No. 732

Determinants of Community-based formal home care
and nursing home care,and their negative
relationship : a case of Japan

by

Tetsuji Yamada,Tadasi Yamada,Marianne C. Fahs,
Chang Gun Kim,and Tetsuo Fukawa

June 1997

Determinants of community-based formal home care and nursing home care, and their negative relationship: a case of Japan

May 1997

Tetsuji Yamada
Department of Economics, Rutgers University, The State University
of New Jersey, Camden, New Jersey 08102, U.S.A.

Tadashi Yamada
Institute of Policy and Planning Sciences, University of Tsukuba
1-1-1 Tennodai, Tsukuba-shi, Ibaraki-ken, 305, Japan

Marianne C. Fahs
Department of Health Services, Graduate School of Management
New School for Social Research
66 5th Avenue, 9th floor, New York, NY 10011, U.S.A.

Chang Gun Kim
Department of Economics, CUNY-Graduate Center,
33 West, 44th Street, New York, NY 10036, U.S.A.

Tetsuo Fukawa
Institute of Public Health, Ministry of Health and Welfare
4-6-1 Shirokanedai, Minato-ku, Tokyo, 108, Japan

Address correspondence:
Tetsuji Yamada, Ph.D.   Tel: 212-808-5375 (U.S.A.)
300 East 40th Street   Fax: 212-297-0192 (U.S.A.)
#4M, New York   E-mail: ytetsuji@aol.com
NY 10016, U.S.A.

Abstract

By using micro-based data on Japanese elderly people aged 65 or over, we analyze determinants of nursing home care, community-based formal and informal home care and find the negative relationships among them. Developing community-based formal home care services along with informal home care, is essential to contain the rapidly growing government health care expenditures in the current national health care system. In addition, a provision of compensations to family care-givers for their informal home care provided for the elderly is a key factor and a viable option to develop community-based long-term formal home care programs.

1. Introduction

Many industrialized nations have been rapidly turning into aging societies. The rapid increase in public health care expenditures, which create budgetary problems at the national and local levels, is a matter of great concern in such societies. This is especially true in the current national health care system in Japan.

To contain the dramatic increase in the health care expenditures and also to meet the growing demand for long-term care due to the rapid growth in elderly population, the Japanese government will implement a new public long-term care insurance system in the year 2000. This new insurance system is expected to give the elderly (i.e., people aged 65 or over) and their family care-givers incentives to substitute less costly community-based formal and informal home care for the institutional long-term care at acute hospitals and nursing homes. This system is considered to be highly important not only to resolve the budgetary crisis but also to meet the needs of the elderly people who need to be cared for at home. However, the success of such a new long-term care insurance system will depend mainly on the willingness of the elderly and their family care-givers on such substitution.

There are a number of studies related to the relationships among different long-term cares in the US. Ettner (1994) shows that

Medicaid home care benefits are negatively associated with the nursing home entry and positively associated with the community-based home care. Medicare home care use is also negatively related to nursing home bed stock (Swan and Benjamin, 1990). Using National Long-Term Care Demonstration, Greene, Lovely and Ondrich (1993) demonstrate that an increase in the community-based services (e.g., housekeeping and personal-care assistance), is highly related to a reduction of admission to nursing home care. These studies provide the evidence of successful and workable substitution between formal home care and nursing home care in the United States. Furthermore, the substitution between formal and informal home care is also supported by quite a number of studies (Greene, 1983; Coughlin, McBride, Perozek and Liu, 1992; Kemper, 1992; Ettner, 1994).[1]

Contrary to the numerous US studies, similar empirical studies in the literature are found quite rare in Japan, albeit the importance of their policy implications. Among a few empirical Japanese studies, the paper by Chuma, Yamada and Yasukawa (1994) on the demand for formal home care, nursing home care, and hospital care by the aged (i.e., bedridden elderly aged 70 or over in their analysis) draws our attention. They found that the effects of male annual real wage rate are significantly positive on formal home care and negative on nursing home and hospital care. Of other

2

variables, the capacity variables related to supply constraints of long-term care have mixed effects on the institutional care demands but no effect on the formal home care demand. However, they used the aggregate pooled time-series data at prefectural level (i.e., 1986, 1989, and 1992) and did not focus on the interactions among nursing home care, community-based formal home care, and informal home care. For policy formulation to contain the rising national health care expenditures, we consider it imperative to clarify the interactions by using micro data on elderly people.

While acknowledging previous research on long-term care, using micro data on Japanese elderly people aged 65 and over, we focus our attention on the determinants of different long-term cares and possible substitutions among the cares. Examination of socio-economic and demographic characteristics of the elderly similar to those of the US studies but from different national characteristics, will reveal a new insight into the literature. Our findings, we hope, provide a better understanding of the real needs of the elderly.

Our analysis is specifically concerned with four basic questions related to long-term care policy. First, what are the basic determinants of the elderly's choices on nursing home care, community-based formal home care and informal home care? Second,

whether and to what extent does substitution among the different long-term cares exist? Third, does an expansion of formal home care lead to more informal home care from family care-givers, as the national government expects it by implementing a new long-term care insurance? Finally, how much can a government save on health care expenditures by transferring a number of elderly persons from costly institutional long-term care to less expensive community-based formal and informal home care? We consider these answers to be important to cope with the problems of the rapidly growing public health care expenditures in Japan.

The organization of this paper is as follows. Section 2 presents a brief summary of the background of the Japanese long-term care system for the elderly. Section 3 describes our conceptual framework and methodology. The empirical results and discussion are presented in Section 4, which is followed by the conclusion in Section 5.

2. Japanese long-term care system for the elderly

A large number of the elderly in Japan are long-term care and indoor patients in acute hospitals. The reason is twofold: the national health insurance allows them to stay at hospitals with a minimal cost; and there has been a shortage of public institutional long-term care facilities for the elderly. Consequently, the increasing demand for long-term care due to the rapid growth in elderly population, will force the Japanese government to develop nursing homes and community-based formal home care services.[2]

In Japan, there are four major types of public institutional long-term care facilities with different functions and purposes: Health Facility for the Elderly (Rhojin-Hoken Sisetsu, in Japanese); Special Nursing Home for the Elderly (Tokubetsu Yhougo-Rhojin Home); Nursing Home for the Elderly (Yhougo-Rhojin Home); and Home for Elderly People(Keihi-Rhojin Home)(see Table 1). All these nursing homes are authorized and supervised by the national government, but they are generally under the jurisdiction of municipal or prefectural governments. Their running costs are subsidized by the national and local governments. The elderly in nursing homes are responsible for daily expenses and their monthly payments are determined according to either their annual income or actual expenses of daily activities.

For example, the monthly running costs per elderly user at the Special Nursing Home for the Elderly are about $2,900 at a 50-bed home, $2,600 at a 80-bed home, and $2,400 at a 100-bed home (see Table 1); these costs are shared and paid by the national government (the share = 2/4), prefectural and municipal governments (1/4 each). There is no monthly personal charge for the elderly having annual income of 1200 dollars or less (see Figure 1)[3]; the charge is 10 dollars per month for the elderly with annual incomes between 1,201 and 1400 dollars. An individual with more than $15,000 annual income pays monthly charge calculated by the formula of $811 + [0.9x($annual income - $15,000)/12]. On the other hand, the average monthly personal expenses are about $600 at the Health Facility for the Elderly.

In addition, there are other public facilities for community-based formal home care in the municipality: community-based day-service center (6,180 centers) and short-stay facility for the elderly (29,074 beds), as of 1995. The day-service center provides services such as meals, bathing, training and practice of daily activities, guidance, laundry services and care-giver classes at the center. The short-stay facility for the elderly is a facility for care, not for cure, in order to lessen the burden of family care-givers (e.g., a maximum of 7-day stay with a conditional

extension). There are also a variety of community-based formal home care services to meet the needs of the elderly: doctor's visit, nurse's visit, home help visit, bathing, lunch, equipment provision and counseling.

In reality, due to the insufficient provision of long-term care and community-based formal home care in municipalities, the elderly are not always able to receive the services at their own will. For example, impaired elderly people at home often wait a few years before admitted to a Special Nursing Home for the Elderly. To cope with the shortage problems, the Japanese government has been preparing a new public long-term care insurance system starting in the year 2000.[4]

The new system of long-term care services is under the jurisdiction of municipal governments. There are two groups of beneficiaries: elderly people aged 65 or over (so-called, the first insurant) and people aged between 40 and 64 but suffering from senility (the second insurant). The former are mainly targeted and privileged people for formal home care services and long-term care at nursing homes (i.e., the Health Facility for the Elderly and the Special Nursing Home for the Elderly) and hospitals; the latter can receive the services only when their needs are approved after being screened by a long-term care approval board of municipal

government.

Monthly premium of the new long-term care insurance system is $25 per person aged 40 or over. For instance, a family of two elderly persons pays $50 premiums to the insurer (i.e., municipal government); a family with one elderly person and one couple of working husband and household wife pays $59, since the premiums for the couple are only $34 rather than $50. A half of the $34 premium is paid by either employer or the national government. The premiums from retired elderly people are automatically deducted from their social security benefits. All premiums are collected by municipal governments but eventually are sent to the national government, which then distributes them back to municipalities according to needs.

In addition to their insurance premiums, care-service recipients must pay 10 percent of costs of long-term care services out of their own pockets. The rest are shared by the national government (50%) and prefectural and municipal governments (25% each). Types of services to be provided for care-service recipients must be determined and approved according to the recipients' requests and needs by the afore-mentioned approval board, but the provision of services is capped by the government.

As an example, for a set of services: nurse's visit (once a

week), home help visit (twice; one hour for each visit), day-service and day-care at community centers (once or twice) and one-week short-stay (once or twice a year), the total maximum subsidies from the governments are $600 per month. Any costs beyond $600 must be paid by the service recipient in addition to the basic charge of 10% of $600. For a bedridden elderly person who totally needs care and helps, a set of services consisting of nurse's visit (twice a week), home help visit (seven times), day-service and day-care (three times) and one-week short-stay (once a month) has a maximum subsidy cap in the range of $2,300 and $3,000 per month. The service recipient pays 10% of the subsidy cap and costs beyond the cap. Finally, the maximum subsidy cap is $2,900 per month for an elderly person in the Special Nursing Home for the Elderly.

3. Analytical framework

3.1 Statistical model

A typical elderly person "i" is assumed to be rational and enjoys his or her healthy time. The individual's utility U_i is assumed a function of healthy time L_i, informal home care Q_i, and a vector of consumption goods Z_i, as follows:

$$U_i = U(L_i, Q_i, Z_i); \tag{1}$$

$u_i' = \partial U_i / \partial X_i > 0, \quad u_i'' = \partial u_i' / \partial X_i < 0, \quad \text{for } X_i = L_i, Q_i, \text{ and } Z_i.$

Concerning the healthy time, we assume L_i is determined by institutional long-term care services:

$$L_i = f(S_{i,NH}, S_{i,FHC}; EN_i); \tag{2}$$

$f'_{NH} (= \partial L_i / \partial S_{i,NH}) > 0$, $f'_{FHC} > 0$, $f'_{EN} > 0$, $f''_{NH} (= \partial f'_{NH} / \partial S_{i,NH}) < 0$, $f''_{FHC} < 0$, $f''_{EN} < 0$,

and $\partial S_{i,NH} / \partial S_{i,FHC} > 0$ or < 0,

where $S_{i,NH}$ stands for nursing home care as a health input; $S_{i,FHC}$ for formal home care; and EN_i for health characteristics of the elderly person, which affect his or her activities of daily living (Breslaw and Stelcner, 1987; Bound, 1991; Strauss, Gertler, Rahman and Fox, 1993). The relationship between nursing home care and formal home care (i.e., $\partial S_{i,NH} / \partial S_{i,FHC}$) depends on either complement or substitute with each other.

With respect to informal home care, Q_i is considered as a joint product by the elderly person with family member(s); the

production of Q_i is assumed weakly separable from that of L_i in the utility function; Q_i is a function of the care-giver's informal home care services provided for the elderly person S_{IHC} and a vector of health-promoting consumption goods H_i:

$$Q_i = \psi(S_{IHC}(T), H_i); \qquad\qquad (3)$$

$H_i \in Z_i$ and $\psi_i'(=\partial Q_i/\partial Y_i) > 0$, $\partial \psi_i'/\partial Y_i < 0$, for $Y_i = S_{IHC}$ and H_i, where T denotes time spent to care the elderly person by himself or herself together with a family care-giver. Thus, an increase in T implies a reduction in potential time available for the care-giver's market as well as other non-market activities.

The budget constraint of the elderly person is expressed in terms of shadow prices of the healthy time and joint product and a vector of the prices of consumption goods (for brevity, we omit the subscript "i" to represent an individual elderly in subsequent arguments):

$$B = L(S_{NH}, S_{FHC}; EN) \cdot P_L + Q(S_{IHC}(T), H) \cdot P_Q + Z \cdot P_z . \qquad (4)$$

In the above budget constraint, P_L is a shadow price of healthy time and depends on attributes of S_{NH}, S_{FHC} and EN. P_Q is also a shadow price of the joint product of informal home care, reflecting attributes of S_{IHC} and prices of health promoting consumption goods H. P_z is a vector of the prices of consumption goods Z.

In this model, we assume the elderly person's utility maximization function to be a separably additive function subject to the budget constraint (4):

$$U(L, Q, Z) = \max_{L,Q,Z} [U\{L(S_{NH}, S_{FHC}; EN) + Q(S_{IHC}(T), H) + Z\}:$$

$$L(S_{NH}, S_{FHC}; EN) \cdot P_L + Q(S_{IHC}(T), H) \cdot P_Q + Z \cdot P_Z \leq B], \quad (5)$$

where the above additive nature implies that the preference is implicitly separable (Deaton and Muellbauer, 1980). From the first-order conditions of the maximization with some modification, we can obtain:

$$u'_{L,S(NH)} = (P_L/P_Q)(u'_{Q,S(IHC)} + u'_{Q,H}) - u'_{L,S(FHC)} - u'_{L(EN)}, \quad (6)$$

where $u'_{L,S(NH)}$ $[= (\partial U/\partial L)(\partial L/\partial S_{NH})] > 0$, $u'_{Q,S(IHC)}$ $[= (\partial U/\partial Q)(\partial Q/\partial S_{IHC})] > 0$,

$u'_{Q,H} > 0$, $u'_{L,S(FHC)} > 0$, and $u'_{L(EN)} > 0$.[5]

Equation (6) indicates that marginal utility of healthy time with respect to nursing home care is equal to the ratio of shadow prices (P_L/P_Q) times marginal utilities of joint product with respect to informal home care and also with respect to health promoting consumption goods, minus marginal utility of healthy time with respect to formal home care, minus marginal utility of healthy time with respect to the elderly person's health characteristics.

In equation (6), an increase in opportunity costs of informal home care provided for the elderly person by a family care-giver reduces the price ratio P_L/P_Q and consequently discourages informal

care time T. But a reduction in T will increase $u'_{Q,S(IHC)}$; also, there will be input-substitution of H for $S_{IHC}(T)$ in the joint production of Q. In addition, $L(S_{NH}, S_{FHC}; EN)$ might be substituted for Q. Therefore, an increase in the opportunity costs will give the elderly person (and the family care-giver) an incentive to substitute nursing home care and formal home care for informal home care. In a similar way, we can also expect substitution between L and Q (or that between S_{NH} and S_{FHC}) in response to a change in the shadow price of the elderly person's healthy time P_L. The key implication here is an interdependency among nursing home care, formal and informal home care.

In *Khonensha Seikatsu Jittai Sougo Chosa* (General Survey on Actual Living Conditions of Elderly People), from which we obtain our data for this analysis, the question of interest for our study is: "when you become bedridden, which long-term care would you like to choose either nursing home care, formal home care, or indifferent?" Another question is: "when you become bedridden, which would you like to choose among ten formal home care services (i.e., community-based day-service and short-stay, doctor's visit, nurse's visit, etc)? Name three at most." However, there was no inquiry to elderly people in the sample about their informal home care. We, therfore, use a proxy for S_{IHC} and the variable is

13

continuous, which is explained in next section.

The observed values for S_{NH} and S_{FHC} are discrete because an elderly person in the sample prefers either nursing home care or formal home care. Further, the elderly person made a choice of at most three different formal home care services among different alternative choices. In order to make our analysis simple, we use a logit model (LOGIT) for nursing home care S_{NH} and formal home care S_{FHC} and an ordinary least squares model (OLS) for informal home care S_{IHC}. In the case of the estimation of probability of choosing formal home care services, our simple logit model seems less hazardous than a multinomial logit model since the latter must choose an arbitrary combination of formal home care services among ten formal home care services.

Accordingly, we estimate the following models.

LOGIT: NH = ϕ_1(FHC, IHC, AVF, EC, EN, SD), (7-1)

LOGIT: FHC = ϕ_2(NH, IHC, AVF, EC, EN, SD), (7-2)

and

OLS: IHC = ϕ_3(NH, FHC, AVF, EC, EN, SD), (7-3)

where NH stands for nursing home care, FHC for formal home care, and IHC for informal home care. AVF and EC represent an availability of family assistance and a vector of economic factors, respectively. EN represents health characteristics of individual

14

elderly. SD indicates a vector of socio-demographic factors of the individual: gender, age, community associations, etc.[6]

Concerning the formal home care equation (7-2), we use three different dependent variables in the logit regressions. First, we estimate the probability of choosing community-based day-service and short-stay facility centers. Second, we group various formal home care services into skilled and semi-skilled home care. The skilled home care consists of medically oriented formal home care services (e.g., doctor's visit and nurse's visit), and the semi-skilled home care includes non-medical services (e.g., home help visit, bathing, and lunch service).[7]

Finally, we are concerned with the specifications of each model because of endogeneity problems of nursing home care, formal home care and informal home care. We have applied and found the Fs of Hausman-Wu test: the null hypothesis of zero correlation is not rejected with 0.089 for nursing home care; 0.168 for community-based day-service and short-stay facility centers; 0.002 for formal home care services; and 0.093 for informal home care. Therefore, we do not use an approach of simultaneous equations model in this paper.[8]

3.2 Data and variables

The data and variables used in this study are all obtained from *Khonensha Seikatsu Jittai Sougo Chosa* (General Survey on Actual Living Conditions of Elderly People, hereafter General Survey) in 1990. The General Survey is a two-stratified random sample of three thousand elderly people aged 65 and over staying at home throughout Japan; it was conducted by Nenkin Sogo Kenkyu Center (the Pension Research Center) and sponsored by the Ministry of Health and Welfare of Japan. The number of respondents who returned their forms were two thousand five hundred twenty nine people. Since some respondents did not provide information necessary for this analysis, our sample size becomes 2501; the definitions of all variables used in this study and their statistics are reported in Table 2.

Of one of our dependent variables we have a few notes to mention. The General Survey made no questions on informal home care such as the number of informal-home-care hours a day family care-givers provided for their elderly. Therefore, we use a proxy for informal home care and calculate informal home care hours. First, we assume a family primary care-giver spends the same amount of daily hours as his or her frail and impaired elderly does on very basic daily activities such as eating, bathing and dressing except

16

all other activities of sleeping, associating, resting, leisure, watching TV, etc. Second, to mitigate measurement error of the time spent on informal home care, we include the availability of family members (i.e., married status, family structure, and living arrangement with children) as independent variables in the regressions. The latter variables are also considered as a proxy to some extent for a shadow price of informal home care, since Family members often actively participate in the production of informal home care (Kemper, 1992).[9]

An assessment of health characteristics of the elderly is often an important issue in the literature. Previous research recommends objective indicators of health status (e.g., ADL: activities of daily living; and IADL: instrumental activities of daily living), because of difficulties in comparing self-evaluated health status among respondents (Bound, 1991; Kemper 1992). Greene, Lovely and Ondrich (1993) employ three different measurements of health status in their analysis of transition from community to nursing homes: instrumental activities of daily living, cognitive impairment, and self-evaluated health. Their results also recommend the use of objective indicators of health status of the elderly. We Consequently use the following health characteristics of the elderly: physical dependence, instrumental dependence, memory, and

psychological status (i.e., depressed affect).

Of other socio-economic and demographic factors studied in this analysis, we include economic factors such as the elderly's monthly income, wealth, and home ownership. These economic variables reflect not only the monetary value of healthy time of an elderly person but also the capability to pay the monthly charges at different long-term care facilities.[10] A binary variable is used to represent urban-rural differentials in taste as well as accessibility of nursing home care and formal home care services. The age and gender variables are expected to reflect health and taste differentials of the elderly. Other variables are also included to show their social attitudes.

4. Empirical results

4.1 The Results

Table 3-1 presents the estimates of our logit model of nursing home care, community-based day-service and short-stay facility centers (day&short center), and skilled home care. Table 3-2 shows the logit estimates of semi-skilled home care (i.e., Semi-skilled h.c.) and the ordinary least squares' estimates of informal home care. In reviewing our empirical results, we concentrate our discussion on interactions of our main concern among nursing home care, formal home care, and informal home care.

First, from the interactions among nursing home care, day&short center, and skilled home care in Table 3-1, we find that the estimated coefficients of nursing home care as a regressor are statistically significant and negative in both the day&Short center and skilled home care equations. That is, an elderly person who wants to use nursing home care services, when he or she is bedridden, is less likely to use formal home care (i.e., community-based day-service and short-stay facility centers and skilled home care services).

Second, the estimated coefficients of day&short center as a regressor in the equations of nursing home care and skilled home care are also negative and statistically significant. Thus, there

19

is a tendency for the elderly to substitute community-based day-service and short-stay facility center services for nursing home care and skilled home care services. Therefore, from a cost perspective, an expansion of less costly programs of formal home care like community-based day-service and short-stay facility centers leads to a reduction in the use of costly nursing homes.

In the nursing home equation in Table 3-1, the skilled home care services such as doctor's visit (i.e., Dr.'s visit) and nurse's visit are positively associated with nursing home care (at different levels of significance), while the semi-skilled home care services (home help visit, bathing, and lunch) are negatively associated with nursing home care. On the other hand, the six formal home care services are all positive and mostly statistically significant in the day&short center equation; thus, the elderly who demand these formal home care services tend to utilize community-based day-service and short-stay facility centers at the same time. In other words, the relationships between each of the six formal home care services and community-based day-service and short-stay facility centers are complementary. The result has an important policy implication for the development of formal home care services in the community.

The positive effects of both doctor's and nurse's visits in

the day&short center equation may seem contradictory, since, as noted earlier, the day&short center is negatively related with the skilled home care. It is, however, not necessarily so. Medical doctors and nurses who visit elderly people at home are very likely to encourage them to utilize community-based day-service and short-stay facility centers for their rehabilitation.

The above encouragement by doctors and nurses will be highly recommendable and cost-effective. That is, the more frequently the elderly utilize day&stay centers, the less will both nursing homes and skilled home care be used; the less frequent use of skilled home care can further reinforce the reduction in the use of nursing homes (see the positive effect of Dr.'s visit on nursing home care). As a consequence, the cost-containment effects take place.

Despite our recommendation of the encouragement of formal home care instead of nursing home care for cost-containment purposes, policy makers must be fully aware that the community-based formal home care services neither mitigate nor encourage informal home care to the elderly at home (none of the estimated coefficients are statistically significant in the informal care equation in Table 3-2).[11] For now, we might say that the national government's attempt to provide more community-based formal care services is an effective cost-containment policy, but a simple expansion of the

service provision will not lead to an increase in informal home care from family care-givers, unless some effective compensations are provided to them.

Now, let us examine whether informal home care is substitutable for nursing home care and community-based formal care. To our knowledge, few Japanese studies clarify the relationships by using micro data on elderly people.

In Table 3-1, the estimated coefficient of informal home care is negative (i.e., -0.064) and statistically significant in the nursing home care equation, but not significant in both day&short center and skilled home care equations. It is evident that informal home care can substitute for nursing home care, but not for community-based formal home care. That is, the elderly who are receiving more informal home care at home are less willing to use nursing home care, when they become bedridden.

The marginal effect and estimated elasticity of nursing home care with respect to informal home care (i.e., a continuous variable) are -0.013 and -0.043, respectively.[12] A one hour increase in informal home care per day lowers the use of nursing home care by 1.3 percentage points. The effect of informal home care will be large on a weekly or monthly basis. In the elasticity term, a ten percent increase in informal home care leads to about a 0.4 percent

decrease in the use of nursing home care. If we double the average time spent on informal home care, the elderly's demand for nursing home care will decrease by 4 percent.[13]

As shown in Table 3-2, since the effect of nursing home care on informal home care is positive (i.e., 0.213 and 0.202), the substitution between informal home care and nursing home care is not dual, but a one-way direction from the former to the latter. Another remark is that informal home care is not a significant determinant for formal home care (i.e., community-based formal home care services, skilled home care, and semi-skilled home care) and vice versa. This seems indicative of the Japanese elderly's strong preference for informal home care provided for by family care-givers regardless of a provision of formal home care services.

A recent government survey reports that one third of family care-givers feel lacking appropriate knowledge for elderly caring and desire guidance and training at community-based day-service and short-stay facility centers.[14] Our results however indicate that their desire probably does not mean that they want to substitute formal home care for their informal home care, but might mean that they want appropriate guidance and training for their specialization in informal home care. Hence, the national and local governments need to carefully assess what assistance is most

necessary, appropriate and desirable for bedridden elderly people who want to remain at home and their family care-givers.

Turning now to the availability of family such as the present of spouse, family structure and living arrangement with children, there are some noteworthy results. First, when we closely look at the estimated coefficients of the variable of "married" (i.e., married and living with spouse), the effects are significantly negative in the semi-skilled home care equation but positive in the informal home care equations (see Table 3-2), while not significant at all in the nursing home care, day&short center and skilled home care equations (Table 3-1). It is very clear from these results that a living spouse is the primary care-giver for an frail elderly person. The spouse tends to substitute his or her informal home care mainly for non-medically oriented formal home care services.

Second, the elderly in a two or more-generation family are more willing to use nursing home care (see the positive effect of "family" in Table 3-1) than those in a one-generation family. This result is rather counter-intuitive, since we normally expect more available hands in a larger family size. On the other hand, as we expected, the elderly, who have their children but not living together, are at high risk of institutionalization of long-term care (see the significantly positive coefficient of "Not children"

24

in the nursing home equation in Table 3-1).

Now, let us briefly discuss on the empirical results of other socio-economic and demographic variables. First, the "home owner" as one of the economic variables has a strong positive effect on nursing home care, but has a strong negative effect on informal home care. Our results reject a hypothesis of a strong psychological and social attachment to the community (Greene, Lovely and Ondrich, 1993). Second, as for the objective health conditions, the elderly with higher physical and instrumental dependence tend to choose more nursing home care, as we expected. But, the elderly with more memory impairment and depressed affect prefer less nursing home care; the elderly with only depressed affect prefer informal home care. This evidence highlights to some extent the reality of shortage of public institutions to care for the elderly with memory and mental troubles in Japan. Finally, of socio-demographic variables, by looking at the estimated coefficients in the informal home care equation, female elderly, who are urban dwellers but not-outgoing type, strongly prefer informal home care to formal home care than male elderly. In contrast, male elderly are more likely to use formal home care than female elderly, even though their spouses are living together.

4.2 Discussion

Our empirical findings have many important policy implications for containing the rapidly growing national health care expenditures on elderly people. Is it possible to substitute less costly community-based formal home care for institutional nursing home care? The answer is affirmative. We find the two-way substitution between nursing home care and community-based day-service and short-stay centers; the one-way substitution of informal home care for nursing home care; and also the complementary relations of formal home care services (i.e., Dr.'s visit, nurse's visit, home help visit, etc) to community-based day-service and short-stay centers. These findings strongly support and facilitate the national and local government programs to develop community-based formal and informal home cares, that will lower the utilization of costly long-term care facilities, such as hospitals and nursing homes.

Here, two remarks have to be made pertaining to the planned government long-term care programs. Our study shows, first, a provision of formal home care services does not give family care-givers incentives to change the amount of their informal home care at home; second, the elderly who are receiving more informal home care are less likely to use nursing home care, when they become

26

bedridden. As expected, Japanese elderly people strongly prefer

informal home care provided by their family care-givers at home to

institutional long-term care. Thus, two issues need to be solved in

establishing community-based formal home care.

First, since informal home care is so much desired by the

elderly, more attention needs to be paid to a provision of

appropriate incentives to family informal care-givers.

Compensations to family care-givers for their opportunity costs

could be a viable option to effectively integrate informal home

care with formal home care programs. Second, the elderly's strong

preference toward informal home care in the community often ends up

with long-term care at hospitals under the current national health

insurance system. The lengthy hospital-stay (i.e., the most

expensive long-term care) of the elderly is a well-known fact and

has been a big social problem.[15]

Now, let's evaluate the economic gains by encouraging the

transfer of the elderly from institutional long-term care to less

costly community-based formal and informal home care. According to

the most recent available figures, there were 16.9 million elderly

people aged 65 and over in 1993; five hundred thirty thousands of

them were receiving nursing home care; and eight hundred forty

thousands were provided informal home care.[16] The national and local

governments spent the average amount of $4,300 per month for an elderly person at nursing homes and $2,900 for formal home care services provided for the elderly.[17] The health care costs at hospitals were $4,950 and $5,250 per elderly person per month in 1993 and 1995, respectively.[18]

Based on our estimated elasticity (-0.04) of nursing home care with respect to informal home care, a one hundred percent increase in informal home care hours lowers nursing home care use by 4 percent. That is, 21,200 elderly people are transferred from nursing homes to formal and informal home care.[19] As a consequence, the government spending on nursing home care declines by $91 millions and the formal home care cost increases by $61 millions.[20]

According to the General Survey, thirty percent of family care-givers are willing to work if they do not need to provide informal home care to their elderly. Of the 21,200 transferred elderly people we assume 30 percent of their care-givers also desire to work part-time. Since the national government's new long-term care plan is to pay compensations of about seven dollars per hour and four hours a day to care-givers; the total compensations of $5 millions per month will be necessary as an expenditure.[21] Our final estimate for the economic gains will be accordingly $25 millions (=$91m-$61m-$5m) per month.

Certainly, the above economic gains will be much larger if elderly patients in hospitals, who do not need acute medical services, move to informal home care (the average cost per elderly person in a hospital is $4,950 for a month in 1993). If the long-term care policy were to create savings for the compensations to thirty percent of the eight hundred forty thousand elderly persons, who are currently provided for informal home care, we need to move about one hundred eighteen thousand elderly inpatients (to be specific, 117,730) in hospitals to informal home care programs. Therefore, the total number of the elderly provided for informal home care will be about one million.[22]

In other words, the economic gains of $25 millions are generated by doubling hours of informal home care through the transfer of 21,200 elderly people from nursing homes to formal and informal home care and another transfer of about 118,000 elderly people from hospitals to formal and informal care. The 118,000 transfers are just large enough to subsidize the compensations to a thirty percent of the care-givers of about 960,000 (i.e., 840,000 + 118,000) elderly persons, while keeping the economic gains of $25 millions.

If the government, however, wants to keep the number of transfers from hospitals to formal and informal home care as

minimum as possible so that there is no economic gains left, the government will need to transfer 12,000 less from the 118,000.[23] That is, as long as the government is successful in transferring elderly people by more than 106,000 from hospitals to formal and informal home care, the nation will start gaining economically and, consequently, will be able to contain the rapidly growing government health care expenditures for elderly people.[24]

The above estimation is made so as to meet the desire of most elderly people to live in the community: Japanese elderly hardly give up their informal home care; this might be one typical characteristic of Japanese elderly in comparison to the U.S. elderly. Furthermore, differences in the characteristics of the elderly (i.e., health conditions, availability of family care-givers, and other socio-economic and demographic factors) certainly require different long-term formal and informal home care.

Thus, the national as well as local governments must carefully screen elderly people to identify differences in their priorities and to consequently provide the most desirable long-term care service for them in the community. The success of such health care programs largely depends on how carefully the programs of community-based formal and informal home care are designed in the new long-term care insurance system, which starts in the year 2000.

5. Conclusion

This study provides a strong evidence of the negative relationships between nursing home care and formal home care (i.e., community-based day-service and short-stay facility centers, skilled and semi-skilled home care). It also shows that informal home care can substitute for nursing home care. Therefore, well-organized and well-developed community-based formal and informal home care is a viable option to substitute for costly long-term care at hospitals and nursing homes. Such a long-term care policy may significantly contain the rapidly growing government health care expenditures. Our conservative estimate shows that there will be economic gains of about $25 millions per month by establishing such informal home care scheme. To be successful, the national and local governments may need to provide compensations for family care-givers.

Footnotes

Acknowledgements

1   On the other hand, Moscovice, Davidson and McCaffrey (1988) show a lack of the substitution.

2   For instance, the number of bedridden elderly people aged 65 or over was about 0.9 million in 1993; the number is expected to become 1.2 millions in 2000 and 2.3 millions in 2025, according to Ministry of Health and Welfare of Japan, Health and Welfare Bureau for the Elderly (ed.), Health Care and Welfare of the Elderly (Rozin no Hoken-Iryou to Fukushi, in Japanese), 1995, p. 24.

3   The source of Figure 1 is from Health Care and Welfare of the Elderly, 1995, p. 150. All dollar values in this paper are calculated based on the exchange rate of $1 = 100 yen, for brevity.

4   The descriptions of this new public long-term care insurance system are as of May, 1997, and are obtained from the Ministry of Health of Welfare of Japan: Points about Long-term Care Insurance and Abstract of Long-term Care Insurance System, and also from the morning editions of Asahi Newspaper, Mainichi Newspaper, and Nihon Keizai Sinbun, 1997.5.22. For problems with public provision of long-term care, Cutler and Sheiner (1993) present a very comprehensive summary of the issues.

5   The utility maximization with respect to L and Q, we obtain:

$$\partial \pounds / \partial L = \pounds_L = u'_{L,S(NH)} + u'_{L,S(FHC)} + u'_{L(EN)} - \lambda \cdot P_L = 0;$$
and
$$\partial \pounds / \partial Q = \pounds_Q = u'_{Q,S(IHC)} + u'_{Q,H} - \lambda \cdot P_Q = 0.$$

6   For the nursing home care equation (7-1), even though many aspects of public nursing homes are basically standardized across the country by the national government, the quality of nursing home care services probably varies at different places. Thus, such characteristic of nursing homes might have to be taken into consideration in the estimation. This is also true in the formal home care equation (7-2). However, since no information is available to correct those deficiencies, we are unfortunately unable to mitigate the possible bias(es). In addition, we do not include supply constraints as an independent variable because the fees at public nursing homes and for community-based formal home care services are fixed across the country, but vary according to service recipient's income.

7   Previous research uses different measurements of formal home care: paid activity-days of care received per week (Ettner, 1994); hours per week of in-home assistance with medical treatment (Kemper, 1992); total expenditures for Alternative Care Grants Program per quarter (Moscovice, Davidson and McCaffrey, 1988); and the number of paid home care visits per week (Coughlin, McBride, Perozek and Liu, 1992).

8   The methods of test for simultaneity and endogeneity are intensively discussed by Wu (1973), Heckman (1978), Hausman (1978), and Nakamura and Nakamura (1981).

9   As for the measurement of informal home care, Moscovice, Davidson and McCaffrey (1988) use total hours spent per quarter by informal care network, while Kemper (1992) employs informal visiting hours by friends, neighbors, and family members. According to the General Survey, 80 percent of bedridden elderly people on average are taken care of by their family members at least for the last six months before death; 16 percent of them by visitors from local health agency; and the rest 4 percent by relatives. In general, when the spouse for a bedridden elderly is living together and active, the spouse is very likely to be the

primary care-giver.

10   For expected effects of the economic variables, since staff intensity and higher skilled staffs at a nursing home may represent better quality of services, the elderly with more wealth may tend to demand a nursing home with better quality, holding the elderly's health status and other socio-demographic characteristics constant (Cohen and Spector, 1996). On the other hand, home ownership may reflect a strong psychological and social attachment to the community (Greene, Lovely and Ondrich, 1993). Thus, the expected effect of this variable is negative on the probability of choosing nursing home care.

11   It is worth noting that Moscovice, Davidson and McCaffrey (1988) also have a similar finding with U.S. data: "Informal care-givers do not appear to stop providing care when formal services become available (p.972)."

12   The value, -0.013, is obtained from -0.064 x sample average of probability of nursing home care x (1 - sample average of prob. of n.h.c) = -0.064x0.2767x0.7233 = -0.0128. The estimated elasticity is -0.064x(1 - sample average of prob. of n.h.c.)x sample average of informal home care: -0.064x(1-0.2767)x0.9345 = -0.0432.

13   The average hours spent on informal home care (i.e., 0.9345 hours = one hour) seems to be too small. The small value might result from the fact that we count only of the elderly in bad health condition the hours of very basic activities such as meals, dressing, and toilet; the proportion of the elderly in bad health condition is 33.1 percent of the overall elderly in our data. For the calculation of hours of informal home care, we assume that only one family care-giver spends his or her time on the above activities with an elderly person. Hence, our average value very likely under-estimates the true hours of family informal home care. If we count the overall average hours spent on the above activities for all elderly individuals in our data, the over-all average value is 2 hours 48 minutes.

14   Health and Welfare Survey: 1990, the Ministry of Health and Welfare of Japan, 1991, Tokyo.

15   Under the present public health insurance system, the

elderly can stay at a hospital only for 7 dollars (i.e., 700 yen) per day and visit for about 10 dollars per month regardless of its frequency.

16   The values are as of 1993 (Asahi Newspaper, Dec. 26, 1995).

17   The values are as of 1994 (Asahi Newspaper, Dec. 22, 1995).

18   The per-day health care costs for an elderly person in hospitals are about $175(17,477 yen) in 1995; the value is $165 in 1993. The value in 1995 is obtained from the Health and Welfare Bureau for the Elderly, Ministry of Health and Welfare of Japan, while the value in 1993 is calculated from Annual Report on the Statistics of Social Security 1995 (Shakai Hosyou Tokei Nennpou, in Japanese), Prime Minister's Office on Social Security, the Advisory Council of Executive Office, 1996, p.292.

19   The value of 21,200 is by 0.04 (i.e., the elasticity value) x 530,000 (elderly people at nursing homes).

20   The values of $91 millions and $61 millions are calculated as follows: 21,200 x $4,300 (i.e., costs per person at nursing homes for a month) = $91,160,000 (i.e., the dollars saved); and 21,200 x $2,900 (i.e., costs of formal home care services per person)= $61,480,000.

21   The value of $5 millions is: 21,200 persons x 0.3 = 6,360; 6,360 x $7 x 4 hours/day x 30 days/month = $5,342,400, which is about $5 millions.

22   The value of one million elderly people is calculated by the following steps:
(1) we use the monthly costs of $4,950 (i.e., $165/day x 30 days) per elderly person in hospitals in 1993;
(2) Total savings = ($4,950 - $2,900) x N, where N = the numbers of inpatients to transfer from hospitals to formal home care;
(3) 840,000 + N = the total number of elderly people after transfers;
(4) thirty percent of informal care-givers are willing to work part-time = 0.3 x (840,000 + N);
(5) the monthly compensations for a care-giver = $840 (i.e., $7/hour, 4 hours/day, and 30 days/month);
(6) thus, ($4,950 - $2,900) x N = 0.3 x (840,000 + N) x 840;

(7) we obtain N =117,730.8, which is approximately 118,000 elderly persons; and
(8) Finally, the total number of the elderly receiving informal home care is about one million (840,000 + 21,200 + 117,730 = 978,930).

23   Now, we try to put some elderly people back from formal and informal home care to hospitals. Thus, ($4,950 - $2,900)B = $25 millions, where B stands for the number of elderly people to move back to hospitals. The number is 12,195.1, which is about 12,000 elderly persons.

24   At this stage, we are, however, not sure whether the $840 monthly compensation is large enough or more than enough to convince family care-givers to double their hours of informal home care and consequently not to look for jobs in the labor market. One interesting thing to note is that under the current income tax system, spouse (normally, wife) can't earn more than $10,300, in order for the bread winner to claim $3,800 as the family allowance. Therefore, the above $840 compensations per month ($10,080 per year) is just large enough so that the bread winner can still claim the family allowance.

References

Bound, J., 1991, "Self-reported versus objective measures of
 health in retirement models," Journal of Human Resources 26,
 106-138.

Breslaw J.A. and M. Stelcner, 1987, "The effect of health on the
 labor force behavior of elderly men in Canada," Journal of
 Human Resources 22, 490-517.

Chuma, H., T. Yamada and F. Yasukawa, 1994, The demand for long-
 term care of the aged in Japan, presented at NBER-JCER
 Conference on the Economics of Health Care.

Cohen, J.W. and W.D. Spector, 1996, "The effect of Medicaid
 reimbursement on quality of care in nursing homes," Journal
 Health Economics 15, 23-48.

Coughlin, T.A., T.D. McBride and K. Liu, 1990, "Determinants of
 transitory and permanent nursing home admissions, "Medical
 Care 28, 616-631.

Coughlin, T.A., T.D. McBride, M. Perozek and K. Liu, 1992, "Home
 care for the disabled elderly: Predictors and expected
 costs, Health Services Research 27, 453-479.

Cutler, David M. and Louise M. Sheiner, 1993, "Policy Options for
 Long-term Care," NBER Working Paper No. 4302, March.

Deaton, A. and J. Muellbauer, 1980, Economics and Consumer Behavior, London: Cambridge University Press.

Ettner, S.L., 1994, "The effect of the Medicaid home care benefit on long-term care choices of the elderly," Economic Inquiry 32, 103-127.

Garber, Alan M. and Thomas MaCurdy, 1990, "Predicting Nursing Home Utilization among the High-Risk Elderly," in Issues in the Economics of Aging, ed. David A. Wise, Chicago: University of Chicago Press, 173-200.

Greene, Vernon L., 1983, "Substitution Between Formal and Informally Provided Care for the Impaired Elderly in the Community," Medical Care 21, 609-619.

Greene, V.L., M.E. Lovely and J.I. Ondrich, 1993, "Do community-based long-term-care services reduce nursing home use? A transition probability analysis," Journal of Human Resources 28, 297-317.

Hausman, J.A., 1978, "Specification tests in econometrics," Econometrica 46, 1251-1271.

Heckman, James J., 1978, "Dummy endogenous variables in a simultaneous equation system," Econometrica 46, 931-959.

Kemper, P., 1992, "The use of formal and informal home care by the disabled elderly," <u>Health Services Research</u> 27(4), 421-451.

Moscovice, I., G. Davidson and D. McCaffrey, 1988, "Substitution of formal and informal care for the community-based elderly," <u>Medical Care</u> 26, 971-981.

Nakamura, Alice and Masao Nakamura, 1981, "On the relationships among several specification error tests presented by Durbin, Wu, and Hausman," <u>Econometrica</u> 49, 1583-1588.

Nyman, J.A., 1989, "The private demand for nursing home care," <u>Journal of Health Economics</u> 8, 209-231.

Sindelar, L. Judy, 1982, "Differential Use of Medical Care by Sex, <u>Journal of Political Economy</u> 90, no.5, 1003-1019.

Strauss, J., P.J. Gertler, O. Rahman and K. Fox, 1993, "Gender and life-cycle differentials in the pattern and determinants of adult health," <u>Journal of Human Resources</u> 28, 791-837.

Swan, J.H., and A.E. Benjamin, 1990, "Medicare home health utilization as a function on nursing home market factors," <u>Health Services Research</u> 25, 479-500.

Wu, De-Min, 1973, "Alternative tests of independence between stochastic regressors and disturbances," <u>Econometrica</u> 41, 733-750.

Table 1 Nursing Homes and their Characteristics

Types of Nursing Home	Health Facility for the Elderly (Rhojin-Hoken Sisetsu, in Japanese)	Special Nursing Home for the Elderly (Tokubetsu Yhougo-Rhojin Home)	Nursing Home for the Elderly (Yhougo-Rhojin Home)	Home for Elderly people (Keihi-Rhojin Home)
Characterisitcs				•Type A Home •Type B Home •Care House
Functions	•to recuperate frail or bedridden elderly aged 65 or over for convalescence following hospitalization.	•to care bedridden elderly aged 65 or over a substitute place to live in because of difficulties in being taken care of at home.	•to care elderly people aged 65 or over, who have difficulty in leading a normal life because of declining mental or physical functions, and economic reasons.	•to care elderly people aged 60 or over in a very low income braket, who have difficulties at home because of their environment or housing circumstances.
Types of service	•rehabilitation after bedridden condition •training of daily activities •medical services •meals •bathing •other basic services necessary for daily activities.	•medical services •meals •bathing •other basic services necessary for daily activities.	•medical services •meals •bathing •other basic services necessary for daily activities.	•medical services •meals (preparing and cooking own meals is required at Type B Home) •bathing •other basic services necessary for daily activities.
Number of facilities (in 1993)	1,038 (in 1995)	2,770	949	•Type A Home: 253 •Type B Home: 38 •Care House: 77

Table 1 (continued)

Number of beds (in 1993)	88,809 (in 1995)	194,091	67,703	• Type A Home: 15,302 • Type B Home: 1,810 • Care House: 3,730
Monthly facility-usage and care costs per person	• $2,700	• $2,900 at a 50-bed home • $2,600 at a 80-bed home • $2,400 at a 100-bed home	• $1,800 at a 50-bed home • $1,600 at a 80-bed home • $1,400 at a 100-bed home	• Type A Home $1,600 at a 50-bed home $1,200 at a 80-bed home $1,100 at a 100-bed home • Type B Home $412 • Care House $1,100
Financial sharings of the costs	• Insurers: 6/12 • National Gov't: 4/12 • Prefectural Gov't: 1/12 • Municipal Gov't: 1/12	• National Gov't: 2/4 • Prefectural Gov't: 1/4 • Municipal Gov't: 1/4	• National Gov't: 2/4 • Prefectural Gov't: 1/4 • Municipal Gov't: 1/4	• National Gov't: 2/4 • Prefectural Gov't: 1/4 • Municipal Gov't: 1/4
Personal Charges per month	• all expences related to personal matters of daily life (e.g., meals, dypers, haircut, etc)	• being determined according to elderly's annual income.	• being determined according to elderly's annual income.	• being determined according to elderly's annual income.

Table 2

Definitions of Variables and their Descriptive Statistics

Variable	Definition (m = Mean and s.d. = Standard Deviation)
Nursing home care	binary variable: 1= elderly person who wants to use an institutional long-term care, namely nursing home care, when he or she becomes bedridden. (m = 0.2767; s.d. = 0.4474)
Day & Short center	binary variable: 1= elderly person who wants to use community-based day-service and shot-stay facility centers, when he or she becomes bedridden within formal home care. (m = 0.3563; s.d. = 0.4789)
Skilled home care care	binary variable: 1= elderly person who wants to use a community-based medical home service (either Dr.'s visit or nurse's visit), when he or she becomes bedridden. (m = 0.7081; s.d. = 0.4547)
Semi-skilled home care	binary variable: 1= elderly person who wants to use home care a community-based home care based non-medical home care service (either home help visit, bathing, or lunch service), when he or she becomes bedridden. (m = 0.4674; s.d. = 0.4990)
Informal home care	informal home care provided for an elderly parent (hours per day) (m = 0.9345: s.d. = 1.7307)
Formal home care services	
Dr.'s visit	binary variable: 1= elderly person who wants to use home health and medical services by doctors, when he or she becomes bedridden. (m = 0.5741; s.d. = 0.4945)
Nurse's visit	binary variable: 1= elderly person who wants to use home health and medical services by nurses, when he or she becomes bedridden. (m = 0.3030; s.d. = 0.4596)
Home help visit	binary variable: 1= elderly person who wants to use personal-care assistance and housekeeping, when he or she becomes bedridden. (m = 0.2307; s.d. = 0.4213)
Bathing	binary variable: 1= elderly person who wants to use bathing service at day-service center, when he or she becomes bedridden. (m = 0.2275; s.d. = 0.4193)

42

Table 2 (continued)

Variable	Definition
Lunch	binary variable: 1= elderly person who wants to use lunch service and its delivery, when he or she becomes bedridden. (m = 0.1095; s.d. = 0.3123)
Equipment	binary variable: 1= elderly person wants to use services of special bed supply, wheelchair and other equipments, when he or she becomes bedridden. (m = 0.1583; s.d. = 0.3651)
Availability of family	
Married	binary variable: 1= married and living with spouse. (m = 0.6261; s.d. = 0.4839)
Family	binary variable: 1= two and three generation families or multi-generation family. (m = 0.4858; s.d. = 0.4998)
Not Children	binary variable: 1= elderly person has children but does not live together. (m = 0.3462; s.d. = 0.4758)
Economic factors	
Wealth low	amount of wealth (bonds, stocks, savings and trusts) less than 1 million yen. (m = 0.2011; s.d. = 0.4009)
Wealth high	amount of wealth (bonds, stocks, savings and trusts) more than 30 million yen. (m = 0.0559; s.d. = 0.2299)
Home owner	binary variable: 1= owns house or apartment. (m = 0.8692; s.d. = 0.3371)
Income	work income, pension, wealth income and welfare income (1,000 yen). (m = 193.87; s.d. = 131.09)
Objective health	
Physical	five measures of physical dependence in daily dependence (PD) activities: walking without help, climbing stairs, physical strength represented by bed-making by himself or herself, hands' and fingers' ability represented by cutting own nails, and eye sight ability represented by reading newspapers. I: five dependence. (m = 0.0136; s.d. = 0.1158) II: from two to four dependence. (m = 0.2810; s.d. = 0.4496)

Table 2 (continued)

Variable	Definition
Instrumental	five measures of instrumental dependence of dependence(ID) either using (electric or non-electric) household tools and machines or performing complicated daily tasks: preparation of meals, being able to use a washing machine, being able to use an automatic machine to deposit/withdraw money at a bank, shopping for necessities, and being able to fill in forms. (m = 0.0544; s.d. = 0.2268) I: five dependence (m = 0.0544; s.d. = 0.2268) II: from two to four dependence (m = 0.3042; s.d. = 0.4601)
Memory(ME)	six abilities of daily living: remembering the location of own clothes, cooking a variety of dishes without recipes, following community rules and regulation, remembering the location of important documents, a choice of clothes by one's own taste and continuation of having own hobbies. I: six dependence. (m = 0.0166; s.d. = 0.1071) II: from three to five dependence. (m = 0.2299; s.d. = 0.4208)
Depressed	seven measures of depressed affect: loneliness, affect(DA) uselessness, anxiety, sadness, preference for death, uneasiness and dissatisfaction. I: four and more depressed affect. (m = 0.1611; s.d. = 0.3677) II: from one to three depressed affect. (m = 0.5977; s.d. = 0.4904)
Other factors	
Urban	binary variable: 1= urban city dweller. (m = 0.6869; s.d. = 0.4638)
Gender	binary variable: 1= male. (m = 0.4606; s.d. = 0.4985)
Age	age of elderly person. (m = 71.8; s.d. = 5.6)
Not Outgoing	binary variable: 1= elderly person who has a negative attitude toward going out. (m = 0.2019; s.d. = 0.4015)
No Friend	binary variable: 1= elderly person who has no close friends. (m = 0.1979; s.d. = 0.3985)
Association	binary variable: 1= elderly person who frequently associates with friends. (m = 0.3482; s.d. = 0.4765)
Communication	binary variable: 1=an elderly person who frequently communicates with relatives. (m = 0.3998; s.d. = 0.4899)

44

Table 3-1

Regression results: nursing home care, day&short center and skilled home care

Variable	Nursing home care Logit		Day&Short center Logit		Skilled home care Logit	
Nursing home care	---		-0.177c	(0.099)	-0.527a	(0.101)
Day & Short center	-0.195b	(0.099)	---		-0.278a	(0.094)
Formal home care						
Dr.'s visit	0.474a	(0.95)	0.497a	(0.088)	---	
Nurse's visit	0.056	(0.103)	0.203b	(0.094)	---	
Home help visit	-0.508a	(0.106)	0.246b	(0.105)	---	
Bathing	-0.199	(0.112)	0.263b	(0.105)	---	
Lunch	-0.310b	(0.144)	0.753a	(0.158)	---	
Equipment	0.067	(0.134)	0.014	(0.117)	---	
Skilled home care	---		---		---	
Semi-skilled home care	---		---		0.583a	(0.093)
Informal home care	-0.064b	(0.026)	0.019	(0.026)	-0.012	(0.026)
Availability of family						
Married	0.191	(0.121)	-0.108	(0.112)	0.172	(0.117)
Family	0.249b	(0.101)	-0.289a	(0.092)	0.071	(0.097)
Not children	0.208a	(0.100)	-0.035	(0.091)	-0.189b	(0.096)
Economic factors						
Wealth low	-0.133	(0.120)	-0.101	(0.112)	-0.255b	(0.114)
Wealth high	0.097	(0.231)	0.119	(0.206)	0.016	(0.226)
Home owner	0.418a	(0.137)	-0.072	(0.141)	0.191	(0.140)
Income	0.001	(0.001)	-0.001b	(0.001)	-0.001	(0.001)
Objective health						
Physical dependence I	1.738a	(0.671)	-0.351	(0.400)	-0.869b	(0.412)
Physical dependence II	0.188	(0.135)	0.077	(0.120)	-0.191	(0.127)
Instrumental depen.I	0.527c	(0.302)	-0.246	(0.245)	0.515c	(0.268)
Instrumental depen.II	0.041	(0.131)	0.034	(0.118)	0.227c	(0.128)
Memory I	-1.326a	(0.468)	0.297	(0.443)	0.239	(0.497)
Memory II	-0.074	(0.143)	0.270b	(0.129)	-0.226c	(0.136)
Depressed affect I	-0.396b	(0.156)	-0.286c	(0.146)	0.309b	(0.154)
Depressed affect II	-0.147	(0.118)	-0.213b	(0.106)	0.162	(0.110)
Other factors						
Urban	-0.221b	(0.110)	0.109	(0.097)	0.164	(0.103)
Gender (male)	0.125	(0.117)	-0.155	(0.107)	0.338a	(0.114)
Age	-0.003	(0.009)	0.007	(0.008)	-0.001	(0.009)
Not outgoing	0.315b	(0.131)	0.031	(0.120)	-0.109	(0.124)
No Friend	-0.397a	(0.125)	0.200c	(0.121)	-0.350a	(0.125)
Association	0.162	(0.111)	0.167c	(0.099)	-0.223b	(0.105)
Communication	0.133	(0.100)	-0.071	(0.090)	-0.041	(0.096)
Intercept	0.584	(0.705)	0.096	(0.648)	0.669	(0.677)
χ^2	205.75		118.39		141.37	
-2 Log Likelihood	2744.4		3139.1		2878.9	
Sample size	2501		2501		2501	

Note: Standard errors are in parentheses. a, b and c represent statistically significant levels of logit coefficients as follows: 99% level(a), 95% level(b) and 90% level(c) for a two-tailed test. The asymptotic t-statistics for each coefficient is based on square roots of Wald chi-square.

Table 3-2

Regression results: semi-skilled home care and informal home care

Variable	Semi-skilled h.c. Logit		Informal Home care OLS		Informal Home care OLS	
Nursing home care	-0.440a	(0.095)	0.213a	(0.077)	0.202a	(0.077)
Day & Short center	0.133	(0.086)	-0.054	(0.070)	-0.048	(0.071)
Formal home care						
Dr.'s visit	---		---		-0.048	(0.069)
Nurse's visit	---		---		0.039	(0.073)
Home help visit	---		---		0.103	(0.081)
Bathing	---		---		0.070	(0.080)
Lunch	---		---		0.052	(0.109)
Equipment	---		---		-0.087	(0.093)
Skilled home care	-0.583a	(0.093)	-0.029	(0.075)	---	
Semi-skilled home care	---		0.054	(0.068)	---	
Informal home care	-0.019	(0.024)	---		---	
Availability of family						
Married	-0.255b	(0.107)	0.323a	(0.087	0.319a	(0.087)
Family	0.292a	(0.087)	-0.063	(0.071)	-0.050	(0.072)
Not children	-0.041	(0.087)	-0.027	(0.071)	-0.028	(0.071)
Economic factors						
Wealth low	0.121	(0.108)	0.044	(0.088)	0.046	(0.088)
Wealth high	-0.133	(0.197)	0.105	(0.160)	0.100	(0.161)
Home owner	0.067	(0.132)	-0.290a	(0.107)	-0.288a	(0.107)
Income	0.0007c	(0.0004)	-0.001b	(0.0003)	-0.0007b	(0.0003)
Objective health						
Physical dependence I	0.646	(0.428)	0.109	(0.321)	0.128	(0.321)
Physical dependence II	0.068	(0.116)	0.134	(0.094)	0.138	(0.094)
Instrumental depen.I	-0.049	(0.236)	-0.017	(0.191)	-0.011	(0.192)
Instrumental depen.II	0.026	(0.114)	-0.052	(0.093)	-0.046	(0.093)
Memory I	-0.094	(0.424)	-0.484	(0.343)	-0.498	(0.343)
Memory II	0.043	(0.123)	-0.083	(0.100)	-0.087	(0.100)
Depressed affect I	-0.000	(0.139)	0.892a	(0.112)	0.888a	(0.112)
Depressed affect II	-0.015	(0.100)	0.403a	(0.081)	0.404a	(0.081)
Other factors						
Urban	-0.042	(0.094)	0.107b	(0.076)	0.185b	(0.076)
Gender (male)	0.258b	(0.103)	-0.336a	(0.083)	-0.330a	(0.083)
Age	-0.007	(0.008)	0.004	(0.006)	0.004	(0.006)
Not outgoing	-0.086	(0.114)	0.400a	(0.092)	0.399a	(0.092)
No friend	0.022	(0.115)	0.031	(0.094)	0.033	(0.094)
Association	0.096	(0.095)	-0.035	(0.077)	-0.032	(0.077)
Communication	0.149c	(0.087)	-0.108	(0.070)	-0.106	(0.071)
Intercept	1.019	(0.622)	0.409	(0.505)	0.402	(0.505)
χ^2	118.20		---		---	
-2 Log Likelihood	3338.2		---		---	
F-statistic	---		7.96		7.02	
Adjusted R-squared	---		0.068		0.067	
Sample size	2501		2501		2501	

Note: Standard errors are in parentheses. a, b and c represent statistically significant levels of logit coefficients as follows: 99% level(a), 95% level(b) and 90% level(c) for a two-tailed test. The asymptotic t-statistics for each coefficient is based on square roots of Wald chi-square.

Figure 1 Monthly Standard Personal Charges ($)
at the Special Nursing Home for the Elderly