand for nursing home care is greater in wealthier areas; a higher median family income in an SMSA is associated with a larger number of residents per thousand aged population (elasticity 0.7). City size is apparently uncorrelated with the demand for nursing home care.

By January 1, 1967, 27 states had Medicaid coverage for nursing home care for the aged poor. The demand for nursing home care was greater, but not significantly greater, in SMSAs situated in these states. It is not clear whether the lack of statistical significance arises because the program was so recently initiated.

The cross-sectional regression coefficients for the demand shift variables were applied to an analysis of the growth of nursing home care from 1963 to 1973 (section IV). During this period there was a 67 percent increase in the number of residents per thousand aged persons. By themselves, the increased real family income, and labor force participation among adult married women, as well as the changing age-sex composition of the aged would have increased utilization by 64 percent. That is, 95 percent of the observed growth from 1963 to 1973 can be attributed to these demand shift variables.

It is anticipated that real family income, the labor force participation rate of adult women and the average age of the aged population will continue to increase. This suggests that there will be an increased demand for nursing home care for the aged in the future. This increased demand will not be the consequence of public policy, but will clearly impact on public policy.

Appendix A

Definitions and Data Sources

A. Cross-Sectional Variables

The unit of observation is a Standard Metropolitan Statistical Area (SMSA). An SMSA is a county or group of contiguous counties which contain at least one city of 50,000 inhabitants of two or more contiguous cities with a combined population of at least 50,000. For New England, State Economic Areas, but not SMSAs, are defined on a county basis and are used as the unit of observation. For simplicity, non-New England SMSAs and New England State Economic Areas are referred to as SMSAs in this study and provide a sample of 201 observations.

1. Quantity (RES*)

The data on nursing home residency are from the nationwide Master Facility Inventory (1967) of the National Center for Health Statistics.[1] A resident is defined as a person who is not an employee or owner but who stayed in the home the night before the survey day in 1967. For the purposes of this study, the term nursing homes is used to include Nursing Care Homes, Personal Care Homes with and without Nursing Services and Domiciliary Care Homes. Facilities that

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[1] Nursing Homes: A County and Metropolitan Area Data Book, U.S. Department of Health, Education and Welfare, National Center for Health Statistics, November 1970.

provide room and board as their only services are not included in the data base.

2. Price (PRICE)

The price variable is the average most frequent (modal) monthly charge per resident in nursing homes in the state during 1968. This is the only quantitative variable not available on an SMSA basis. Each SMSA is assigned the price value for the state in which it is located, or in which the greater proportion of its population resides for SMSAs that overlap two states. Charges for Care in Nursing Homes: United States April-September 1968, U. S. Department of Health, Education and Welfare, National Center for Health Statistics, May 1972, Table 6.

3. Income (INC)

Median family income in 1969 in the SMSA. 1970 Census of Population, Vol. 1, Characteristics of the Population, Table 89.

4. Wage Variables (WRNS, WAIDES, WCLN)

The median earnings in 1969 of women in the SMSA who worked 50 to 52 weeks as (a) registered nurses (WRNS), (b) nursing aides, orderlies and attendants (WAIDES), and (c) cleaning service workers (WCLN). 1970 Census of Population, Vol. 1, Characteristics of the Population, Table 176. Data of nearby large SMSAs are used for the 69 SMSAs with populations less than 250,000 in 1970 for which wages by occupation were not reported.

5. Small SMSA (SMSMSA)

Dummy variable taking the value of unity for the 69 SMSA's for which wage data by occupation were not reported in the 1970 Census of Population.

6. Physicians (PHYS)

Nonfederal, nonhospital based physicians per thousand population of the SMSA. J. N. Haug and G. A. Roback, "Medical Practice Data by Metropolitan Area," Distribution of Physicians, Hospitals and Hospital Beds in the U.S. - 1967 by Region, State, County and Metropolitan Area, Chicago, American Medical Association, 1968, Table 14.

7. Labor Force Participation Rate of Married Women (%MWLF)

The proportion of married women (spouse present) age 25 to 64 in the SMSA who were in the labor force during the survey week in 1970. 1970 Census of Population, Vol. 1, Characteristics of the Population, Table 165.

8. Age-Sex Distribution

The proportion in 1970 of those aged 65 and over in the SMSA who are (a) female (%F65), (b) 70 to 74 years of age (%7074), (c) 75 to 84 years of age (%7584) and (d) 85 or more years of age (%85+). 1970 Census of Population, Vol. 1, Characteristics of the Population, Table 24.

9. Mortality (DEATH)

Age-adjusted death rates in the SMSA of persons 65 to
85 years. Vital Statistics of the United States, 1960, Vol. II
Mortality, Part B, Washington, D.C., U.S. Government Printing
Office, 1963 and 1970 Census of Population, Vol. 1, Characteristics
of the Population, Table 24.

10. Medicaid (MEDAID)

A dichotomous variable equal to unity for SMSAs in
(or primarily in) the 27 states in which Medicaid became
operational on or prior to January 1, 1967, and equal to
zero in the other 23 states and the District of Columbia,
Nursing Home Fact Book, 1970-1971, Washington, D. C.,
American Nursing Home Association, July 1971, pp. 55-56.

11. Employees per Resident (EMPL)

The number of nursing home employees per nursing home
resident in the SMSA in 1967. Nursing Homes. op. cit.

B. Time Series Variables

The population base for the time series variables is
the entire country. The variables are defined in the same
manner as in the cross-sectional analysis, unless specified
otherwise.

1. <u>Quantity</u> (RES*)

   <u>Statistical Abstract of the United States: 1974</u>, p. 78;
"Estimates of the Population of the United States...1973,"
<u>Current Population Reports</u>, Series P-25, No. 519, Bureau of
the Census, Table 1; National Center for Health Statistics
(1973 data).

2. <u>Income</u> (INC)

   Median family income deflated by the consumer price index.
"Money Income in 1973 of Families and Persons in the United
States," <u>Current Population Reports</u>, Bureau of the Census,
Table 13, p. 20.

3. <u>Labor Force Participation Rate of Married Women</u> (%MWLF)

   "Marital and Family Characteristics of the Labor Force,"
<u>Special Labor Force Reports</u>, Table B in Nos. 40, 90, 120, 144,
164, Bureau of Labor Statistics.

4. <u>Age-Sex Distribution</u>

   "Estimates of the Population of the United States by Age,
Sex and Race: April 1, 1960 to July 1, 1973," <u>Current Population
Reports</u>, Bureau of the Census, Table 1.

5. <u>Medicaid</u> (MEDAID)

   Percent of the population in states with Medicaid on or
before 1965, December 1966, October 1968 and January 1971.
<u>Nursing Home Fact Book, 1970-1971</u>, Washington, D.C., American
Nursing Home Association, July 1971, pp. 55-56.