

THE ALLOCATION OF LABOR TO INFORMAL HEALTH PRODUCTION: HEALTH CARE
FOR THE ELDERLY, IF TIME PERMITS*

Shelley I. White-Means, Memphis State University¹

REVIEW OF PREVIOUS RESEARCH

This paper examines the impact of family caregiving on the allocation of time between labor market, caregiving and leisure activities. A reduced form regression model is the analysis framework for these simultaneous decisions. The data analysis indicates that the number of caregivers and their assumed responsibilities are significantly related to the caregiving time allocation decision. Alternatively, the leisure and employment decisions are predominantly determined by the financial status of the caregiver and health status of both the caregiver and the impaired elderly relative.

INTRODUCTION

Recent research on health care for the elderly has addressed the role of home health care as a substitute for more expensive and impersonal hospital and nursing home care. However, much of this analysis has focused on market-supplied home services. The home care production activities of informal caregivers, usually family members and friends are seldom examined. These caregivers contribute time that aides in the effective administration and provision of market-supplied home health services. As a result, input costs of market-supplied home health care and out-of-pocket expenditures on medical services are reduced. Nonetheless, when informal caregivers allocate time to home care production, less time is available for labor market activities, household production, child care and leisure.

Informal home health providers have developed diverse systems of family care. Families differ in the number of individuals directly involved in care, as well as in the amount of time contributed to caregiving. The diversity in family caregiving production reflects the opportunity cost of informal care. One of the first steps toward understanding this diversity is a close examination of the factors determining caregivers' time allocation decisions--caregiving hours, labor force participation, household production and leisure decisions.

*The data used in this paper were made available (in part) by the Inter-University Consortium for Political and Social Research. The author thanks Howard Tuckman, Ramona Heck and Albert Okunade for insightful comments and Judy Boggess for research assistance. A special thanks goes to Cyril Chang for providing a critical reading of the manuscript, resulting in a much improved product.

¹Associate Professor of Health Economics

The existing literature predominantly evaluates home health care as a cost effective alternative to hospital and nursing home care (Vogel and Palmer, 1984; Kramer, Shaughnessy, and Pettigrew, 1985). Input costs of market-supplied home care are carefully defined and assessed. The cost of service providers (wages and salaries), the opportunity cost of renting technological devices for home utilization and the cost of food and housing are the measures of per visit costs of home care. However, assessments of the costs of market-supplied home care seldom include any estimates of the opportunity cost resulting from the use of informal care workers in home service provision. The exclusion of estimates of informal care cost is in part explained by the limited availability of data fostering such analysis.

Research about the diverse informal home health sector is in its preliminary stages. The majority of the research uses small sample surveys to describe the sociodemographic characteristics of caregivers. More recently there have been assessments of informal care teams, primary and supplemental caregivers, and their task assignments (Stephens and Christianson, 1986). Only a few researchers have used multivariate frameworks to examine the determinants of caregiving hours (Moscovice, et al., 1988; Stoller, 1983). To date, only one study has evaluated labor market decisions of caregivers (Muurinen, 1986).

Research describing the sociodemographic characteristics of caregivers and the determinants of caregiving hours suggest the types of opportunity cost experienced in the informal home care sector. For example, using national data, Stone, et.al. (1986) describe caregivers as predominantly females whose average age is 57.3, the young old. While 30.9 percent of caregivers are employed, 8.9 percent withdrew from the labor force to fulfill their caregiving responsibilities. Other caregivers adjusted their time schedules by working fewer hours (21%), rearranging their schedules (29.4%), or taking time off without pay (18.6%).

In a study of New York City caregivers, Cantor (1983) identifies caregivers' rank ordering of activities given up in order to engage in caregiving. The spouse of the impaired elderly patient will first trade leisure time/socializing for caregiving time. Time previously allocated to housework, family members, and employment are the next sources of caregiving time. On the other hand, adult children initially reallocate housework time, leisure/socializing, time with other family members and employment, respectively.

These data suggestive non-trivial opportunity costs for caregivers.

Caregivers develop informal health care teams, i.e., networks. These networks include immediate family members, residing in or outside the household of the impaired elderly, as well as other relatives, neighbors and friends. As network size increases, caregiving tasks are redistributed from primary to supplementary caregivers (Stephens and Christianson, 1986). While we may suggest that development of the network and task reallocation impacts on the time allocation decisions of caregivers, the literature has not examined these relationships.

Studies of the determinants of caregiving hours use theoretical perspectives exclusive of economics and are generally exploratory. These studies find that women and unmarried caregivers contribute more hours to home care production (Stoller, 1983; Horowitz and Shindelman, 1983). Additionally, labor force participation reduces the number of caregiving hours contributed by sons (Cicirelli, 1984). Finally, these studies have found that the health needs of the elderly (activity limitations) significantly determine caregiving time allocation.

Muurinen (1986) uses a Beckerian theoretical framework to study labor market decisions by caregivers of hospice patients. She examines choices of caregivers facing an impending death of a family member. Her theoretical framework suggests that caregivers are less likely to leave the labor market if they face a high opportunity cost of leaving. Thus, if the dying patient is serviced by a spouse, the spouse is more likely to quit his/her job. While women and older caregivers are also more likely to quit their jobs, those with high income are least likely. Muurinen's hypotheses are supported by her data. Thus, caregivers faced with one of the most stressful home environments are shown to exhibit rational, optimizing decision-making.

Similar to Muurinen's study, this paper uses a household production model as its theoretical base to systematically examine caregivers' joint decisions of caregiving, employment, and leisure hours. The analysis builds on Stephens and Christianson's preliminary analysis of caregiving networks. It provides a perspective on the essential role of the structure of the household's caregiving team (network) as it impacts on the decisions of the individual caregiver. The next sections of this paper present the theoretical model and discuss the empirical results from the reduced form model of caregivers' decisions. The paper concludes with a discussion of the implications for future research and health care policy.

ANALYTICAL FRAMEWORK

The Model

Following standard models of household production (Willis, 1973); Becker & Lewis, 1973), assume a

caregiver maximizes utility subject to time and budget constraints:

$$(1) U(X + X_{HC}, G_{HP} + G_{HC}, L; C)$$

$$(2) T = L + M + H_{HP} + H_{HC}$$

$$(3) wM + V = p_X X + p_C X_{HC} \quad \text{where,}$$

X = market goods; X_{HC} = market purchased home health services; G_{HP} = household produced goods; G_{HC} = informal home care production; L = leisure; C = personal characteristics of the caregiver; T = total available time; M = employment hours; H_{HP} = household production hours; H_{HC} = home care production hours; w = caregiver's wage rate; V = non-wage income; p_X = prices of market goods used in household production; and p_C = prices of market goods used in home care production.

Equation (1) postulates that the caregiver's utility function depends on market goods ($X + X_{HC}$), household produced goods ($G_{HP} + G_{HC}$), leisure (L), and the caregiver's personal characteristics (C). The caregiver produces informal home care, as well as other household goods, using her time. Constraints are imposed on her household and home care production, (E_{HP} , E_{HC}), respectively.

$$(4) G_{HP} = G(H_{HP}; E_{HP})$$

$$(5) G_{HC} = G(H_{HC}; E_{HC})$$

The above production functions are quasi-concave, continuous and twice differentiable.

According to the above model, the caregiver demands market goods, household produced goods (including home health) and leisure. Additionally, household produced goods are directly determined by the number of hours allocated to household production. The subsequent analysis assumes that the household's optimal demand for home produced goods and home health care reflect quantities that are feasibly supplied by the household. Thus, the caregiver's utility function is

$$(6) U(X + X_{HC}, G(H_{HP}; E_{HP}) + G(H_{HC}; E_{HC}), L; C).$$

The caregiver maximizes utility through optimal purchases of market goods and allocation of hours to household production and leisure.

Hypotheses on the Optimal Decision-Making

According to the above model, the determinants of the caregiver's optimal purchase of market goods and allocation of time are the prices of market goods, the price of time, income, taste and household and home care production constraints. Four specific hypotheses from this model will be examined in the empirical analysis:

(1) Price of Market Goods. As the price of market-purchased goods increase, there will be a substitution toward home produced goods. Thus household and home care production hours are hypothesized to increase. Since the price change decreases the caregiver's real wage,

labor market hours are hypothesized to decrease and leisure hours increase.

(2) Wage Rate Effects. The wage rate is the opportunity cost of alternative time uses. Thus, caregivers with high market wages should substitute home care and household production hours for more hours in labor market employment. The net effect on leisure and labor choices depends on whether the substitution effect of the wage increase exceeds the income effect. If so, leisure hours decline and labor hours increase.

(3) Preference Shifters. Age, sex, marital status relative ratings of home health care to nursing home care, education and living arrangements are hypothesized to effect the allocation of hours to caregiving, leisure and labor market activities. As age increases, the caregiver perceives greater benefits of leaving the labor market (Muurinen, 1986). Men are less likely to leave the labor market to contribute hours to home care (Muurinen, 1986). Married caregivers face the responsibility of managing their own households and are less likely to contribute hours to home care (Cicirelli, 1983). If nursing home care is rated superior to home care, less hours may be allocated to home care. Education increases the demand for leisure. Caregivers who live with the frail elderly are expected to demand less leisure (Lang and Brody, 1983).

(4) Production Constraints. The role of production constraints in affecting caregiver's choices has not been examined in the literature. Their role as determinants of a caregiver's derived demand for home care, leisure and labor force participation is further clarified by examining the associated first order conditions for these choices, according to the theoretical model described above. These equations are:

$$(7) \text{ (home care)} \quad \frac{\delta U}{\delta G_{HC}} \quad \frac{\delta G_{HC}}{\delta H_{HC}} \quad - \frac{\delta U}{\delta G_{HP}} \quad \frac{\delta G_{HP}}{\delta H_{HP}} = 0$$

$$(8) \text{ (leisure)} \quad \frac{\delta U}{\delta L} \quad - \frac{\delta U}{\delta G_{HP}} \quad \frac{\delta G_{HP}}{\delta L} = 0$$

$$\text{(labor)} \quad - \frac{\delta U}{\delta G_{HP}} \quad \frac{\delta G_{HP}}{\delta H_{HP}} + \lambda w = 0$$

Thus, if the production constraints of home care increase the relative marginal product of home care or increase the relative marginal product of household production, less time will be allocated to the labor market and hours in home care and/or household production will increase. If, on the other hand, the production constraints of home care impose a minimum time constraint on caregivers, more time will be devoted to home care production. Given less total time available for allocation among other activities, the real income of the caregiver declines. Thus, labor and leisure hours decline, assuming leisure is a normal good.

DATA, VARIABLE MEASUREMENT AND ESTIMATION PROCEDURE

The data used in this study are from the National Long-Term Care Survey and National Survey of Informal Caregivers collected by the U.S. Department of Health and Human Services. This survey provides nationally representative data on 1924 caregivers of the impaired, Medicare enrolled, elderly and their networks of care. Caregivers provide services to non-institutionalized elderly when at least one of six activities reflects the patient's health limits: eating, getting in and out of bed, getting around the house, dressing, bathing or getting to or using the bathroom/toilet.

Sample Selection

The present analysis uses a subsample of the survey's caregivers. The subsample includes employed caregivers of the elderly and caregivers who quit their jobs due to caregiving demands on their time. The subsample excludes all caregivers who were unemployed when they initially engaged in home care production, i.e., those who chose to leave the labor market for some reason other than caregiving demands and those who were never employed. This sample selection process was necessary to assess the caregiver's joint decisions of (a) changes in hours allocated to market employment, (b) changes in leisure, and (c) allocation of caregiving hours. The excluded sample does not make decisions regarding changes in hours allocated to market employment. Thus, they are not examined in the subsequent analysis.

Variable Measurement

Table 1 lists definitions of all the independent variables in the regression models. The sample selection procedure and unique measures of the dependent variables require further discussion.

Changes in labor hours are measured by whether the caregiver has faced employment transition. This transition occurs if the caregiver decided to quit a job due to caregiving or if the caregiver takes time off without pay to engage in care production. An employment transition dummy variable equals one if either of these conditions describes the caregiver. Due to the sample selection procedure, the employment transition variable has a value of zero if the caregiver did not change his allocation of time to the labor market when faced with caregiving demands.

Caregiving hours is a continuous variable measured by the hours spent per day helping the impaired elderly. A positive response to the statement, "Taking care of him/her limits my social life or free time," is used to develop a proxy measure of leisure transition. It reflects the caregiver's perception of changes in time available for two types of activities that are the major components of leisure time. It does not provide a direct measure of changes in the caregiver's actual leisure hours. Thus, the measure does not distinguish between the caregiver who reduces leisure by one hour and the caregiver who faces several hours of leisure

reduction. The leisure transition variable is dichotomous and equals one if the caregiver perceives limits in social life and free time. Otherwise, leisure transition has a value of zero.

TABLE 1: Independent Variables and Variable Measurement

Variable Name	Variable Measure
<u>Income and Prices of Home Health Care</u>	
Family Income	income (before taxes) of all household members
Medicaid	= 1 if Medicaid Insured
Private	= 1 if Privately Insured
<u>Production Variables (EHC, EHP)</u>	
ADL	# limits in daily activities, including walking, dressing, eating
IADL	# limits in instrumental activities
Substitutes	= 1 if respondent answers yes to the question, "If you are not available to help, is there someone who would do the things that you do?"
Number of Caregivers	# usual caregivers
Health Perception	self perception of health
<u>Preference Shifters</u>	
Age	continuous measure
Sex	= 1 if male
Marital Status	= 1 if married
Rate Home Care	= 1 if evaluate home care as superior to nursing home care
Education	highest grade attended in school
Live With Elderly	= 1 if caregiver lives with impaired elderly

The theoretical model indicates that the caregiver's wage is the measure of the price of time. However, no wage measure is available in the data. Family income is used as a proxy measure. This alternative measure reflects the caregiver's time price if family members equalize their time prices at the margin.

Stephens and Christianson (1986) provide a framework for formalizing the measure of production constraints in informal home care. They suggest that caregivers develop production teams (networks) and caregiving tasks vary according to the composition of the network. Based on the theory of the firm, the size of the firm, the allocation of tasks among workers and the characteristics of the firm's product determine the technological base and efficiency of the firm. Similarly, when the household is perceived as a producer of home care, the technology of production can be specified as

$$(10) \quad EHC = E(N, S, H),$$

where N=the number of workers, S=the degree of worker substitution among tasks, and H=health needs of the elderly relative.

The relationship between these measures and the theoretical hypothesis needs further discussion. The number of workers in the production team is a measure of the ability of any home care worker to specialize in a particular caregiving task.

Specialization leads to increased relative efficiency in caregiving. If a worker has a substitute, a worker of equivalent skill available in the team, the minimum number of hours a worker needs to contribute to production decreases. The health needs of the elderly may reflect factors that either influence the marginal product of hours spent in home care production or impose minimum hours constraints on care. This dual role of the elderly's health status suggests that two separate measures of health status are needed. If the elderly relative needs assistance in performing general tasks, eg., shopping, home care production is similar to household production for the caregiver. Thus, this form of home care activity (providing care for limits in instrumental activities) may increase the caregiver's productivity in household work. On the other hand, if the elderly relative needs assistance in performing physical tasks, eg., eating, dressing, getting in and out of bed, these types of home care activities imply some minimum number of hours of care are needed to maintain the elderly patient's ability to function.

Estimation Procedure

Two of the dependent variables discussed above are dichotomous. Thus a limited dependent variable regression procedure is preferred. A logistic regression procedure was used in the estimation of employment and leisure transition. The determinants of caregiving hours are assessed through use of a log-linear regression procedure, a procedure consistent with a theoretical assumption of a quasi-concave production function.

EMPIRICAL RESULTS

Table 2 presents the log-linear regression estimates for caregiving hours and the logistic regression estimates for employment and leisure transition. These estimates are the reduced form equations for the theoretical model of the analytical framework section. Independent variables reflect measures of the prices of time or goods, caregiving production constraints, household productivity shifters, and preference shifters for time utilization and goods expenditures.

Caregiving Hours

The caregiving hours regression is generally consistent with the predictions of the theoretical model. Production constraints, income and preference shifters are significant determinants of this time allocation decision.

TABLE 2: Reduced Form Model of Family Caregivers' Decisions About Time Allocation

Variables	Care Hours (t)	Leisure Reduc. (t)	Labor Reduc. (t)
Income and Prices of Home Health Care			
Family Income	-0.0387 (-3.37)***	0.0599 (1.65)*	-0.0850 (-2.12)**
Insurance			
Medicaid	0.0343 (0.43)	-0.2460 (-0.97)	0.5789 (1.98)**
Private	0.0341 (0.46)	-0.1515 (-0.65)	0.0998 (0.37)
Production Variables (E_{HC}, E_{HP})			
ADL	0.0458 (2.53)***	0.0075 (0.13)	0.2423 (3.48)***
IADL	0.0293 (1.65)**	0.2029 (3.53)***	0.0053 (0.08)
Substitutes	-0.1731 (-2.22)***	-0.3124 (-1.27)	-0.3925 (-1.39)
Number of Caregivers	0.0412 (1.53)*	0.0612 (0.71)	-0.1166 (-1.12)
Health Perception			
=1 if good	0.0295 (0.39)	0.4901 (2.05)**	0.4989 (1.69)**
=1 if fair or poor	0.2201 (2.32)**	9.0459 (3.11)***	1.3456 (3.94)***
Preference Shifters			
Age	-0.9395 (-1.43)	-0.1063 (-1.21)	08.1205 (-1.16)
Sex (Male = 1)	-0.1250 (-1.67)*	-0.6703 (-2.82)***	-0.7153 (-2.38)**
Married	-0.1651 (-2.22)**	-0.0077 (-0.03)	-0.0457 (-0.17)
Rate Home Care Superior	-0.2003 (-2.53)**	-0.1178 (-0.47)	0.3566 (1.26)
Education	-0.0118 (-0.97)	0.0989 (2.55)**	-0.0134 (-0.31)
Live With Elderly	-0.1870 (-2.50)**	0.2648 (1.13)	-0.0669 (-0.24)
Constant	4.8001 (4.22)***	-2.7329 (-3.55)***	-0.5666 (-0.65)
N	435	435	435
F	5.55	54.41***	79.04***
X ²			
R ²	0.13	0.201	0.31

*p<.10 **p<.05 ***p<.01
(One and two tailed test used according to the hypothesis of the theoretical model.)

Income and caregiving hours are inversely related. Thus with higher prices of time, caregiving hours are lower.

Caregiving hours are predominantly determined by caregiving production constraints, i.e., the elderly patient's activity limits, and substitution in work effort. For the reasons indicated above, activity limits have been grouped in two categories, ADLs and IADLs. Previous research has generally grouped these two activity limits as a single measure of activity restriction. ADLs are the number of limits in the ability to eat, walk, use the toilet, etc. These limits are hypothesized to pose minimum hours constraints for caregivers. IADLs are the number of limits in the ability to manage finances, grocery shop, etc., i.e., normal household production activities. A caregiver engaged in these tasks is hypothesized to face the opportunity to increase overall productivity in household production (an opportunity for joint production), as well as provide a needed service. As suggested by the theoretical model, ADLs are positively related to caregiving hours. Additionally, limits in IADLs significantly increase the hours allocated to caregiving, as hypothesized. The differences in the magnitudes

of the coefficients for these two variables suggest that they reflect unique influences on caregiving hours.

The structure of the caregiving network is also a significant determinant of caregiving hours. The above theoretical model suggests that as there are more caregivers, each worker specializes in tasks. Thus as the productivity of each caregiver increases, more hours are allocated to caregiving. The empirical results indicate that this coefficient is positive, as hypothesized. The substitution of workers is also vital in affecting the caregiver's time allocation decisions. If a substitute worker is available, the caregiver has greater flexibility in time allocation, i.e., a lower minimum hours constraint faced by the caregiver. In such an environment, caregivers allocate less time to care production.

A caregiver's health perception that is fair or poor rather than excellent will increase the hours allocated to caregiving. Perceptions of health as inadequate may indicate relatively low labor market productivity (Muurinen, 1986). Thus more hours are allocated to the alternative work setting, caregiving.

As suggested by numerous researchers, male caregivers contribute less hours to informal care production than females. Additionally, married caregivers, those rating the quality of informal care as greater than nursing home care and caregivers who do not live with the elderly contribute less hours to caregiving. For married caregivers, time contributed to caregiving competes with family time, family time gaining priority. The negative relationship between perceptions of home care quality and caregiving hours is surprising, yet intriguing. It suggests that the lower the relative rating of informal care to nursing home care, the more time allocated to home care production. This attribute may reflect the caregiver's incentive to compensate for relatively low quality services by providing more quantity.

Employment Hours

Caregivers made significant adjustments in employment hours. Over one-third of caregivers either quit their job or took time off without pay because of caregiving responsibilities. The caregivers' opportunity cost was a significant influence on this decision. The higher the caregiver's income (opportunity cost of employment time), the less likely hours were allocated away from the labor market.

The price of market purchased home care is proxied by health insurance coverage. Medicaid/Medicare insured elderly are more likely than those insured solely by Medicare to have caregivers that reduce employment hours. This conclusion is the opposite of the original hypothesis. Two explanations are possible. First, while Medicaid typically reimburses the full cost of market provided home care services, this reimbursement policy only applies to agencies that accept Medicaid patients. These

results are consistent with a conclusion that Medicaid insured elderly perceive a high relative out-of-pocket price of market supplied home health services. Thus, caregiving responsibilities are predominantly placed on family care providers and labor market hours are reduced. A second explanation for the positive Medicaid coefficient is the following. Medicaid coverage produces a wealth effect such that as the price of market goods decreases, the demand for leisure increases; labor hours decline.

Limits in daily activities, ADLs, are significant determinants of the reduction of labor market hours. The more activity limits, the less time available to allocate to labor and leisure activities and the greater the probability of reducing labor market hours. Caregiver substitutes, IADLs, and the number of caregivers insignificantly influence employment hours. However, the coefficient of caregiver substitutes and IADLs are generally consistent with the model's hypotheses.

The results for health perception and employment hours are consistent with the results from the caregiving hours equation. If health is perceived as fair or poor, the cost of withdrawal from the labor market are relatively lower. Muirinen (1986) also observed this behavior for hospice caregivers. Similar to the results found in descriptive studies of caregivers, men are less likely to reduce employment hours.

Leisure Reduction

As predicted, the higher the opportunity cost of leisure, the more likely time will be allocated away from this activity. This result is also consistent with the role of income in the employment reduction regression.

The probability of leisure reduction increases as the IADLs of elderly patients increase. Thus activities that increase the caregiver's household productivity will also increase the opportunity cost of leisure and thus lead to a smaller allocation of hours to leisure. This result was not as predicted. The model predicts that leisure hours are unaffected. The coefficients of the other production constraints have the correct signs, yet are insignificant.

A perception of health as being good, fair or poor increases the probability of leisure reduction. Thus caregivers with the most severe health problems are also the most likely to reduce social activities. Women and those with greater education are more likely to reduce their leisure.

DISCUSSION

This paper has focused on three simultaneous decisions of caregivers to the elderly. The decisions were modeled using a household production framework in an attempt to understand the decision processes of informal caregivers as well as to examine the role of caregiving

production constraints in affecting those decisions. The regression results were generally consistent with the theoretical model and suggest several research and policy approaches.

The opportunity cost of caregiving has not been assessed in evaluations that address whether home care is a cost effective alternative for hospital care (Hendrick and Inui, 1986; Kramer, Shaughnessy and Pettigrew, 1985). This paper has focused on one component of the caregiver's opportunity cost (lost employment hours) and identified factors that influence this cost of caregiving. Those most likely to quit their jobs or to take time off from employment are women, low income, those in poor health who service Medicaid/Medicare insured patients with extensive activity limits. Evaluations of the relative cost of hospital, nursing home and market-supplied home health care should include estimates of the opportunity cost for this group. Additionally, the caregiving equation shows a significant relationship between nursing home ratings and caregiving hours, i.e., when relative ratings on nursing homes are low, caregiving hours increase. Thus, appropriate costing should develop numerical valuations of caregiver perceptions of differences in the quality of life in nursing homes and home care settings. If home care is perceived to provide the benefits of higher quality services, the net cost of home care may be lower than previously indicated.

Theoretically modeling and incorporating estimates of the production constraints in a model of caregiving has provided useful insights on the caregiving process. Thus, we can examine the choices of caregivers and the circumstances leading to those choices. Without this framework, the positive coefficient in the caregiving hours regression for the factor, number of caregivers, would seem unusual. On the other hand, this coefficient is consistent with the theoretical interpretation that when caregivers work effectively as teams, each member will contribute more hours. Furthermore, the theoretical modelling implies the role of ADLs and IADLs should be examined separately. Isolating the independent effects of ADLs and further characterizing production constraints by whether there is a substitute caregiver or not, allows an interpretation of the factors that truly impose minimum time constraints on caregivers. The analysis indicates that the latter factor has a larger magnitude of influence on caregiving hours and leads the caregiver to allocate relatively more hours to home care production. Furthermore, caregivers without substitutes are significantly different from caregivers with substitutes in their leisure and employment choices. This preliminary analysis of the role of production constraints suggests that additional study of such factors would further enhance our knowledge of informal caregiving.

A recent Senate bill (S779) was proposed to provide tax deductions for home-care of chronically ill, elderly family members. This paper's analysis of the simultaneous choices of caregivers illustrates the value of such policy.

The results show that low income caregivers allocate more hours to caregiving, are more likely to both leave the labor market and reduce their leisure time. Thus, caregivers with the least financial resources are those who face greater risk of poverty status due to caregiving responsibilities. Financial compensation for these caregivers would alleviate a hardship resulting from caregiving.

A central issue posed by community agencies and others is the development of effective networks for strengthening the capacity of informal caregivers. Caregiving has been found to lead to significant stress in informal caregivers. The results of this analysis provide data that suggest the causes of this stress. While the least healthy caregivers are most likely to reduce their labor time, they also contribute more hours to caregiving and are most likely to reduce their leisure and recreational time. The strains due to leisure reduction and heavy hours contribution by the least healthy caregivers have implications for long run health costs. That is, providing care to the impaired elderly may depreciate the health stock of caregivers. This enhanced depreciation of health implies larger future health care costs for caregivers. These results provide support for the financing of respite services of family caregivers. Such support would be a short run strategy that mitigates long run health care costs.

ENDNOTES

1. The Lagrangian equation for this model is:

$$U(X + X_{HC}, G_{HP} + G_{HC}, L; S) + \lambda_1 [wM - p_X X - p_C X_{HC}] + \lambda_2 [T - L - M - H_{HP} - H_{HC}] = U(X + X_{HC}, G_{HP} + G_{HC}, L; S) + \lambda [wM - p_X X - p_C X_{HC}]$$
 The latter specification incorporates the time constraint in the utility function, since $H_{HP} = T - L - M - H_{HC}$ and $G_{HP} = G(H_{HP}; E_{HP})$. Thus, this one constraint utility maximization model can be solved for the optimal quantities of X , X_{HC} , L , M , H_{HC} and λ .

REFERENCES

- Becker, Gary and H. Gregg Lewis. (1973). "On the Interaction Between the Quantity and Quality of Children," in: T. W. Schultz, ed., New Economic Approaches to Fertility: Proceedings of a Conference Sponsored by the National Bureau of Economic Research and the Population Council.
- Cantor, M. H. (1983). "Strain Among Caregivers: A Study of Experiences in the United States," The Gerontologist 23: 597-604.
- Cicirelli, Victor. (1983). "A Comparison of Helping Behavior to Elderly Parents of Adult Children with Intact and Disrupt Marriages," The Gerontologist 23: 619-625.
- Corman, Hope, Theodore Joyce and Michael Grossman. (1987). "Birth Outcome Production Function in the United States." The Journal of Human Resources 22(3):339-360.
- Doty, Pamela. (1986). "Family Care of the Elderly: The Role of Public Policy." The Milbank Quarterly 64 (1):34-75.
- Heckman, J. J. (1979). "Sample Selection Bias as a Specification Error." Econometrica 47 (1): 153-161.
- Horowitz, Amy and Lois Shindelman. (1983). "Social and Economic Incentives of Caregivers," Health Care Financing Review 5: 25-33.
- Kramer, Andrew, Peter Shaughnessy and Mary Pettigrew. (1985). "Cost Effectiveness Implications for Nursing Homes and Home Health Case Mix," Health Services Research 20(4): 387-405.
- Lang, Abigail and Elaine Brody. (1983). "Characteristics of Middle-Aged Daughters and Help to Their Elderly Mothers," Journal of Marriage and the Family: 193-202.
- Matthews, Sarah and Tena Rosner. (1988). "Shared Filial Responsibility: The Family as the Primary Caregiver." Journal of Marriage and the Family 50: 185-195.
- Moscovice, Ira, Guster Davidson and David McCoffrey. (1988). "Substitution of Formal and Informal Care for Community-Based Elderly," Medical Care 26: 971-981.
- Murphy, Mary. (1987). "The Importance of Sample Selection Bias in the Estimation of Medical Care Demand Equations." Eastern Economic Journal 13(1): 19-29.
- Muurinen, Jaana-Marja. (1986). "The Economics of Informal Care," Medical Care 24: 1007-1017.
- Stephens, Susan and Jon Christianson. (1986). Informal Care of the Elderly Mass: Lexington Books.
- Stoller, Eleanor. (1983). "Parental Caregiving by Adult Children," Journal of Marriage and the Family 45: 851-858.
- Stone, Robyn, Gail Cafferata and Judith Sangl. (1987). "Caregivers of the Frail Elderly: A National Profile," The Gerontologist 27(5): 616-626.
- Vogel, Ronald and Hans Palmer. (1984). Long-Term Care: Perspectives from Research and Demonstrations, Washington, D. C.: Health Care Financing Administration.
- Willis, Robert. (1973). "A New Approach to the Economic Theory of Fertility Behavior," in: T. W. Schultz, ed., New Economic Approaches to Fertility: Proceedings of a Conference Sponsored by the National Bureau of Economic Research and the Population Council.